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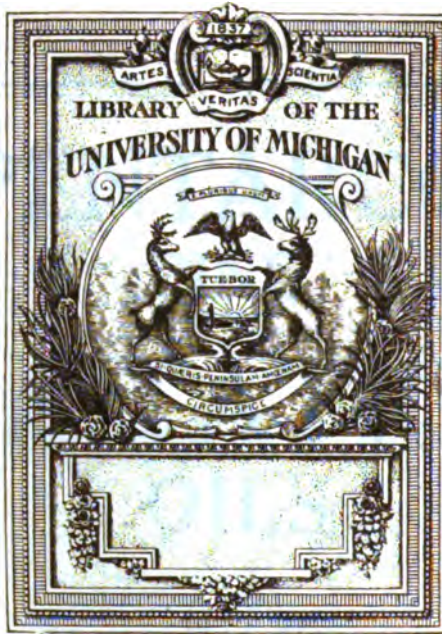
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THE MINES HANDBOOK

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INTERNATIONAL EDITION
THE MINES HANDBOOK

AN ENLARGEMENT OF
THE COPPER HANDBOOK

Founded by Horace J. Stevens, 1900

A MANUAL OF
THE MINING INDUSTRY OF THE WORLD

BY

WALTER HARVEY WEED, E.M.

Former Geologist in the U. S. Geological Survey, 1883-1906. Member
Institution of Mining and Metallurgy of America; Fellow
Geological Society of America; Author: Copper
Mines of the World, Geology of Butte, Mon-
tana: Nature of Ore Deposits, etc.

VOL. XIII

Supplementing Volumes I to XII

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
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29 Broadway, New York City

1918

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THE TROW PRESS
NEW YORK

PREFACE

The present volume is the second issue of the MINES HANDBOOK and the thirteenth of the COPPER HANDBOOK, of which it is an enlargement.

The volume has many notable changes and has been rewritten and entirely reset. It is no longer merely a Copper Handbook, but is a METAL MINES HANDBOOK, covering all metallic mines.

The greatest change in the volume is the new arrangement of companies. Heretofore all mines and mining companies have been listed alphabetically, an arrangement that saved indexing and concealed imperfections. The new geographical arrangement reveals the completeness or incompleteness with which the book covers the active properties of any particular mining district, or town, and enables the reader to judge whether or not a property is in a successful district or not. This arrangement of companies has very many advantages, but necessitates the use of an index, which, following the custom of other manuals, is put in the front of the book and printed on tinted paper for convenience in reference.

The geographic arrangement is primarily one by countries, states, counties, districts and towns, but this has not been consistently followed at the cost of the readers' convenience, and where practicable the properties of a mining center have been grouped, as, for example, those of Butte, Montana; Jerome, Arizona, etc.

Volume 13 has other new features. It contains maps of the more important mining districts in compact form, and refers to noteworthy articles and books describing mines, mills and processes in use at various properties.

The glossary, chapters on mineralogy and those on metal prices, production, etc., are full and authentic.

The list of producers and buyers of the rarer metals proved very useful and was widely copied, usually without giving credit to the MINES HANDBOOK, from Volume 12; it has been revised and reprinted for this edition.

The more important foreign mines are included in the present volume, and the Japanese information is especially noteworthy.

In the preparation of material on the iron mining companies, Crowell & Murray's Manual has been freely consulted and used. It is cordially recommended to those especially interested in iron mining.

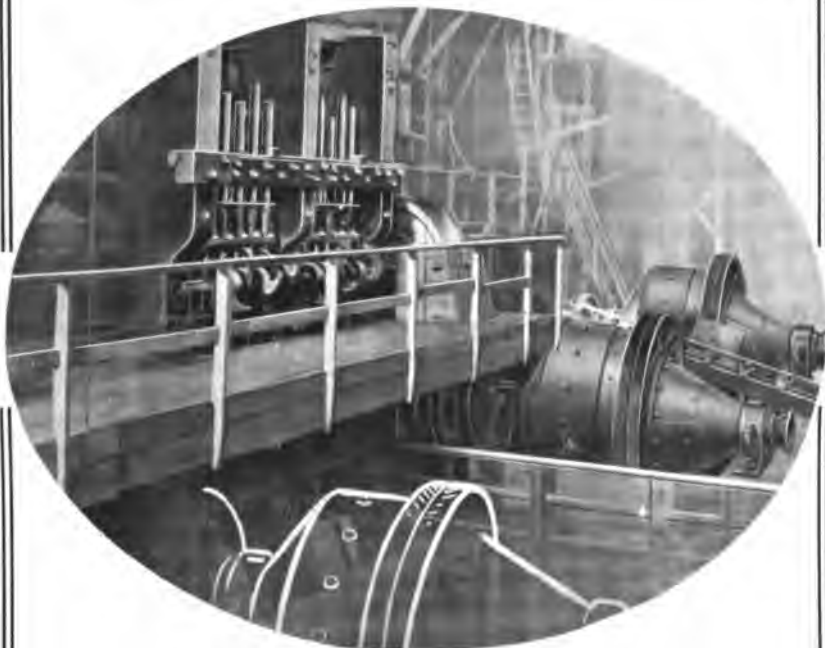
Skinner's Mining Manual, published in London, covers the financial and organization details of all British-owned companies, and has been freely consulted for information concerning the foreign companies.

The war has taken Mr. George H. Morgan, my former assistant editor, who now holds a commission in the Engineers' Corps of the army. Mr. M. von Bernewitz, formerly of the Mining & Scientific Press, is the new assistant editor, and together with M. Stencel, have been valued assistants in writing up material from the field.

The editor has personally visited all the larger and many of the smaller camps during the year in the course of his professional work and feels therefore that the information herein, while not guaranteed, is correct, to the best of his knowledge and belief. Suggestions for betterment and corrections are earnestly invited.

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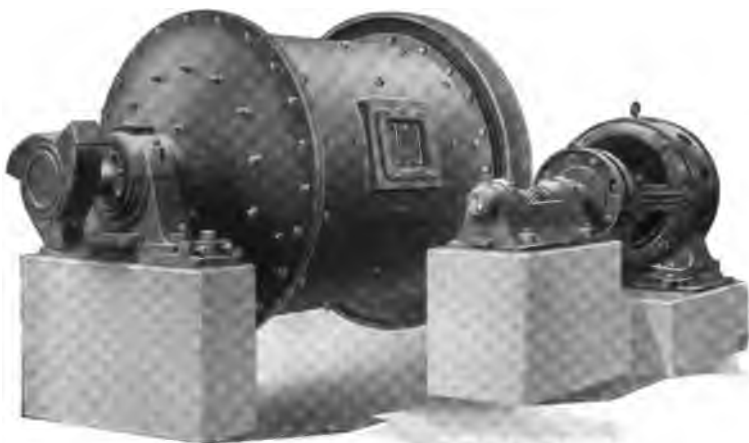
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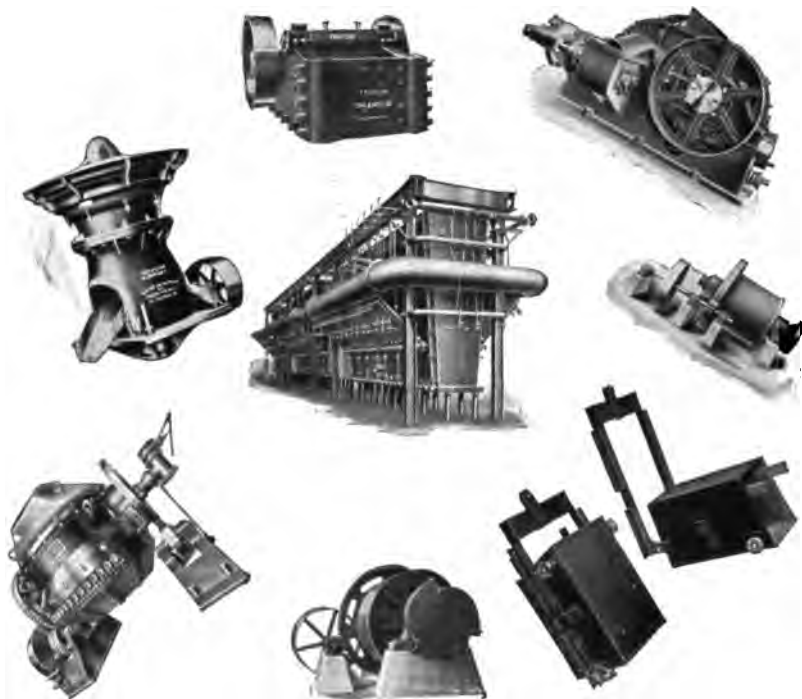
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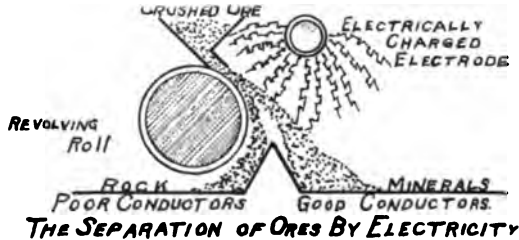
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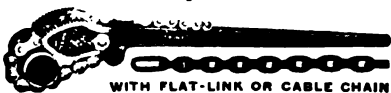


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CHAPTER I

GLOSSARY OF MINING TERMS

The following glossary of mining, milling, and trade terms will be found useful by many readers.

Acicular. Needle-shaped.

Acid. An acid or silicious rock is one in which bases are combined with silica. The antithesis of basic.

Adit. A level mine opening driven into a hill or mountain.

Adobe. Sun-dried brick used in all Latin-American countries.

Air-blast. A violent explosion caused by the escape of air compressed by the settling down of rocks in the upper workings of a mine.

Air Compressor. A machine for condensing air to a pressure sufficient to actuate machinery. The compressed air is forced through pipes to various parts of the mine, or surface plant, and used in the same way as steam for driving drills, pumps, hoists, etc.

Air-doors. Doors built in mine passageways to stop air currents.

Air-drill. A drill driven by the elastic pressure of compressed air.

Air-shaft. A shaft used to provide ventilation for deep workings. Two shafts, one opening on slightly higher ground than the other, will provide natural ventilation underground, when connected by a drift, the longer shaft becoming a chimney, and the shorter an inverted syphon, down which the air is sucked with great force.

Alkali. Potash and soda are the common alkalis. An alkali is the opposite of an acid; it turns red litmus blue, and forms salts with acids.

Alloy. Two or more metals united mechanically, but not chemically by fusion.

Alluvium. Soil or broken rock deposited by the action of water.

Altered. An altered rock is one that has undergone changes in its chemical and mineralogical structure since its original deposition.

Aluminous. Containing aluminum.

Amalgam. An alloy of mercury with another metal such as gold, silver or copper. Mercury will not amalgamate with iron.

Amalgamation. The process of extracting gold and silver from crushed ores by amalgamation with mercury. The quicksilver is expelled later by heat, and recovered for further use.

Amorphous. Without form.

Amygdaloid. A trap rock, containing vesicles or small rounded cavities filled by mineral matter such as calcite, agate, etc. Rock is spotted and in outcrop often pitted as amygdules weather out, leaving cavity. In the Lake Superior district copper-bearing amygdaloids frequently show native copper in the cavities left by the leaching out of the soft minerals originally therein.

Analysis. A determination of the constituents of a chemical substance.

Anhydrous. Devoid of water.

Anode Copper. Copper from a converter, cast in molds into plates with ears, and used in cells of electrolytic refineries.

Anticline. An arch or fold of rock-strata bulging upwards, in U shape; is the reverse of syncline.

Antigua. In Mexico, is a mine worked by Spaniards or Mexicans at a time so remote—from 50 to 300 years—that particulars have been forgotten; sometimes valuable, but "every antigua is not a bonanza."

Antimonide. An ore of any metal chemically united with antimony.

Apartado. Apartado de correos is Spanish for postoffice box; usually abbreviated to Ap.

Apex. The top or uppermost part of a vein. In the United States the ownership of the outcrop or apex carries the right to follow the vein downward beneath another's ground, if within one's end lines extended.

Arastra. A circular rock-lined pit in which broken ore is pulverized by stones attached to horizontal poles fastened in a central pillar and dragged around by mules.

Arenaceous. Sandy; carrying silica as sand.

Argentiferous. Silver-bearing.

Argillaceous. Clayey.

Aroba. A Spanish weight of 25.36 lbs. avoirdupois; Portugese, 32.38 lbs.

Arroya. A gulch.

Arsenide. A mineral composed of arsenic combined with another metal.

Arsenopyrite. A mineral composed of arsenic sulphur and iron; often carries gold or silver also.

Assay. A test of ore or metal to determine the exact amount of any metal or metals contained in it. Usually fire assay; smelting on a small scale.

Assessment Work. The work required annually by the U. S. government, on an unpatented mining claim to keep title.

Attle. Cornish term for waste rock.

Auriferous. Containing gold.

Back. The rock above mine opening like the ceiling of a room. The part or section of a vein between two levels or between a level and the surface.

Bad air. Air vitiated by powder fumes, noxious gases or insufficient ventilation.

Ball Head or Stamp. A steam stamp, named after its inventor.

Barilla (De Cobre). Spanish term for particles of native copper, cleaned (concentrates). Equivalent to the "mineral" of Lake Superior mines. Used mainly in Bolivia among tin producers.

Barranca. A deep gulch or canyon, with precipitous sides.

Barrel Work. Masses of crude native copper, picked out by hand before ore passes beneath stamp. Was formerly shipped in barrels to the smelter.

Barrow. A wheelbarrow.

Basalt. A dark colored heavy igneous rock, carrying much iron; a trap rock.

Base. Impure; an alkaline element.

Base Bullion. Copper or lead carrying much gold or silver.

Base Metal. Any of the non-precious metals.

Basic. Low in silica; containing more than enough iron and lime to form a good slag.

Basin. A syncline; a trough in the earth's surface.

Battery. A set of stamps, usually five in a stamp mill.

Bearing. The course of direction, as that of a mineral outcrop in degrees, east or west of, north (meridian).

Bed. A seam or layer of stratified rock. Used in some mineral districts for flat veins or lodes.

Bed Rock. The solid rock underlying stream gravel or rock.

Bedded Vein. One parallel with the bedding of the country rock.

Bells. Signals for lowering and hoisting the bucket, skip or cage in a shaft usually are given by bells, the number of strokes indicating the nature of the load, the place for stopping, etc.

Bit. The cutting end of a boring tool. A steel drill; a short hollow

cylinder of soft steel, used in diamond-drilling. The diamonds are set around the inner and outer edges of the bottom of the bit, and cut into the most refractory rocks when the bit is rotated.

Black Copper. Impure copper, smelted, but containing impurities requiring refining.

Black Jack. Sphalerite, zinc blende of dark color.

Blanched Copper. Copper containing a large amount of arsenic, practically forming an alloy.

Blast. (N.) Air forced through tuyeres into a blast furnace or Bessemer converter. (V.) to explode gunpowder or dynamite.

Blast Furnace. A cupola furnace in which ore is smelted, with the aid of air pumped in under pressure.

Blasted. A blasted miner is one who has been injured by the explosion of dynamite or gunpowder.

Blasting. The breaking of rock by means of high explosives, inserted in holes bored in the rock for the purpose.

Blende. Zinc-blende or sphalerite; sulphide of zinc.

Blind Drift. A drift connected with other workings of the mine at one end only; a cul de sac.

Blind Lode. A lode not outcropping at surface.

Blister Copper. Copper of 96 to 99% purity; applied to product of Bessemer converter.

Blocking Out. Exposing the ore in a mine so that it can be extracted by stoping. Properly speaking, ore is not block out for stoping until opened on three sides.

Blossom. The oxidized, softened outcrop of an orebody altered by weathering.

Blout. A mass of quartz, often mineralized, that is often isolated and not connected with a vein; an abbreviation of blow-out.

Blower. A fan used to force air into a mine; a blowing engine.

Blowing Engine. An engine for forcing air into blast furnaces under pressure, often about one pound avoirdupois per square inch.

Blowing In. A smelting furnace is blown in, when charge is ignited, fusion begins and the process of reduction by fire is begun.

Blowing Out. A smelting furnace is blown out when the metal and slag are tapped out, and the fires are allowed to die out.

Blowout. An outcrop larger than the orebody beneath; see blout.

Bluestone. Copper sulphate.

Bonanza. Spanish for pay-ore. Usually applied in United States to a body of exceptionally rich ore, especially in silver mines.

Bonnet. The cover or roof of a cage; also a steel casting connecting the piston-rod with the upper end of a stamp-shaft.

Bostonite. A light colored igneous rock composed mainly of potash feldspar.

Bore Hole. A drill hole bored for test purposes.

Bort (Bortz). A form of crystallized carbon between the diamond and the black diamond.

Botryoidal. Resembling a bunch of grapes.

Bottom. A mass of impure copper formed below the matte, in matting copper ores.

Boulders. Loose, rounded masses of rock, larger than cobbles.

Box Canyon. A canyon closed at one end.

Branch. A vein branching off from the main orebody.

Brattice. A screen for the regulation of air currents in a mine.

Breast. The face or innermost end of a mine working.

Breccia. A rock formed of angular fragments cemented together.

Brecciated. Broken into angular fragments partly or wholly cemented together.

Broken. A vein is broken when dislocated by faults.

Broken Ground. Rock strata where the walls are poorly defined and the general formation shattered.

Bucket. An iron or steel bucket used for hoisting men or ore in a

mine. In a vertical shaft a bucket swings free, but in an incline shaft the bucket runs on a skidway of plank timbers.

Buddle. A conical table on which ore is dressed; formerly used in Cornwall, etc., and recently applied to a new concentrator.

Bulkhead. A wooden or masonry partition walling off part of a mine or protecting it against soft or creeping ground; also damming back water.

Bullion. Includes any of the base metals containing gold and silver; also mixture of gold and silver.

Bullion Bars. Unrefined gold and silver melted and cast into bars.

Bunch. A small mass or pocket of exceptionally rich ore.

Bunchy. An orebody containing small scattered masses or bunches of ore.

Cable. The steel wire rope used in shafts for hoisting buckets, skips or cages.

Cage. The elevator used in vertical shafts for hoisting ore and rock, and for lowering men, timber, etc.

Calcareous. Limey.

Calcine. To drive off sulphur, carbonic acid gas, or other volatile constituents of an ore by heating.

Calcining Furnace. A furnace for roasting ore to drive off sulphur, previous to smelting; also for heating cement materials.

Calcite. Crystallized calcium carbonate.

Cam. A double-curved tooth, fixed on a shaft, for lifting gravity stamps.

Camp. A mining town.

Canyon. A deep gorge with precipitous walls.

Cap. The top piece of a framed set of mine timbers; copper caps containing fulminate of mercury, used to explode dynamite in blasting rock.

Capping, or Cap-Rock. The rock or other ground above a mineral deposit.

Captain. In most mining fields where Cornishmen are employed the foreman in charge of mining work is termed a captain.

Carbonaceous. Any mineral in which carbon and oxygen are chemically united.

Carbonates. A term commonly applied in the western part of the United States to oxidized lead ores, usually argentiferous.

Carboniferous. Rocks of the coal age of geological eras.

Carga. A Mexican weight of 300 lbs. avoirdupois.

Cartridge. Dynamite put up in cylindrical cases of oiled paper to fit the holes bored by drills.

Casing. The wooden lining of a shaft; an iron pipe put down outside of a diamond drill hole when passing through soft or broken ground, to prevent the hole becoming clogged by matter intruding from outside.

Casting Copper. Impure copper better suited for casting into various forms than for drawing into wires or rolling into sheets.

Cave. A natural opening or vug in a rock formation; the part or complete falling in of a mine.

Caving System. A plan of mining, by which the worked out upper levels and surface are allowed to subside gradually, as the mine workings are deepened.

Cement Copper. Regulus; the loose and usually impure copper deposited on iron by copper-bearing waters.

Cerro. Spanish for a mountain or hill showing rock outcrops.

Chalybeate. Iron-bearing waters.

Chamber. A large stope.

Change House. Building where miners change their clothing before entering a mine.

Change Day. The day when miners are transferred from day shift to night shift, or the reverse.

Chapeau de Fer. French term for an oxidized iron outcrop; gossan or iron hat.

Charge. The amount of ore, flux and fuel fed to a smelting furnace.

Chert. A coarse impure chalcedony or flint.

Chile Bars. Bars of Chilean blister copper, weighing about 200 lb. each.

Chilean Mill. A grinding apparatus with three heavy wheels running around in a circular pan.

Chimney. An orebody or pipe shape in an approximately vertical position.

Chloride. A mineral (or ore) of any metal united chemically with chlorine; usually applied to hornsilver ore.

Chloride. (V.) To work the oxidized part of an ore deposit on a lease or tribute; a term used in the western part of the United States.

Churn Drill. A drill having a churning motion, used for boring oil wells, test-holes, etc.

Chute. A hole, usually lined with planks, used for dropping ore or waste to a lower level of a mine.

Claim. The area of 600' x 1,500', or 20 acres of U. S. public land staked off and claimed by a prospector or miner. Size of claims varies in different countries.

Classifier. A machine which separates mineral particles according to their weight.

Chloride. (V.) To work the oxidized part of an ore deposit on a lease or tribute. A term used in the western part of the United States.

Clay Gouge. A thin seam of clay separating ore, or ore and rock.

Clay Slate. An argillaceous slate.

Clean-Up. The collection or gathering together of accumulated ore or metal in a mill or smelter.

Cleavage Planes. The more or less regular lines along which slates and other metamorphic rocks break into slabs or leaves.

Coarse Jigs. The jigs used to handle the larger sizes and heavier grades of ore or metal.

Coarse Metal. Matte resulting from the first smelting in old-style smelting of oxidized copper ores.

Cobbing. Breaking masses of ore into lumps by hand hammers and sorting ore out.

Collar. The top of a shaft; surface timbering of a shaft.

Colloids. Non-crystalline materials.

Compartment. Mining shafts usually are divided into two or more compartments or sections, separated by framed timbers and planking.

Concentrate. The ore or metal, after part or complete elimination of gangue rock.

Concentration. The process of separating the metallic part of an ore from the waste rock or mineral in which it has been enclosed. It involves crushing to free the metallic particles. The separation may be by gravity, either dry or in water; by oil or froth flotation, or magnetic separation.

Concentrating Table. A table on which a stream of finely crushed ore and water flows downward and the heavier metallic minerals lag behind and flow off in a separate compartment.

Concentrator. A plant where ores are concentrated; a jig or machine for separating ore or metal from gangue-rock, the process usually employing a rocking or oscillating motion, aided by jets of water, whereby the worthless gangue is carried off and the heavier mineral remains.

Conchoidal. Breaking with a curved or shell-like face, or fracture.

Concretion. A rounded mass or nodule formed of mineral matter gathered about a center.

Conductivity. Electrical conductivity is measured by the resistance offered to the passage of an electrical current.

Conglomerate. A rock formed of pebbles and rounded boulders cemented together. Sedimentary conglomerates are ancient shore deposits whose pebbles and sands are hardened into rock. Volcanic conglomerates are formed of rounded masses ejected from volcanic vents cemented together by volcanic sand or ash (tuff) rock.

Construction Account. Many mining companies summarize their finances so that the cost of operation is divided into two classes, one being for general working expenses and the other for construction, sometimes

classed as capital account. It includes new buildings and machinery on surface and frequently new mine openings.

Contact. The junction of two dissimilar bodies of rock, as limestone and porphyry.

Contact Deposit. A mineral deposit found between two unlike rocks, usually applied to an orebody at the contact between a sedimentary rock, limestone shale or sandstone and an igneous rock.

Contract. In mining applies to an agreement between operator and workman to pay latter so much per foot for excavating drift or stope. These men are known as contract miners and are usually skilled workmen. They work harder than men on wages, due to the incentive of higher earnings.

Copper Ore. Rock carrying copper mineral or minerals. See detailed descriptions of copper-bearing minerals in Chapter III.

Core. A drill core.

Cornish Pump. A form of mine pump actuated by long rods reaching from surface down mine shafts.

Costeaming. Proving an ore deposit or vein by trenching across its outcrop at approximately right angles.

Counterbalance. Hoisting plants usually are worked in counterbalance for deep shafts. The weight of the descending cage or skip is used to partly offset the weight of the ascending cage or skip.

Counter Vein. A cross vein running at approximately right angles to the main orebody.

Country Rock. The predominant rock about an ore deposit.

Course. The direction or strike of a vein; a stretch of mineralized matter in a vein.

Crab. A hand winch.

Creeping. The slow movement of the rock in mine workings caused by the pressure of super-incumbent and adjacent rock masses.

Cretaceous. A geological age characterized by chalky beds in England. The limestones of Arizona and Mexico are large of Cretaceous age, and so are the coal-bearing beds of the Rocky Mountain region.

Cribbing. Close-set round timbers supporting an underground roof, or lining a shaft.

Croppings. Outcrops.

Cross-Course. An intersecting vein.

Crosscut. A mine opening, similar to a tunnel, that is driven across the rocks at approximately right angles to the orebody; a drift follows the lode or vein.

Cross Vein. An intersecting vein.

Crucible. A vessel of refractory material in which ores and fluxes are melted.

Crystals. Geometrical forms, with plane faces, of infinite variety, assumed by the majority of minerals.

Cupola. An upright furnace used in smelting.

Cupriferous. Copper-bearing.

Cut. To intersect an orebody; the portion of a working face of mineral removed at one operation.

Cwt. A hundredweight, or 112 lb. avoirdupois.

Cyanide. (V.) To treat crushed rock with a weak solution of cyanide of potash or of soda, dissolving the gold and silver, which is recovered by precipitating it with zinc (or aluminum for certain silver ore).

Datum Level. The level (usually sea-level or mean level of nearest considerable body of water) from which altitudes are measured in surveys.

Dead Roasting. Sulphide ores are dead roasted when all the sulphur possible to drive off by roasting has been eliminated.

Dead Work. Underground work which is not in ore; the opening of new shafts, drifts, and winzes preliminary to the stoping of the mineral bodies.

Debris. Broken down rock material; the fragmental material broken off by frost, etc., from rock exposures; talus.

Decomposed. Rock or ore altered and leached by air and water.

Decrepitate. To break into fragments with violence, under the blow-pipe or great heat.

Dendrite. A moss or fern-like mineral stain or film usually of manganese or iron oxides.

Denouncement. In Mexico, the formal filing of a claim to mineral land.

Denudation. The uncovering of rock or an ore deposit by the weathering of wind and water, or glaciation.

Dessication. Drying out; loss of water from any given substance.

Detritus. Debris; broken down rock, usually applied to gravel, etc., moved and deposited by streams or glaciers.

Development Work. Mining work performed to develop or expose an ore deposit and to open up new and further amounts of ore.

Diabase. A dark trap rock composed largely of a felt of lathe shaped crystals of plagioclase feldspar, plus ferro-magnesian minerals, etc.

Diamond Drill. A machine used for boring holes in rocks, with a hollow cylinder for a bit, whose end is set with black diamonds or bort.

Die. The iron block in a mortar, onto which ore is fed for crushing by a stamp.

Dike. A vein of igneous rock; locally a reef or wall of rock projecting above the ground; also applied to the hardened waste material filling fissures.

Diorite. A crystalline granitic rock with predominant plagioclase feldspar.

Dip. The inclination or angle at which a lode or vein pitches downward into the earth.

Dip Compass. A compass having the needle fixed to swing in a vertical plane, so it can be readily deflected by magnetic rocks.

Dirt. Frequently used to designate ore broken underground; for instance, in Joplin district, Missouri.

Disintegration. The breaking down of rock through weathering.

Disseminated Ore. Ore carrying fine particles of metallic minerals, usually sulphides, scattered through rock or gangue matter.

Disturbed. An orebody is disturbed when lacking defined walls and settled character.

Dolomite. Magnesian limestone; carbonate of calcium and magnesium.

Donkey. A small auxiliary hoisting engine, usually operated underground and actuated by compressed air, or used for preliminary work at new shafts or exploring pits.

Downcast. A shaft having a downward air current.

Draftage. An arbitrary allowance claimed by some British smelters to cover loss of weight in transport.

Dress. To separate ore from gangue rock by hand or machinery.

Dressing Floor. A floor where ore is sorted by cobbing and picking.

Drift. A horizontal passage in a mine following the lode or vein.

Drift Copper. Native copper found in gravel and clay, far from original orebody, from which it has been carried by glaciers.

Drifting. Opening drifts; driving.

Drill. A steel bar with chisel shaped end used for boring in rock; is struck on the other end by a hammer, or is forcibly driven against rock by air piston.

Drill-Core. Solid, cylindrical cores of rock cut out by a diamond drill. These form a record of the strata through which the drill has passed.

Driving. Extending a drift horizontally.

Drum. The cylinder of a hoisting engine, around which the rope is wound.

Druse. The crystallized crust lining a cavity in rock or ore.

Dry Ore. Argentiferous ores containing insufficient lead for fluxing in a smelter.

Ductile. That which is capable of being extended in length by tension, as into wire.

Ductility. The capacity of a metal to elongate, when under pull from the ends, without cracking or breaking.

Dump. A place for depositing rock taken from a mine; a pile of ore or rock.

Dyke. See dike.

Dynamite. Nitro-glycerine held in wood pulp, infusorial earth, or some similar article, to render it safer in use. Strength varies according to percentage of nitro-glycerine contained.

Eisener Hut. German for iron hat, or gossan, occurring above an ore-body.

Electrolyte. The solution in which electrolytic separation of metals is carried on.

Electrolysis. The separation and redeposition of metals by electrolytic action.

Electrolytic. Applied to copper means copper made from impure metal by electrical decomposition and redeposition. The bar of impure copper is gradually dissolved and the pure metal redeposited at the opposite pole of the battery, while other metals fall as black slime to the bottom of the tank in which the solution (electrolyte) is held.

Elvan. Cornish name for dikes of greenstone, porphyrite and granite.

Erosion. The wearing away of surface masses of rock and soil by the elements, or by glacial action.

Eruptive. Igneous rocks, brought to the earth's surface or outer crust by volcanic activity.

Escarpment. A rock wall, nearly or quite vertical.

Exfoliation. The separation of thin leaf-like layers from a rock mass.

Exploders. A fulminating cap for setting off high explosives.

Exploitation. The productive working of a mine or ore deposit.

Exploration. Prospecting work; looking for ore.

Face. The inner or working end of any mine opening. A face of ore is the ore shown at the extreme end of a drift, stope, or tunnel.

Fahlband. A zone or band of crystalline rock, carrying finely disseminated metallic sulphides.

Fall of Ground. Rock falling from the roof into a mine opening.

False Set. A temporary set of timber.

Fan. A machine for forcing or sucking air into or out of a mine.

Fathom. Six feet. In stoping, a fathom is a cube of six feet.

Fault. Dislocation of a vein or of a rock stratum.

Feeder. A branch or small vein joining a larger one.

Ferruginous. Containing iron.

Filling. The waste material used to fill up old stopes or chambers; allowing a mine to fill with water.

Filter. A machine for removing the solution or moisture from crushed ore, either by forcing it under pressure or sucking it through canvas or cloth, leaving the muddy ore behind.

Fines. The finer particles of ore or metals saved in concentrating processes.

Finisher Jigs. The jigs used to save the smaller particles of ore in a concentrator or stamp mill.

Fire. The miner's warning cry when a blast is to be set off is "fire."

Fissile. Splitting easily into plates

Fissure Vein. A fissure in the earth's crust filled with mineral matter.

Flake Copper. Very thin scales of native copper.

Float. Loose ore or rock, away from its parent mass, on the surface.

Float Copper. Drift Copper.

Float Ore. Loose ore, often water worn ore, found at a distance from its outcrop.

Flocculent. Resembling tufts; cloudy masses of slightly coherent material floating in a liquid.

Floor. The floor of a drift or other horizontal mine opening; the rock bed beneath an orebody.

Flour Copper. Very fine scaly native copper that floats on water and is difficult to save in milling.

Flotation. A process of concentrating or separating out the valuable metallic sulphide minerals of an ore, by mixing the pulverized ore with

acid and oil and agitating it by air or paddles to make a scum or froth that takes up the metallic minerals and floats them off, leaving the waste behind.

Flume. A launder or conduit for carrying water.

Flux. Substances used in furnaces to form a fusible compound with the waste matter and make slag. In assaying, borax, soda, salt, etc., are used; in smelting, limestone, ironstone, etc.

Fluxing Ore. An ore containing appreciable metallic minerals, but smelted mainly because containing fluxing agents required in the reduction of richer ores.

Foliated. Having a laminated structure.

Foot. The foot-wall.

Foot-Wall. The rock wall under a vein or underlying inclined mineral deposit.

Fork. The branching of a vein.

Formation. A term used by miners for any particular body of rock, as a granite formation, a sandstone formation. Geologists limit term to groups or rock beds of similar age.

Founders Shares. The few shares issued to the individuals organizing a stock company. In companies owned outright by other companies, founders shares are issued to as many individuals as are required to incorporate and hold the offices required for corporate management, as the laws do not permit a corporation, which is an artificial person, to form another corporation, or to serve as a director of another corporation.

Free. A metal is free when virgin or native, and not combined chemically with any other element.

Free Milling. An ore that readily yields metallic contents by simple means, such as amalgamation or cyanidation.

Freeze. A furnace freezes when the molten charge solidifies.

Friable. That which may be pulverized or broken up easily.

Froth. Foam; a mass of bubbles.

Furnace. A structure for the smelting or roasting of ore.

Fuse. A cotton cord with a gunpowder core, so made as to carry fire to an explosive.

Fusible. That which may be melted.

Fusion. Melting; alloying metals while liquid, through heat.

Gabbro. A rock composed mainly of plagioclase feldspar and iron magnesia minerals.

Gad. A small steel wedge or chisel.

Galena. Lead sulphide; see Mineralogy.

Gallery. A drift or level.

Gallows Frame. The timber or steel framework over the mouth of a shaft, carrying a sheave-wheel, over which the hoisting rope passes to the engine; now commonly called head frame.

Gangue. The waste rock or mineral in which ore or metallic particles are held.

Gash Vein. A gash-shaped fissure vein, rapidly pinching downward.

Geode. A hollow crystal-lined cavity, or the rounded mass containing such a cavity.

Geological Horizon. Rocks of one geological age.

Geology. The science of the formation of the earth and the rocks of which it is made.

Giant Powder. Dynamite.

Girt (or Girth). A horizontal brace in direction of a drift in mine timbering.

Glaciation. The erosive effect produced by glaciers.

Glance. A metallic sulphide showing a bright, shining surface. Cop-per glance is chalcocite; silver glance is argentite.

Glory Hole. A large open pit from which ore is or has been extracted.

G. M. B. Good Merchantable Brands, an English grade of refined cop-per Term replaced by "Standard."

Gneiss (pronounced nice). A banded coarse-grained rock often formed

of the same minerals as granite, often in patchy and irregular arrangement. May be a diorite gneiss, granite gneiss, etc.

Gob. Waste used to fill worked-out openings.

Gophering. Prospecting work confined to digging shallow pits or starting adits. Term used from similarity of this work to the crooked little holes dug in the soil by gophers.

Gossan. Iron hat; is the leached capping, usually quartzite, showing yellow to reddish brown iron stains found overlying veins.

Grade. The percentage, or value, of ore and partly refined metals; the percentage of rise in roads or mine openings driven on an approximately horizontal plane.

Gram. A metric weight of 15.4 grains or 1-500 of a pound avoirdupois.

Granite. A dense, granular rock of igneous origin, composed of varying proportions of quartz, feldspar and mica.

Granulated. In the form of grains.

Gravity Stamp. A stamp, usually set in batteries of five, in which the piston is raised by a cam, the stamp crushing the charge in the mortar by its weight, when allowed to fall.

Greenstone. An altered basic porphyry; usually andesite or diorite.

Grizzly. A screen or grating of heavy iron rails or steel bars, through which the smaller pieces of rock or ore fall through.

Groundsill. The bed-piece of a set of mine timbers.

Guides. Perpendicular square wooden strips or stringers for guiding cages in vertical shafts. Cables or steel rails are used instead in some mines.

Gut. To rob, or extract, only the rich ore of a mine.

Hade (American). Inclination or dip of a vein, measured from the vertical, while dip is measured from the horizontal. Becoming obsolete, and should not be confounded with rake of an ore-shot.

Hanging. The hanging wall; the rock on the upper side of a mineral vein or deposit.

Hardinge Mill. A cone-shaped cylinder, resting horizontally and half filled with pebbles, which fall and crush ore when mill is revolved.

Haulage Plant. A mechanical installation for the underground tramping of rock, operated by ropes, compressed air, or electricity.

Head or Heading. An underground level or airway in a mine; also water pressure.

Head Frame or Gallows Frame. A framework of 2 or 4 legs, made of wood or steel, fitted with sheaves, over the mouth of a shaft.

Heap-Roasting. Burning the sulphur out of ores piled in heaps, with a small amount of wood or other fuel.

Heave. A horizontal dislocation of a vein or bed caused by a fault. Also applied to the rolling out of line of a lode in making depth.

Hectare. An area 100 meters on each side; called *pertenencias* in Mexico; equals 2.471 acres.

Hoist. An engine for raising ore from a mine and for lowering men and material.

Holing Through. A drift or other mine opening is holed through when a connection is made between two separate sections working toward each other.

Horizon. The sky-line, commonly used in the sense of absolutely flat, as shown by a spirit level. Geologically, all rock strata of the same geological period.

Horse. A mass of country rock enclosed in a mineral vein or deposit.

Horsepower. A measure of power of an engine. One horsepower is rated as equivalent to raising 33,000 lbs. avoirdupois to a height of one foot in one minute.

Horse-Whim. A windlass operated by horses.

Hot Blast. Heated air supplied to a blast furnace.

Hungry. Nearly or quite barren.

Hunt & Douglas Process. A leaching process, using chloride of iron and salt, to dissolve oxide ores of copper.

Huntington Mill. Somewhat similar to a Chilean mill.

Hutch. See Jig.

Hydrated, Hydrous. Containing water combined chemically.

Hydro-Metallurgy. The reduction of ores by wet processes.

Igneous. Rocks consolidated from a molten state; includes not only volcanic rocks but those deep-seated rocks, hardened under cover, which have been exposed to view by erosion, or artificial openings.

Impregnated. Containing metallic minerals, scattered or diffused through the mass; properly used in referring to country rock-carrying mineral similar to that in the vein.

Incrustation. A solidified coating, usually crystallized.

Infiltration. The deposition of mineral matter from percolating waters.

Ingot. A mass of metal cast in a peculiarly formed mold; applied only to gold, silver, or copper. Iron and lead are cast in pigs.

In Place, In Situ. Rock or ore that is in the position where deposited by nature.

Intrusive. Igneous rock masses pushed up through other and older rock formations.

Iridescent. Showing the colors of the rainbow.

Iron Hat. Gossan; outcrop of iron-stained material over an ore deposit or vein.

Jack. A miner's term for sphalerite; is called black jack, ruby jack, or rosin jack, according to color.

Jig. A machine for concentrating ore; i. e., separating the metallic mineral from the waste, by means of oscillatory or vibratory motion, aided by jets of water. The heavier minerals sink, and the lighter rock or gangue is carried off by the current.

Jump. To locate and take possession of mineral lands held or claimed by another party.

Kaolin. China clay.

Keweenawan. Pertaining to or of the Keweenaw formation or rocks in which the Lake Superior copper veins occur.

Kibble. A bucket used for hoisting material in a shaft.

Kilo or Kilogram. A metric weight of 2.2046 lbs.

Kilometer. 0.621376 miles. For rough computations may be figured as $\frac{3}{5}$ of a mile.

Kin. A Japanese weight of 1.31 lbs. avoirdupois.

Kindly. The appearance of rock carrying or promising to carry good mineral value.

Ladderway. The series of ladders giving ingress and egress to a mine; the compartment in which the ladders are located.

Lagging. Timber, usually of small diameter, placed over the cap-timbers of incline shafts and drifts, to prevent damage from falling rock.

Lamina. A thin plate; plural is laminae.

Lamellar. In thin sheets of laminae.

Lander. The top man at the mouth of the shaft who receives signals from below, and attends to the unloading of rock sent up in buckets, skips or cages.

Launder. A wooden flume or sluice, used to convey water, or tailings held in suspension in water.

Lava. Rock from volcanoes.

Leach. To dissolve metals out of ore by water or acid, or both.

Leaching. The process of extracting a metal from its ores or salts by treatment with a solvent, such as weak acid.

Lead (pronounced leed). A mineral body.

Leader. A small vein running into a larger one.

Ledge. The solid vein or lode.

Leg. An upright timber supporting the cap of a set of timber.

Lense. An orebody of lenticular form.

Lenticular. Having the shape of a double convex lense.

Level. A horizontal opening in a mine, usually connected with a shaft.

Levels are commonly opened at stated intervals as depth is gained—usually at 100 feet in modern mining practice. The word "level" frequently is used interchangeably with the word drift, but is more comprehensive. Both

drifts and crosscuts may be opened on a level, though a crosscut is not a level.

Limestone. A rock composed of lime carbonate.

Lixiviation. The process of leaching out the metallic contents of ores.

Locate. To locate a mining claim is to file a notice claiming ownership, at the point where mineral is discovered, and to put up stakes or monuments at the corners of the rectangular area claimed.

Location Work. Labor required by law to be done on mining claims within 60 days of location, in order to establish ownership.

Lode. A metalliferous vein. In Lake Superior region refers to the mineralized beds; is used generally as synonymous with vein; used by geologists as meaning an aggregation or congerie of mineralized veins.

Long Ton. An English ton of 2,240 lbs. avoirdupois.

Low Grade. Ore whose recoverable value yields but slight profit per ton. Carrying mineral value but sparingly.

Magma. An originally molten mass of rock coming to the earth's crust from depth.

Magmatic Segregation. The process by which the different constituents of molten rock masses crystallize at varying temperatures with a tendency to separate themselves, so far as circumstances allow, from the other compounds.

Malacate. A horse whim with vertical drum used for hoisting in Mexico. Sometimes is called a Zacatecas malacate.

Mass. Copper; a solid chunk of native metal.

Massive. Rock without defined lines, of cleavage; ore occurring without appreciable gangue, as contradistinguished from ore disseminated throughout a gangue.

Matrix. The rock between imbedded objects, such as a particle or mass of ore or native metal. More rarely a metallic mineral is the matrix cementing together rock particles.

Matte. A furnace product composed of copper and iron sulphides, produced by shaft or reverberatory fusion. Usually contains 30-40% copper, but varies from 20-60%. Is blown to blister copper 98-99% fine in bessemer converters.

Matting. The process of smelting sulphide ores into matte.

Mesa. Spanish for tableland or plateau.

Mesh. The size of openings in a screen.

Metalliferous. Carrying metal.

Metallurgy. The science and practice of reducing metals from ores and minerals.

Metamorphic. Rock that has been changed from its original condition by pressure, chemical action, heat, or other causes.

Metamorphosis. The process by which changes in structure are effected in a rock form by heat or percolating waters.

Metasomatic. Replacement, particle by particle, so that original structure is often preserved.

Meter or Metre. 39.37 inches.

Metric Ton. A weight of 2,204.6 lbs. avoirdupois.

Mica. A scaly transparent mineral. Biotite is brown or black mica; muscovite or isinglass is the clear mica used in stoves, lanterns, electric apparatus, etc.

Mill. Works for treating ores without smelting.

Milling. Dressing ore in a mill; also dumping ore in a winze to be drawn off into cars or wheelbarrows on a lower level.

Mill Run. The treatment of a definite quantity of ore in a mill; also the result or yield thereof.

Mill Test. The determination of the metallic contents and recoverable values in any given ore by the milling of a sufficient quantity to afford average milling conditions.

Miner. In strict construction, the man that does the drilling and blasting in a mine. In a broader sense, all men working underground.

Mineral. Ore or rock containing metal. In the Lake Superior district the term mineral has a special use, being employed to designate the concen-

trate of native copper, with its small amount of admixed amygdaloid or conglomerate, as it comes from the mill, before going to the smelter.

Mineral Belt. The strip or zone of mineralized territory in a given formation or district.

Mineral Right. The ownership of mining rights under the surface of land owned by another holder. Mineral rights sometimes are reserved in selling land in some districts.

Mineralized. Carrying metalliferous minerals.

Miner's Inch. The amount of water that will flow through an opening one inch square under a six-inch head, which is 2,274 cubic feet in 24 hours, or 94% cubic feet per hour, equal to 655 wine gallons or 593 imperial gallons hourly.

Mining Engineer. Graduates of technical mining schools are given the degree of engineer of mines and sign the letters M. E. after their names. The letters M. E. stand for mechanical engineer, when given by a school, but are often used by men engaged in mining, who lack scholastic degrees, as an abbreviation for mining engineer, or mining expert.

Missed Hole. A drill hole, charged with explosives, which fails to be set off by the fulminating cap.

Moil. A steel bar, like a drill, except that it is sharpened to a point instead of having a cutting face.

Molybdenite. A graphite-like, flaky, lead-colored mineral found in some ores; composed of molybdenum and sulphur.

Momme. A Japanese weight equal to 3.75 grams or 2.413 pennyweights.

Monocline. Upturned beds of rock that have a practically uniform dip.

Monzonite. Agranitic rock intermediate between diorite and granite.

Morgen. A South African land measure—2.1165 acres, or 1.44 claims.

Mortar. An assayer's mortar in which rock or ore is crushed with a pestle. A mortar is the box, about the stamp of a mill, in which the ore is stamped and crushed.

Mother Lode. The main lode of the district. In America applies to the mineralized belt of the principal Californian gold region.

Mouth. The surface entrance or opening of an adit, tunnel or shaft.

Mucker. Ore shoveller, who loads the mine cars and in most mines is also a trammer, pushing the cars to the shaft or tunnel mouth.

Mullock. Australian for waste-rock broken underground.

Mundic. Pyrrhotite, magnetic pyrite; iron sulphide.

Mynpacht (South Africa). A part (10%) of a farm, which the owner has the first right to locate or peg out, when the farm is proclaimed a public goldfield.

Nickelliferous. Carrying nickel.

Nodule. A small concretionary, rounded mass of mineral matter.

Non-Conformable. Rock strata not associated originally in the position now occupied.

Nugget. A lump of native metal; usually applied to gold.

Open Cast, Open Cut. A mine worked as a quarry, or pit open to the sky.

Ore. Metallic minerals; mineralized material or rock, holding metallic minerals. Called pay ore when it can be profitably worked; low-grade ore when it yields but slight profit.

Ore Car. A mine car for carrying ore or waste rock.

Ore Chute. An opening in ore or rock through which ore is dropped downward. Also used for ore bins and pockets.

Ore Dump. A heap or pile of ore at the tunnel mouth or top of shaft.

Ore-Shoot. An orebody or portion of a vein carrying high-grade, or payable ore. Usually has a vertical or diagonal dip on the plane of the dip of the vein.

Orthoclase. A white, or pale-colored feldspar composed of silicate of potassium and aluminum. Occurs as white crystals or spots in porphyry.

Outcrop. The apex, or part of a vein or mineral deposit that is exposed at the surface of the earth.

Outlier. An isolated mass of rock or group of rocks lying at a dis-

tance from the main body, and separated therefrom, on the surface by a different rock formation.

Output. Production.

Overburden. Waste material, usually drift or alluvium above the solid rock, or orebody.

Overhand Stopping. Removing ore in ascending steps.

Oxide. An ore of any metal or metals chemically united with oxygen.

Oxidize. To unite with oxygen. Many minerals and most metals oxidize with greater or less rapidity when exposed to air or water.

Panning. To wash gravel, etc., in a pan, so that the sand and gravel is loosened and thrown out and the gold or heavy metallic minerals left in the pan.

Patent. A deed given by the Government, to mineral lands.

Patio. A walled yard with paved floor in houses and mine plants, in Mexico and other Spanish countries.

Paystreak. The rich band, part, or zone in a vein or ore deposit which carries the profitable, or pay ore.

Pegmatite. Very coarsely grained granite; a giant granite.

Penthouse or Pentice. A shed-roof erected in the bottom of a shaft, when sinking, to protect miners from accidental fall of rock, timber or tools from above.

Peroxide. The oxide of any metal containing the greatest proportion of oxygen.

Pertenencia. The unit of a mineral claim in Mexico; 100 meters square, or one hectare, 2.471 acres.

Peter Out. To pinch out, or feather out and end.

Petrology. The study of rocks by thin sections and microscope.

Phosphate. An ore of any metal or metals with which phosphorous and oxygen are chemically united.

Picul. A Chinese weight of 133½ lbs.; commonly used in the Orient.

Pillar. A section, or block of ore left in place to support shafts or roofs.

Pinching. The narrowing of a vein.

Pinching Out. The narrowing of a vein to extinction.

Pipe Vein. An orebody of chimney form.

Pitch. The angle and direction of dip or take of an ore-shoot in a vein. If a vein dips east, an ore-shoot may pitch at a flatter angle than the vein, to the N. E. or S. E.

Plain. A flat or nearly level country.

Placer. A deposit of metal-bearing gravel or alluvium.

Plant. The machinery equipment of a mine or reduction works. In general use the term includes buildings, housing, machinery.

Plat. To draw to scale. In Lake Superior and Australian usage it is the station or enlargement of a level, to give extra space for loading and unloading the cage, skip, or bucket.

Plumbiferous. Carrying lead.

Plutonic. Rocks of deep-seated, igneous origin.

Pocket. An orebody of small extent; a natural underground reservoir of water; a cavity cut in the rock underground to hold ore; a bin at shaft house or mill, in which ore, flux, or fuel is stored.

Pockety. Carrying only occasional bunches of good ore.

Poling. The process of deoxidizing molten copper and tin in a reverberatory furnace by stirring with long poles of green timber.

Poll-Pick. A tool having a pick on one end, and a poll, or hammer head, on the other.

Pood. A Russian weight of 36.112 lbs. avoirdupois.

Poppet-Head. Framework or gallows frame over a shaft, for sheave-wheel and hoist rope.

Porphyritic. Carrying isolated crystals in a ground mass, like plums in a pudding.

Porphyry. Properly, is any igneous rock showing phenocrysts, i. e., distinctly isolated crystals in a dense or crystalline matrix. Porphyry may be granite, quartz, or one of several other rocks.

Pound. The troy pound alone is used for gold, silver, and platinum only. It is 0.82286 of an avoirdupois pound. A pound of gold weighs 12 troy ozs. or 5,760 grains and the avoirdupois pound 7,000 grains.

Primary. The first; primary ores are those first or originally formed in an ore deposit, before alteration began. Also applies to the oldest rock formations.

Prop. A heavy timber placed with its foot against the floor of a mine opening, and its top against the roof, to support the rock above.

Prospect. To seek for mineral; a new mining property that has not yet been developed enough to be called a mine.

Prospector. A searcher for mineral deposits.

Protoxide. The oxide of any metal containing the least proportion of oxygen.

Puddingstone. A coarse conglomerate showing rounded pebbles.

Pulp. Pulverized ore or concentrate.

Pulverize. To crush to powder.

Pulverulent. That which may easily be reduced to powder.

Pyrrhotite. Iron sulphide, often called mundic or magnetic pyrite.

Pyrite. Iron disulphide; fool's gold.

Pyrites. A local term for pyrite and for sulphide ores; more properly, iron disulphide.

Pyrolusite. A black, manganese ore containing 63% manganese.

Quarry. An open pit, of varying size, sometimes several acres, from which stone or ore is mined.

Quarter-Section. In the United States a quarter of a square mile; 160 acres, laid out in a parallelogram, each side of which is one-half mile in length.

Quartz. Crystalline silica; any hard silicious ore, in miners' usage.

Quartz Claim. In the United States mining claims are of two classes: placer claims, carrying mineral, usually gold, in alluvium; and quartz lode claims, any prospect carrying metalliferous bodies in place.

Quartzite. An altered (metamorphosed) crystalline sandstone.

Quartzose. Rock having much quartz in its composition.

Quicksand. Fine sand, which flows easily when wet.

Ragging. Cornish for rough cobbing; broken lumps of ore of medium size.

Raise or Rise. A shaft or winze that is being opened from below. Sometimes called upraise or uprise.

Rake. The pitch of an ore-shoot on the plane of the vein. Also applied to cross veins, which are sometimes called rake, or counter veins.

Range. A mineral belt; also in many American states a surveyor's term for describing and locating lands. The state is surveyed in sections, towns, and ranges. A township comprises 36 sections and is a square of six miles. Each township receives a double number, one for the town and one for the range. The towns are numbered consecutively from south to north, and the ranges are similarly numbered from east to west. Thus T. 2 N., R. 5 W. means Township 2 north or 12 miles north and Range 5, or 30 miles west of the State meridian.

Reamer. A tool like a bit, used to enlarge a hole previously drilled.

Reduction. The separation of metals from their ores.

Reef. A quartz vein or lode; a projecting ledge or inclined wall like an outcrop. The gold deposits on the Rand are termed reefs.

Refining. The elimination of impurities from crude metals, or separation of metallic alloys obtained in the reduction of ores.

Refractory. A refractory ore is one that cannot be smelted or otherwise treated by ordinary metallurgical processes. A refractory stamp-rock is one that is pulverized with unusual difficulty.

Regulus. The metallic material that separates and settles in the bottom of a pot of molten matte, or slag.

Reniform. Kidney-shaped.

Reserves. The amount of payable ore, developed and ready for extraction, or blocked out ahead of immediate requirements.

Reverberatory Furnace. A smelting furnace in which the flame from the grate below is reflected back by the roof on the charge of ore.

Rise. A raise or opening driven upward.

Roasting. Driving off sulphur and other volatile elements from ore, by heat. When done in a furnace, under great heat, the process is called calcining.

Rob. To remove pillars and other supports from a mine for their mineral content, regardless of the future of the property.

Rock. Lake Superior; applied to ore mined and ready for the stamp mill. In English practice ore is called "Stone." More properly applied to the stony matter surrounding ore, or constituting the earth's crust; is a synonym for stone.

Rock Crusher. A machine for reducing rock or ore to smaller sizes. Crushers are of two types, the jaw and the gyratory. The jaw-crusher works by means of swinging jaws; the gyratory operates on the plan of a coffee-grinder, only that the motion is somewhat eccentric.

Rock Drill. A power drill.

Rock Filling. Waste rock, used to fill up worked-out stopes to support the roof.

Rock House. Lake Superior; the building (usually the one over the shaft) where copper-bearing rock from the mine is dumped from the ore skip (or bucket), is screened, crushed and stored in a bin, ready for shipment to the mill.

Rolls. Heavy steel rolls, worked in pairs, like a clothes wringer, for crushing rock and ore.

Roof. The rock overhead in a mine opening.

Room. Similar to a stope; term usually applied to mines working mineral bodies lying nearly horizontally.

Royalty. A percentage of the ore or value thereof paid to the land owner by the lessee of the mine; often a fixed sum for each ton of ore extracted.

Run. See mill run. A bar or course of ground better or worse than the average value of the mine.

Running Ground. Superincumbent material that breaks off readily and falls into the mine openings.

Saddle. Depression or U-shaped fold; the reverse of an arch or anticline.

Safety Cage. A cage furnished with automatic appliances to stop its descent in case the cable breaks.

Salting. Placing rich foreign ore, minerals or substances in a mine to deceive intending purchasers or other interested parties.

Sample. A specimen of ore from a mineral deposit. A selected sample is misleading because containing far above average value, and splendid samples frequently come from the poorest mines. An average sample is what its name purports—if it be an average sample.

Sampling. Cutting a representative part of an ore deposit, which should truly represent its average value. Most usually a trench-like cut 4 inches wide and 2 inches deep, cut into the clean face of ore and across its course. Honest sampling requires good judgment and practical experience.

Sand Pump. A pump, usually centrifugal, designed to lift water carrying large quantities of coarse tailings or sand in suspension.

Sand. Tailings from the stamp mills of Lake Superior copper mines; in fact, from any mills.

Sand (or Tailings) Wheel. A large wheel, having buckets on its inner perimeter, for elevating water carrying stamp-sand.

Scale Copper. Copper in very thin flakes.

Schist. A crystalline, usually micaceous rock of foliated structure, made up of superimposed flattened particles.

Scoria. Slags from copper smelters; volcanic ash.

Scoriaceous. Of the nature of scoria.

Scram. To search for ore in a mine that is apparently worked out and to extract it.

Screen. A grating of perforated metal or woven wire.

Seam. A thin layer of rock or ore.

Secondary Enrichment. An enrichment of a vein or an orebody by material of later origin, often derived from the oxidation of decomposed overlying ore masses. Nature's process of making high-grade out of low-grade ores. First discovered by Weed and announced by publication in Geol. Soc. of America program, Dec. 8, 1899. Confirmed by Emmons and by Van Hise, Feb., 1900.

Sectile. Easily cut.

Section. A field or district; also, in the U. S. a square mile of land.

Sedimentary. Rocks formed by deposition from water, as contradistinguished from rocks formed by igneous action.

Selvage. A clay seam along which parting occurs; also called fluccan.

Set. A framed form of timber, used for supporting ground in a mine.

Shaft. A pit or deep mine opening.

Shaft-House. A building at the mouth of a shaft, where ore or rock is received from the mine.

Shale. A hardened clay with fissile structure.

Shear Zone. A belt in which the rocks are crushed by many parallel fissures.

Sheave. A grooved wheel, notched to carry rope; an open pulley.

Shift. A miner's work period of 8 to 10 hours' time; a force of men employed on one turn.

Shift Boss. A mine boss, or under-captain, in charge of a gang or shift of miners.

Shoot. See ore-shoot. To fire or explode dynamite in holes drilled for that purpose. An erroneous spelling for chute.

Short Ton. A weight of 2,000 lbs. avoirdupois.

Shot. A blast of some explosive.

Shot Copper. Small rounded particles of native copper, somewhat resembling small shot in size and shape.

Shrinkage Stoping. Taking out ore by blasting it down on a heap of broken ore. Working space for drilling is kept open by drawing out part of the ore from an opening beneath. Is a method of overhead stoping.

Silica. Quartz, a compound of oxygen and silicon. Ordinarily sand is composed largely, if not wholly, of silica.

Silicate. A mineral composed of any metal or element chemically united with silica.

Silicious. Containing much silica or quartz.

Sill. The floor-piece of a set of mine timbers.

Sinking. The process of deepening a shaft or winze.

Sinking-Pump. A movable pump, usually vertical, hung in a shaft, and lowered, as the shaft is deepened.

Skip. An iron box, open at the top, running on guides, on four wheels, and hauled by a cable; used for hoisting ore and rock, and for lowering timber.

Skip-Road (or Way). A track of T-rails, spiked to wooden sleepers, on which a skip runs.

Slag. The melted rock or waste separated from the metal in a smelting furnace.

Slice. To remove ore in mine in pillars, or by successive slices.

Slickenside. A polished rock surface, showing striations produced by the opposing walls of a fracture rubbing and grinding against each other in the movement produced by earth stresses.

Slide. A bedding fault or slipping caused by the subsidence of the overlying rock formation; also applied to masses of loose rock, or ore on a mountain slope.

Slime. Exceedingly small particles of rock and mineral held in suspension in water. This mud is called slum.

Slime Table. A circular revolving table, on which slim flows and minute particles of mineral are saved.

Slip. A fault.

Sludge. The mixture of rock and water, or slime, formed by a diamond drill.

- Sluice.** A wooden trough, box, flume, or launder.
- Smelter.** Works where ores or crude metals are reduced by fusion.
- Soapstone.** Steatite; a soft unctuous rock.
- Soft Ground.** Heavy ground; rock about underground openings that does not stand well and requires heavy timbering.
- Sollar.** A platform or ladder landing in a shaft.
- Spathic.** Containing carbon dioxide; a carbonate.
- Specimen.** A sample of mineral selected because typical, unusual or exceptionally rich.
- Speiss.** Impure metallic arsenides produced in copper smelting; ore particles finely disseminated through a rock, usually occurring as impregnations.
- Spelter.** The common term for metallic zinc.
- Sphalerite.** Zinc blende; zinc sulphide; the most common zinc ore mineral; is often found associated with galena and chalcopyrite.
- Spile.** Lagging driven ahead of the regular timbering in treacherous ground.
- Spitzkasten.** Pyramidal boxes wherein ores are concentrated and sized by a jet of water fed from below.
- Spoon.** A long-handled spoon, used to scrape out drill holes.
- Sprag.** A prop or cross-timber set to secure the hanging wall in a stope. A short piece of wood used to block the wheels of a mine car.
- Spur.** A short, small branch from a vein.
- Square Sets.** A frame of mine timbers with mortised and tenoned sill, top piece and uprights of equal length, joined at right angles.
- Squib.** A fuse.
- Squeeze.** The slow settling down of the roof in mine workings without fracture.
- Stack.** The chimney of a furnace; usually employed to designate a number of furnaces, when used in the plural.
- Stamp-Mill.** A mill for crushing and concentrating minerals by stamps and jigs, etc.
- Stamp-Rock.** Rock containing fine copper that must be crushed and jigged to recover the metal.
- Stamps.** Machines to crush rock or ore by heavy blows.
- Stamp-Shoe.** The heavy chilled iron casting attached to the lower end of a stamp piston, and does the actual crushing of rock in a stamp-mill. It hits against a round steel block called a die.
- Stanniferous.** Tin-bearing.
- Station.** A chamber in a shaft, cut out for pumps, landing place, etc.
- Station-Pump.** A mine pump permanently placed, as distinguished from a movable sinking-pump.
- Steatite.** Soapstone; a greasy mineral, having a talc base.
- Step Fault.** A series of faults, rising like steps.
- Stockwerk.** A mass of rock penetrated by numerous small stringers of ore, the entire mass averaging sufficiently rich in metallic material to warrant its mining and treatment.
- Stone.** See Rock.
- Stope.** (V.) To mine or extract ore. (N.) The workings between levels or drifts, in which ore is broken down in a series of chambers and taken away for treatment.
- Stopping.** Breaking down the mass of pay-rock or ore above a drift. When stopping in an orebody of average width, miners can break rock much more quickly and cheaply than when driving the drifts.
- Stopping Ground.** Part of an orebody opened by drifts and raises and ready for breaking down.
- Strata.** The successive beds or layers of sedimentary rocks.
- Stratified.** Having regular layers of varying rock varieties.
- Stratum.** A layer or bed of rock.
- Streak.** The color given by a mineral when scratched or when rubbed on porcelain.
- Strike.** The horizontal direction of a vein, measured by the points of the compass; a discovery of ore.

Stringer. A thin seam of ore.

Strip. To remove the overburden of waste, drift, or alluvial soil overlying an orebody.

Stripping. The waste or overburden above an orebody.

Structure. The form of a mineral, whether granular, crystalline or amorphous.

Stull. The top-piece of a set of mine timber. A timber prop supporting the roof of a mine opening.

Sulphate. A chemical compound (or a mineral) of a metal combined with sulphuric acid; an ore of any metal or metals with which sulphur and oxygen are united chemically.

Sulphide. A mineral or ore of any metal or metals with which sulphur is combined chemically.

Sulpho-antimonite. A mineral in which sulphur and antimony are united chemically with a metal.

Sulpho-arsenite. An ore mineral of any metal or metals with which sulphur and arsenic are united chemically.

Sulphuret. A sulphide; term becoming obsolete, but used in California.

Sump. The pit at the bottom of a shaft, where water collects; also in cyanide plants.

Surface Rights. The ownership of the surface of land only, where mineral rights are reserved.

Swabstick. A stick used to clean out drill-holes.

Syncline. Canoe or U-shaped fold of rock layers; the reverse of an anticline.

Table. A concentrating machine for separating finely crushed particles of ore from gangue.

Table Land. A plateau.

Tailings. The sandy and gravelly residue or refuse matter from a concentrating mill.

Tamp. To closely pack clay or other sticky earth into a drill-hole above the cartridges, to give greater force to the blast.

Tap. To draw off molten metal or slag from the vent of a furnace.

Taper Off. Cornish for stopping work temporarily.

Tenor. The percentage or average metallic content of an ore, matte, or impure metal.

Terrero. Spanish for heaps of partly leached ore.

Tertiary. The third great geological period preceding the present Quaternary period.

Test-Pit. A shallow pit sunk to look for mineral.

Texture. A rock structure; is fine or coarse grained, porphyritic, etc.

Throw. The displacement of a vein caused by faulting.

Timber. The wooden logs and sticks used for underground supports.

Timberman. One who works at timbering a mine.

Ton. Long, 2,240 lbs.; metric, 2,206 lbs.; short, 2,000 lbs.

Tonelada. Spanish for long ton.

Township. Abbreviated T. or Twp.; see Range.

Trachyte. A light-colored volcanic rock made of alkaline feldspar with black mica and hornblende.

Tram. To load rock or ore in cars and push same to the shaft; a tramway.

Trammers. Men who load and tram the broken rock underground.

Trap. A dense gray, blue or greenish rock of volcanic origin; usually an old and altered basaltic rock.

Trend. The general direction of a mineral body.

Trestle. A frame-work of timbers, carrying tram-tracks.

Tribute. The money per ton or percentage of ore extracted which is paid by lessees to owners for the privilege of working a mine.

Tripod. The three-legged iron frame on which the working parts of a power-drill rest; a three-legged wooden frame over the mouth of a pit or shaft.

Trommel. A revolving cylindrical sieve for sizing ore.

Troubled. A vein is sometimes called troubled when disturbed or faulted.

True Fissure Vein. All mineralized fissures are true fissure veins. Term commonly used as meaning a fissure vein with promise of holding to great depth, in contradistinction to a gash vein.

Tsubo. A Japanese measure of 6 feet square, equalling 36 square feet.

Tube Mill. A steel cylinder half filled with flint pebbles, which crush ore when the tube is revolved.

Tufa. A limestone formed by spring waters. Name frequently used in place of tuff.

Tuff. Volcanic ash, cinder, and lapilli, ejected from volcanic vents and deposited in layers from air in water and solidified by time and superincumbent pressure. Name also used for coarser volcanic debris, including breccia and conglomerate.

Tunnel. A practically horizontal opening entirely through a hill or mountain. Term is commonly used instead of adit, which is a horizontal gallery having only one opening to surface.

Turbine. The most efficient form of water-wheel; also a new form of steam-engine in which the entire movement of the power-producing parts is rotary instead of reciprocating.

Tuyeres. The pipes in a furnace wall by which air is supplied under pressure, to either blast furnaces or bessemer converters.

Unconformable. With a break between rock beds lying at different angles or with erosion surface between.

Underhand Stopping. Cutting out ore from the floor of an opening. Removing ore in descending steps.

Underlay, Underlie. The downward extension of a vein or bed beneath the ground. Is technically the horizontal departure of a vein from the vertical measured in feet, per fathom (or 100'). Mineral bodies lying under a given tract, though not outcropping on surface.

Unpatented. Mining claims to which a deed from the U. S. Govt. has not been received. They are subject to annual assessment work, in order to maintain ownership.

Unstratified. Rock that is not bedded in layers.

Unwater. To free from water; to pump out or drain a mine.

Upcast. A shaft having an upward air current.

Upraise. A raise, an upward opening in a mine.

Van. To wash ore on a shovel, like panning.

Vanner. A concentrating table or machine for dressing ore by means of vibratory motion, aided by jets of water to carry away waste rock.

Vara. A Spanish-American measure of length, of 33 inches.

Vein. A rock fissure filled with mineral matter; a mineral body having defined walls. See contract vein and fissure vein.

Veinstuff. Vein filling; also used for gangue.

Vertical Shaft. One sunk at an angle of 90° with the horizon, or directly downwards toward the center of the earth.

Virgin. Native metal occurring elementally, as distinguished from ore minerals, which are chemical compounds.

Vitreous. Of a glassy nature.

Volatile. That which can be driven off as vapor, by heat.

Vug. A cavity in the rock; usually lined with a crystalline encrustation.

W. The chemical symbol for tungsten.

Wall. The side of a mine opening or drift. The waste or country rock on each side of a vein.

Wall Plates. Are the two side pieces of a set or frame of shaft timbers, as distinguished from the end pieces.

Water-Jacket. An outer casing for a blast-furnace, in which water circulates, to keep the metallic furnace-walls from melting because of the intense heat of the charge.

Water Level. The level above which water does not rise, when a mine is allowed to fill. The water level is often the point below which altered and enriched ores are succeeded by base unaltered sulphides.

Weathered. Changed by long exposure to air and water.

Wet Process. Leaching or lixiviation.

Wheal. Cornish for mine.

Whim. A windlass with a vertical drum revolved by horse-power and used for hoisting.

Whip. A fixed pulley with hoisting rope passed through it and pulled by a horse or mule.

Wilfley. A Wilfley concentrating table; about 20,000 in use throughout the world.

Winch. A windlass.

Winding. Hoisting with rope and drum.

Windlass. A device for hoisting from a pit or shaft, by means of coiling a rope or cable around a drum, with crank handles.

Winze. A shaft, usually short, extending downward from the floor of a mine opening.

Wire Bars. Refined copper cast into bars for wire drawing.

Workings. The underground openings of a mine.

Wulfenite. See molybdenum in minerals.

Zinc Blende. Sphalerite; sulphide of zinc.

Zinckiferous. Carrying zinc.

Zinc Sulphide. A compound of zinc and sulphur. See minerals.

Zn. The chemical symbol for zinc.

CHAPTER II

MINERALOGY

(See Chapter III for Copper Ores)

ORE MINERALS:

Ores as mined are very seldom composed entirely of ore minerals, usually consisting of a mixture of quartz, or other non-metallic mineral, or of altered rock and metal-bearing minerals. The mixture constitutes ore when it contains enough value, in one or more metals, to pay for the cost of mining, concentrating, transportation, smelting, and marketing. As this cost varies with each mine and locality, and the price of every metal, save gold, also fluctuates, there is a wide range of value to ore. The Alaska gold quartz mines operating on a gigantic scale can mine, mill, and extract their product for less than \$1 per ton, whereas many smaller mines cannot make a profit on \$3 ore of similar character. Copper ores show a much greater margin, between the costs at the Utah Copper Co. and those of small vein mines.

In the following pages I have given a list of the more important ore minerals of each metal. It is intended only for general reference, the minerals being arranged under the name of the metal. The list of copper minerals is complete, giving every mineral containing copper. For sight tests and recognition of ore minerals, see "Practical Field Mineralogy," Farrell-Moses, 1912.

ALUMINUM.

Bauxite. 74% alumina. Hydrated alumina. Regarded as a hot spring deposit. Occurs in pockets in clay in Arkansas.

Corundum. 53% aluminum. A bluish-gray, brown or white mineral which is harder than and will scratch any other mineral except diamond; will scratch steel. The clear red is the gem ruby and the blue, sapphire, found in many basic igneous dikes in Montana, especially in the sapphire mines at Yogo.

Cryolite. 12.8% aluminum, sodium alumina fluoride. A Greenland ore, essential to aluminum reduction.

Gibbsite. 65.4% alumina. Hydrated alumina, derived in Arkansas deposits from decomposition of a granitic rock (Elaeolite syenite).

ANTIMONY.

Stibnite. Antimony glance 71.4% antimony. Is the common ore; a sulphide of the metal. Is in process of deposition at Steamboat Springs, Nevada. Antimony occurs in many silver ores. Is common in tetrahedrite or silver-bearing copper minerals. Antimony ores are mined at Pine Creek, near Wardner, Idaho. Specific gravity, 4.5.

ARSENIC.

This metal is largely derived from arsenopyrite deposits, from nickel or cobalt arsenides, common at Cobalt, from enargite, copper arsenide, at Butte.

Arsenopyrite, or Mispickel, a sulpharsenide of iron, with 46% arsenic, which looks like iron pyrite, but emits a garlic odor when struck. Occurs in fissure veins, with gold ores. Ruby silver and other minerals rich in silver also contain arsenic. Gravity, 6.

Bismuthinite. Bi_2S_3 , 81.2% bismuth, a sulphide of bismuth. Gravity, 6.4. The metal is a subordinate constituent of many gold, tin, and silver ores, especially those of Leadville, Colo. It is obtained mainly as a by-product from gold-silver and lead ores and not from ores mined for this metal itself.

CADMIUM.

Greenockite. Is the only important ore mineral, the yellow sulphide, which occurs with zinc (sphalerite) ores in the Mississippi states.

CHROMIUM.

Chromite, $\text{FeO} \cdot \text{Cr}_2\text{O}_3$, or chrome iron ore, with 68% chromium, is the sole ore of commerce. Gravity, 4.5. It resembles magnetite, the black iron oxide ore.

COBALT.

Cobaltite, or cobalt sulpho-arsenide, with 35.4% cobalt.

Erythrite. A cobalt bloom, 37.4% cobalt, a creamy raspberry red mineral, formed by oxidation; a hydrated arsenious oxide.

Smaltite. Cobalt arsenide with 28.2% arsenious oxide. A silver-white mineral, harder than cobaltite; garlic odor when struck. Gravity, 6.5.

COPPER.

See special list of all copper minerals given in Chapter III.

GOLD.

Calaverite. A pale bronze yellow telluride of gold with 40% gold, 1-2% silver and balance tellurium. Breaks with uneven fracture and scratches easily. If burned in a forge gives beads of gold. Common at Cripple Creek and Kalgoorlie, Western Australia.

Native. As clean metallic, gold; as rusty and mustard colored gold and as pale colored electrum, an alloy with silver.

Petzite. Tellurides of gold and silver, a steel or iron gray metallic lustered mineral easily scratched with knife, slightly scaly, 20% to 25% gold; 18% to 25% silver.

Pyrite is the commonest gold bearing mineral.

Sylvanite. A silvery telluride of gold and silver, with brilliant metallic lustre, very soft, and carries 26% gold, 12.5% silver. Common in Cripple Creek, Colorado, ores.

IRON.

Hematite. 70% iron; black to brick red color; 5.5 to 6.5 hardness; 4.9 to 5.3 gravity. Mined in enormous quantities in Lake Superior region.

Magnetite. 72.4% iron; a black, sandy material or as coarse and fine-grained masses; is magnetic; 5.5 to 6.5 hardness; 4.9 to 5.2 gravity.

Pyrite. 46.7% iron; 53.4% sulphur; brass color; occurs frequently in crystalline masses; 6 to 6.5 hardness; 4.9 to 5.2 gravity. Rarely used as a direct source of iron.

LEAD.

Galena. The common ore of lead; lead sulphide, 8.6% lead, a steely, silvery mineral that crystallizes in cubes, occurs massive, resembling pig iron, or with sheeted structure. Breaks with perfect cleavage. Is often silver-bearing. Gravity, 7.5 to 7.7.

Cerussite. White lead ore, lead carbonate, 77.5% lead, a white or gray brittle mineral with waxy lustre. Is the most common oxidized ore of lead and effervesces with acid. Gravity, 5.5.

Anglesite. Lead sulphate, 73.6% lead; a brittle, colorless, or white mineral, often coating a kernel of galena and mixed with cerussite; very common. Gravity, 6.3.

Pyromorphite. Lead phosphate, 76.30% lead, a green, gray or brown mineral fusing easily to crystalline globules. Occurs in six-sided crystals and mossy fibres.

Jamesonite. Feather ore, lead sulpho-antimonide, 50.8% lead, 29.5% antimony, 19.7% sulphur, steel gray, metallic hairs and needles, also compact.

Bournonite. Lead copper sulphide. See Copper.

Vanadinite. A lead chloro-vandaninite, containing 18.7% lead oxide, 19.4% vanadium oxide, 2.5% chlorine, a bright yellow, orange or brown mineral, occurring in small, sharp hexagonal crystals; fuses easily.

Wulfenite. See molybdenum.

MANGANESE.

Ores to be valuable must contain at least 40% of the metal. Only the oxide ores are valuable.

Braunite. 69.6% manganese. Occurs as brown and black bands in clay in Arkansas.

Franklinite. See under zinc.

Pailomelane. 77% manganese; earthy manganese.

Pyrolusite. 63.2% manganese; black manganese ore resembling limonite. Is the common form of the Virginia deposit.

Wad. A soft earthy brown or black ore of variable composition, generally 20 to 45% manganese, also 10 to 25% water, and oxides of iron and copper.

MERCURY.

Cinnabar. 86.2% mercury. Sulphide of mercury, a red mineral, which is easily decomposed by heat.

MOLYBDENUM.

Molybdenite. The sulphide carries 60% molybdenum. Is a soft, lead colored, scaly metallic mineral resembling graphite, but malleable and giving a greenish streak on unglazed porcelain. Easily scratched by fingernail. Gives sulphurous odor when heated, thus distinguishing it from graphite.

Molybdate. Oxide with 66.7% molybdenum. Is an earthy yellow powder, formed by oxidation, but has never been found in commercial quantity.

Wulfenite. Lead molybdate, contains 39.3% molybdenic oxide. It usually occurs in flat, resinous, lustered, yellow, orange or red crystals, in the oxidized parts of lead deposits. Arizona has several deposits.

NICKEL.

Niccolite. Arsenical nickel, copper nickel, 43.6% nickel, 56.4% arsenic; somewhat resembles native copper. Has brownish, black scratch; metallic lustre and melts on heating.

Millerite. Sulphide of nickel, 64.4% nickel, a brass yellow, easily tarnished mineral, easily scratched by a knife.

Pyrrhotite (magnetic iron pyrite). Contains 2-6% nickel at Sudbury, Ont. Sulphur content is about 30%.

PLATINUM.

Metallic. In America is found in the black sand of gold placers, also at the Boss mine in Nevada, and as minute crystals of sperrylite in Sudbury, Canada, nickel ores.

RADIUM.

Carnotite. See Uranium.

Pitchblende. See Uranite (uranium).

SILVER.

Argentite. Silver glance; 85% silver; a silver sulphide of leaden-gray, metallic appearance; scratches with thumb nail.

Embolite. Silver bromide, 67% silver; resembles horn-silver.

Frieslebenite. Gray silver; 22% silver, 30% lead, 28% antimony, 18% sulphur. Resembles gray copper ore (tetrahedrite), but contains silver.

Galena. Lead sulphide. Is usually silver-bearing in our Western ore deposits.

Hornsilver. Cerargyrite; 75.3% silver, 24.7% chlorine. When pure resembles wax and cuts like it. A fragment put on zinc and wetted turns black and is reduced to silver.

Polybasite. 50.6% silver. A brittle, metallic mineral formed of silver and copper, combined with arsenic and antimony; often shows triangles on.

Proustite. Light red or ruby silver, with 65% silver; also called arsenical silver; a brilliant red or ruby colored mineral that is sub-translucent, and is bright red, when powdered.

Pyrrargyrite. Dark ruby; 60% silver; antimonial silver; a dark red to black metallic lustered mineral with brilliant red streak, or purplish powder.

Stephanite. Brittle silver, 68.5% silver; an antimonial sulphide of silver, with iron black color and streak.

Tetrahedrite. Gray copper ore, often rich in silver, with up to 17% silver. Usual composition, copper 30-40%; antimony 15-25%; sulphur 20-25%. Brittle iron gray to black metallic mineral; an important silver ore. See under Copper Minerals, next chapter of this book.

TIN.

Cassiterite. Oxide of tin, 78.67% tin. Is the common ore of tin; when weathered, looks like wood, but is very heavy.

Stannite. Tin sulphide, rare.

TUNGSTEN.

Wolframite. Iron manganese tungstate, 76.4% tungstic acid (WO_3). Has a hardness of 5; gravity 5, and a dark brown streak. The name covers all transitions and variations of iron-manganese tungstate from iron tungstate ferberite to manganese tungstate hübnerite.

Occurs in long, dark brown crystals, or short, stoutish columnar masses, varying to black, brilliant, lamellar masses in quartz and pegmatite. The brown varieties are softer and more brittle than the blacker form, whose thin flakes are deep red in transmitted light. Is the most common ore of tungsten.

Ferberite. Iron tungstate, 76.3% tungstic acid. A dull, coal black mineral, sometimes in an aggregate of cubic crystals, more often massive in black, sooty looking material in veins in pegmatite. Is thus far only found commercially in Nederland district, Boulder Co., Colo., and is a desirable ore.

Hübnerite. Manganese tungstate, 76.6% tungstic acid. A light brown mineral often in needle-like crystals of hair brown color, in quartz.

Scheelite. Tungstate of lime, 80.6% tungstic acid. Hardness $4\frac{1}{2}$, gravity 6. Streak white, gray or pale brown, very heavy mineral with peculiar glitter to fractured surfaces. Occurs massive, and as crystals imbedded in quartz, and also in garnet (Hawthorne, Nev., and Bishop, Calif.). Also in gold ores, as at Grass Valley, Calif.; Seoul, Korea; Murray, Idaho; and in New Zealand.

The field test for tungsten is to crush the specimen and "pan" it, to get the heavy residue; powder a part of the residue and put it in a glass or porcelain dish; add a half ounce (tablespoonful) of muriatic acid and heat to near boiling for fifteen minutes. Then add a few drops of nitric acid and boil one minute. Set aside a moment to settle and pour off liquid into a large tumbler of cold water. Also add cold water to residue and stir. Set aside both dishes a few minutes to settle, then pour off liquid. Canary yellow sediment in dish shows tungstic acid.

The more common test is to wrap tin foil about the specimen and boil hard in hydrochloric (muriatic) acid for 15 minutes, remove foil; a blue color indicates tungsten, but the test does not always show the color.

URANIUM.

Carnotite. 52%-57% oxide of uranium. A vanadate of uranium and potassium; a canary yellow powdery mineral occurring in large bedded deposits of impregnated sandstone in southern Utah and southwestern Colorado. Is the chief ore of uranium.

Uraninite. Pitchblende. 65%-80% uranium. A black to dark brown, olive green, very heavy mineral, found in Connecticut, Texas, Colorado, South Dakota, and in Austria. (See Bull. 70, U. S. Bureau of Mines, for description of mines.)

VANADIUM.

Carnotite. (See above.) 18% vanadium.

Roscoelite. 21%-29% vanadium; a scaly green to brown micaceous mineral mined at Vanadium, Colo., by the Primos Co., and also found in California quartz mines.

Vanadinite. 19.4% vanadium oxide. See under lead minerals.

ZINC.

Calamine. Hydrated zinc silicate, 67.5% zinc oxide, balance water and silicon; gravity, 3.9.

Is also the trade name for oxidized zinc ores. Often occurs in clay. Is yellow to brown, rarely pale blue or green.

Franklinite. An iron manganese zinc mineral with 5.54% zinc, 51.8% iron and 7.5% manganese; found at Franklin, N. J.

Smithsonite. Zinc carbonate, 64.8% zinc oxide. Dry bone, the white carbonate of zinc, differs from calamine by effervescing in acid; hardness, 5.

Sphalerite. Blende, Black jack, zinc blende, 67% zinc. Is the chief

source of the metal; varies from brown to black, rarely clear resinous. Gravity, 4. Hardness, 3.5-4. Knife scratch, brown to yellow.

Willemite. Zinc silicate, with 72.9% zinc oxide. Is a greenish yellow to applegreen mineral with resinous lustre. Is only important as an ore mineral at Franklin, N. J.

Zincite. Red zinc ores, 80.3% zinc. Occurs at Franklin, N. J.

CHAPTER III

A DESCRIPTION OF ALL COPPER-BEARING MINERALS

Important ore minerals in capitals

This chapter has been carefully revised and amplified and is the only complete list of copper-bearing minerals published.

Aciculite. Aikinite.

Adamite. A hydrous basic zinc arsenate, in which copper sometimes replaces zinc to the extent of about 18%.

Aguilarite. An unnamed alteration product of aguilarite, has the formula $5(\text{Ag,Cu})_2\text{S}(\text{Sb,As})_2\text{S}_2$. The mineral, which is an arseno-sulpho-antimonite, is isometric.

Aikinite. $3(\text{Pb,Cu})\text{S.Bi}_2\text{S}_3$. A lead and copper sulphobismuthite, carrying 11% copper. Common names, needle ore, acicular bismuth. Crystallization, orthorhombic. Fracture, uneven. Hardness, 2 to 2.5. Gravity, 6.1 to 6.8. Lustre, metallic. Color, blackish lead-gray, tarnishing to pale copper-red. Fuses on charcoal and is soluble in nitric acid. Occurrence, in acicular crystals in quartz, Ural Mountains of Russia and Gold Hill, North Carolina.

Alaskite. An argentiferous and cupriferous variety of galenobismuthite, which is a lead sulphobismuthite, carrying 3.5 to 5.1% copper.

Algodonite. Cu_2As . A copper arsenide carrying 85.5% copper. Structure, massive and granular. Fracture, subconchoidal. Hardness, 4. Gravity, 7.62. Lustre, metallic on fresh fractures, dulling on exposures. Color, steel-gray to silver-white on freshly polished surface, tarnishing to bronze. Is less fusible than domeykite. Occurs in Chile and Lake Superior, in the latter district being found in cross-courses traversing the cupriferous beds of the South Range mines, causing the copper product to be highly arsenical.

Alisonite. $3\text{Cu}_2\text{S.PbS}$. A copper and lead sulphide, carrying 53.5% copper, and 28.5% lead. Is related to cuproplumbite. Structure, massive. Color, deep indigo-blue, quickly tarnishing. Occurs at Coquimbo, Chile.

Ammiolite. Formula undetermined. A mercury and copper antimonite, carrying about 12.5% copper. Occurs, as an earthy powder, in Chile.

Andrewsite. Formula undetermined. A hydrous iron and copper phosphate related to chalcosiderite, containing about 8.6% copper.

Annivite. A variety of tennantite with antimony and bismuth, from Switzerland.

Antimonial Copper. Common name for chalcostibite.

Antlerite. Formula probably $10\text{CuO}.3\text{SO}_3.7\text{H}_2\text{O}$. A basis copper sulphate, containing about 54.7% copper. Structure, massive. Gravity, 3.93. Color, light green. From Yucca, Mohave county, Arizona.

Aphanesite. See clinoclasite.

Aphtonite. An argentiferous and zinciferous variety of tetrahedrite.

Arnimite. $5\text{CuO}.2\text{SO}_3.6\text{H}_2\text{O}$. A hydrous basic copper sulphate, containing 47.6% copper. Color, bright green. Occurs in acicular crystals.

Arzunitite. $(\text{Pb}_2\text{O})\text{SO}_3(\text{CuClH}_2\text{O})\text{CuOH}_2$. Crystallization orthorhombic, in small bluish green prisms.

Arsenical Copper. Domeykite.

Aperolite. $\text{CuSiO}_3+3\text{H}_2\text{O}$. A hydrous copper silicate. Apparently a hydrated chrysocolla, from Tagilsk, Perm, Russia.

Atacamite. $\text{CuCl}_2.3\text{Cu}(\text{OH})_2$. A hydrous copper oxychloride, containing 60.5% copper. Crystallization, orthorhombic. Fracture, conchoidal. Tenacity, brittle. Hardness, 3 to 3.5. Gravity, 3.75. Lustre, adamantine

to vitreous. Color, emerald green to blackish green. Streak, apple-green. Is transparent to translucent. Occurs, as sandy granules, in numerous mines in the province of Atacama, Chile, and elsewhere. Usually occurs disseminated, and low in copper tenor, but is extensively mined in Chile.

Atelite. $2\text{CuO}\cdot\text{CuCl}_2\cdot 3\text{H}_2\text{O}$. A hydrated copper oxychloride. An altered tenorite. Color, green. An alteration product from Mt. Vesuvius, closely related to atacamite chemically and mineralogically, but occurring as a pseudomorph after tenorite.

Atlasite. A copper carbonate containing chlorine, from Chañarcillo, Chile. Apparently is merely an intimate mixture of azurite and atacamite.

Aurichalcite. $2(\text{Zn,Cu})\text{CO}_3\cdot 3(\text{Zn,Cu})\text{(OH)}_2$. A basic zinc and copper carbonate, containing 16.6% copper. Crystallization, probably monoclinic. Occurs in acicular crystals, forming drusy incrustations, also columnar, laminated and granular. Hardness, 2. Gravity, 3.5 to 3.6. Lustre, pearly. Color, pale turquoise green to sky-blue. Streak, light green to light blue. Is translucent. Is soluble in acids. Occurs in small quantities in many zinc and copper fields.

AZURITE. $2\text{CuCO}_3\cdot\text{Cu(OH)}_2$. A basic copper carbonate, containing 53.3% copper. Common names, blue carbonate of copper, blue malachite, azure copper ore. Crystallization, monoclinic. Fracture, conchoidal. Tenacity, brittle. Hardness, 3.5 to 4. Gravity, 3.77 to 3.83. Lustre, vitreous. Color, azure blue. Streak, lighter blue. Is subtranslucent to transparent. Occurs frequently in the oxidized zone of copper ore bodies, almost invariably with malachite, but is much less common than malachite. Is a valuable commercial ore of copper.

Barnhardtite. Formula uncertain. A copper and iron sulphide, probably an alteration product from chalcopyrite that has lost part of its iron and copper, containing 46.7 to 50.4% copper. Apparently is nearer to bornite than to chalcopyrite. Structure, massive, compact. Fracture, conchoidal. Hardness, 3.5. Gravity, 4.5. Lustre, metallic. Color, bronze-yellow, tarnishing to pinchbeck-brown. Streak, grayish black, slightly shining. Occurrences: North Carolina and Arizona.

Barracanite. Cupropropyrite.

Bayldonite. $4(\text{Pb,Cu})\text{O}\cdot\text{As}_2\text{O}_5\cdot 2\text{H}_2\text{O}$. A hydrous basic lead and copper arsenate containing 26.1% copper. Occurs in minute mamillary concretions with drusy surface. Fracture, subconchoidal. Hardness, 4.5. Gravity, 5.35. Lustre, resinous. Color, grass-green to blackish green. Streak, apple-green. Is subtranslucent. Soluble, with difficulty, in nitric acid. Occurs in Cornwall, England.

Beaumontite. A very doubtful hydrous copper silicate, from Chessy, France.

Bell-Metal Ore. Common name for stannite.

Berzelianite. Cu_2Se . A copper selenide containing 61.6% copper. Occurs disseminated in incrustations. Is very soft. Gravity, 6.71. Lustre, metallic. Color, silver-white, soon tarnishing. Streak, shining. Usually is argentiferous. Occurs in Småland, Sweden.

Beudantite. Apparently this name is applied to two minerals, one an arsenate and the other a sulphate of iron, lead and copper, carrying from a trace to 9.8% copper.

Binnite. Formula probably $3\text{Cu}_3\text{S}_2\text{As}_2\text{S}_8$. A copper sulphoarsenite, containing 37.7% copper. A variety of tennantite. Crystallization, isometric. Fracture, conchoidal. Tenacity, brittle. Hardness, 2.5 to 3. Gravity, 4.47. Lustre, metallic. Color, dark steel-gray to iron black. Streak, reddish brown. Occurrence: Binnenthal, Switzerland.

Black Copper. Common name for melaconite or disseminated chalcocite. In all likelihood much of what has been taken for melaconite in the past was disseminated chalcocite.

Blue Copper. Common name for azurite.

Blue Malachite. Common name for azurite.

Bluestone. Common name for chalcantite; also for blue vitriol, the manufactured product corresponding in chemical formula with chalcantite; CuSO_4 .

Blue Vitriol. Common name for chalcantite or bluestone.

Bogosllovskite. Chrysocolla carrying carbon dioxide as an impurity, from the Bogosllovsk mine, Perm, Russia.

Boléite. $\text{Pb}(\text{OH})\text{Cl}\cdot\text{Cu}(\text{OH})\text{Cl}+\frac{1}{2}\text{AgCl}$. A hydrated lead, copper and silver oxychloride, containing about 12% copper. Crystallization, isometric. Texture loose. Hardness, 3 to 3.25. Gravity, 5.08. Color, indigo-blue. Occurrence: at the Boleo mines, Baja California, Mexico.

Boothite. $\text{CuO}\cdot\text{SO}_3\cdot 7\text{H}_2\text{O}$. A hydrous sulphate of copper. Crystallization, monoclinic. Color, blue. A variety Morenoside.

BORNITE. Cu_2FeS_4 . A copper and iron sulphide, containing 55.5% copper, 16.4% iron, 28.1% sulphur. Common name, peacock copper ore. Crystallization, rare isometric, with many hexagonal penetration twins. Structure, granular or compact. Fracture, small conchoidal to uneven. Tenacity, brittle. Hardness, 3. Gravity, 4.9 to 5.4. Lustre, metallic. Color, copper red to bluish brown, quickly tarnishing to iridescence, often most brilliant. Streak, pale grayish-black. Is soluble in nitric acid, with separation of sulphur. Is a primary mineral, at Butte and in contact metamorphic ores, but also occurs as the first alteration product from chalcocopyrite among the secondary copper sulphides, and often carries nodules and occasionally larger masses of chalcocite. Is one of the most important ores of copper.

Botallackite. Atacamite.

Bournonite. $3(\text{Pb},\text{Cu})_2\text{S}\cdot\text{Sb}_2\text{S}_3$. A lead and copper sulphantimonite, containing 13% copper and 42.5% lead. Crystallization, orthorhombic. Structure, massive, granular and compact. Cleavage, imperfect. Fracture, subconchoidal to uneven. Tenacity, rather brittle. Hardness, 2.5 to 3. Gravity, 5.7 to 5.9. Lustre, brilliant metallic. Color and streak, steel-gray, inclining to blackish gray or iron-black. Fuses easily on charcoal and is soluble in acids. Occurrence: in many copper fields.

Brass Ore. Common name for aurichalcite.

Brochantite. $4\text{CuO}\cdot\text{SO}_3\cdot 3\text{H}_2\text{O}$. A basic copper sulphate containing 56.2% copper. Crystallization, orthorhombic. Fracture, uneven. Hardness, 3.5 to 4. Gravity, 3.9. Lustre, vitreous. Color, emerald-green to blackish green. Streak, paler green. Is translucent to transparent. Is found in many copper fields, and is an important commercial ore in the Clifton district, Graham county, Arizona, and Chuquicamata, Chile.

Buraitite. An aurichalcite containing calcium monoxide, probably as a mechanical admixture.

Cacheutaite. A lead, copper and silver selenide carrying 7 to 36% copper. Is closely related to zorgite.

Calciovolborthite. $4(\text{Cu},\text{Ca})\text{O}\cdot\text{V}_2\text{O}_5\cdot\text{H}_2\text{O}$. A hydrous basic copper and calcium vanadate, containing 31.7% copper. Hardness, 3.5. Gravity, 3.5 to 3.86. Color, gray to green. Streak, brownish yellow to greenish yellow. Occurrence: Thuringia, Germany.

Caledonite. $2(\text{Pb},\text{Cu})\text{O}\cdot\text{SO}_3\cdot\text{H}_2\text{O}$. A basic lead and copper sulphate, containing 9.4% copper. Crystallization, orthorhombic. Fracture, uneven. Tenacity, rather brittle. Hardness, 2.5 to 3. Gravity, 6.4. Lustre, resinous. Color, verdigris-green to bluish green. Streak, greenish white. Is translucent. Occurrence: Scotland, Hungary, California, etc.

Cantonite. A dimorphous variety of covellite, apparently a pseudomorph after galena, crystallized in cubes with cubical cleavage.

Capillary Red Oxide of Copper. Common name for chalcotrichite, a form of cuprite.

Carmentite. A variety of digenite.

Carrollite. $\text{CuS}\cdot\text{Co}_2\text{S}_3$. A cobalt and copper sulphide containing 20.5% copper and 38% cobalt. Crystallization, isometric. Fracture, subconchoidal to uneven. Hardness, 5.5. Gravity, 4.85. Lustre, metallic. Color, light steel-gray, with faint reddish hue. Occurrence: Carroll county, Maryland.

Castillite. $(\text{Cu},\text{Ag})_2\text{S}\cdot 2(\text{Cu},\text{Pb},\text{Zn},\text{Fe})\text{S}$. A copper, silver, lead, zinc and iron sulphide carrying about 41% copper. Apparently an impure bornite. Structure, massive. Hardness, 3. Gravity, 5.19 to 5.24. Resembles bornite in color, streak and tarnish. Occurrence: Guanacevi, Mexico.

Ceraleite. (Coeruleite) $\text{CuO} \cdot 2\text{Al}_2\text{O}_3 \cdot \text{As}_2\text{O}_5$. A massive clay-like, turquoise blue, arsenate of copper and aluminum.

CHALCANTHITE. $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$. A hydrous copper sulphate containing 25.4% copper. Common names, blue vitriol, bluestone, copper sulphate. Crystallization, triclinic. Structure, massive, stalactitic and reinform, sometimes fibrous. Fracture, conchoidal. Tenacity, brittle. Hardness, 2.5. Gravity, 2.12 to 2.30. Lustre, vitreous. Color, sky-blue. Streak, uncolored. Is translucent to subtransparent. Is soluble in water. Occurs as deposits from mine water in most sulphide copper mines, and is found in impure state, in beds, in Chile.

CHALCOCITE. Cu_2S . A copper sulphide carrying 79.8% copper. Common names, copper glance, cuprous sulphide. Crystallization, orthorhombic; also occurs massive, with structure granular to compact and irripable. Cleavage, indistinct. Fracture, conchoidal. Tenacity, brittle. Hardness, 2.5 to 3. Gravity, 5.5 to 5.8. Lustre, metallic. Color and streak, blackish lead-gray, tarnishing to dull green or blue. Is soluble in nitric acid. Occurs in all copper districts, frequently in large quantities. Is the richest commercial ore of copper and yields more than one-half of world's copper supply.

Chalcolite. Torbernite.

Chalcomenite. $\text{CuO} \cdot \text{SeO}_3 \cdot 2\text{H}_2\text{O}$. A hydrous copper selenite containing 28% copper. Crystallization, monoclinic. Gravity, 3.76. Lustre, vitreous. Color, bright blue. Is transparent. Is soluble in acids. Found at Cachenta, Mendoza, Argentina.

Chalcomichlite. Bornite.

Chalcophacite. Liroconite.

Chalcopyllite. $7\text{CuO} \cdot \text{As}_2\text{O}_5 \cdot 14\text{H}_2\text{O}$. A hydrous basic copper arsenate containing 42.3% copper. Crystallization, rhombohedral. Hardness, 2. Gravity, 2.43 to 2.66. Lustre, vitreous. Color, grass-green to verdigris-green. Streak, grass-green. Occurs in Hungary, Siberia, and Utah.

CHALCOPYRITE. $\text{Cu}_2\text{S} \cdot \text{Fe}_2\text{S}_2$. A copper and iron sulphide containing 34.5% copper and 30.5% iron. Is the primary ore of copper. Crystallization, tetragonal, sphenoidal, often twinning, also frequently massive and compact. Fracture, uneven. Hardness, 3.5 to 4. Gravity, 4.1 to 4.3. Lustre, metallic. Color, brass-yellow, often tarnishing to iridescence. Streak, greenish black. Is soluble, except sulphur, in nitric acid, and, on being heated, yields a portion of its sulphur. On exposure to moisture and heat becomes hydrated, and copper and iron change readily to sulphates. Alters to azurite, malachite, melaconite, chalcocite, covellite, bornite, brochantite, chrysocolla, tetrahedrite, and tennantite. Is found in practically every copper field in the world, and is second only to chalcocite in importance among the commercial ores of copper.

Chalcopyrrhotite. $\text{CuS} \cdot \text{Fe}_2\text{S}_2$. An iron and copper sulphide containing 13% copper and 48.2% iron. Structure, massive. Hardness, 3.5 to 4. Gravity, 4.28. Color, brassy, with brownish tinge. Occurrence: Nya Kopparberg, Sweden.

Chalcosiderite. $\text{CuO} \cdot 3\text{Fe}_2\text{O}_3 \cdot 2\text{P}_2\text{O}_5 \cdot 8\text{H}_2\text{O}$. A hydrous iron and copper phosphate containing 6.4% copper. Hardness, 4.5. Gravity, 3.1. Crystallization, triclinic in minute distinct crystals in sheaf-like group. Lustre, vitreous. Color, dark green. Streak, pale green. Occurs in Cornwall, England, and Westphalia, Germany.

Chalcosine. Chalcocite.

Chalcostibite. $\text{Cu}_2\text{S} \cdot \text{Sb}_2\text{S}_3$. A copper sulphantimonite containing 25.6% copper and 48.5% antimony. Crystallization, orthorhombic, in thin prisms. Fracture, subconchoidal. Tenacity, brittle. Hardness, 3 to 4. Gravity, 4.75 to 5. Lustre, metallic. Color, between lead-gray and iron-gray. Occurrences: in the Harz Mountains of Germany, and in Guadix, Spain.

Chalcotrichite. A form of cuprite with capillary or acicular crystallization. Common name, plush copper ore.

Chalmersite. $\text{Cu}_2\text{S} \cdot \text{Fe}_2\text{S}_2$. Occurs in orthorhombic prisms. Color, bronze yellow. Found in Moiro Velho gold mine, Brazil, and Alaska.

Cheleutite. A ferruginous, nickeliferous and slightly cupriferrous smaltite.

Chenevixite. $2\text{CuO}\cdot\text{Fe}_2\text{O}_3\cdot\text{As}_2\text{O}_5\cdot 3\text{H}_2\text{O}$. A hydrous copper and iron arsenate containing 21% copper. Structure, massive. Fracture, subconchoidal. Hardness, 3.5 to 4.5. Gravity, 3.93. Lustre, vitreous. Color, dark olive-green to greenish yellow. Streak, yellowish green. Is soluble in acids. Occurrence: Cornwall, England, and Eureka, Juab county, Utah.

Chessylite. Azurite.

Chileite. Formula uncertain. A hydrous lead and copper vanadate containing 11.7 to 13.6% copper. Is related to psittacinite. Structure, earthy. Occurrence: Chile.

Chilenite. $(\text{Ag},\text{Cu})_2\text{Bi}$. A silver and copper bismuthide, containing 8.5% copper and 75% silver. Structure, amorphous, granular. Is soft. Color, silver-white. Occurrence: Copiapó, Chile.

Chiviatile. A lead sulphobismuthite carrying about 2.5% copper.

Chloanthite. Empirically nickel diarsenide, but analyses invariably show cobalt and iron, and commonly small quantities also of copper, lead, silver, bismuth, and antimony.

Chlorothionite. $\text{CuCl}_2\cdot\text{K}_2\text{SO}_4$. A copper and potassium chlorosulphate. Occurs in bright blue crystalline crusts on lava. Is an alteration product from Mt. Vesuvius.

Chlorotile. Formula probably $3\text{CuO}\cdot\text{As}_2\text{O}_5\cdot 6\text{H}_2\text{O}$. A hydrous copper arsenate containing about 33% copper. Is related to trichalcite. Crystallization, orthorhombic; also occurs fibrous and massive. Is soft. Color, pale emerald-green. Is transparent.

CHRYSOCOLLA. $\text{CuSiO}_3\cdot 2\text{H}_2\text{O}$. A hydrous copper silicate carrying 36% copper. Common names, mountain green and mountain blue. Structure, cryptocrystalline, enamel-like, sometimes botryoidal. Fracture, conchoidal. Is brittle and somewhat sectile. Hardness, 2 to 4. Gravity, 2 to 2.24. Lustre, vitreous to earthy. Color, mountain green, bluish green and sky blue to turquoise-blue, with impure varieties brown to dull black. Streak, white, from pure green and blue varieties. Is opaque to translucent. Is decomposed by acids, without gelatinization. Commonly occurs with carbonate ores in the oxidized zones of copper ore bodies, and is a commercial ore of value in many districts.

Clarite. $3\text{Cu}_2\text{S}\cdot\text{As}_2\text{S}_5$. Crystallization monoclinic. Color, dark lead-gray. Belongs to enargite family. A dimorphous form of enargite, from Schapbach, Baden, Germany.

Clayite. A lead sulphantimonite, carrying copper as a replacement of lead to extent of circa 8%.

Clinoclasite. $6\text{CuO}\cdot\text{As}_2\text{O}_5\cdot 3\text{H}_2\text{O}$. A hydrous basic copper arsenate carrying 48% copper. Crystallization, monoclinic. Is brittle. Hardness, 2.5 to 3. Gravity, 4.19 to 4.36. Lustre, vitreous to resinous. Color, blackish blue-green externally, dark verdigris-green internally. Streak, bluish green. Is subtransparent to translucent. Is soluble in nitric acid. Occurrence: Cornwall and Utah.

Condurrite. Apparently a copper arsenide, related to domeykite. Is supposed to be an alteration product of tennantite. Is soft and black. Occurs in the Condurrow mine, and at Carn Brea, Cornwall, England.

Conicalcrite. $4(\text{Cu},\text{Ca})\text{O}\cdot\text{As}_2\text{O}_5\cdot 1\frac{1}{2}\text{H}_2\text{O}$. A hydrous basic copper and calcium arsenate, carrying 24% copper. Structure, reniform and massive. Fracture, splintery. Tenacity, brittle. Hardness, 4.5. Gravity, 4.12. Color and streak, pistachio to emerald green. Is translucent. Occurs in Andalusia, Spain, and at Eureka, Juab county, Utah.

Connellite. Formula probably $\text{Cu}_{11}(\text{Cl},\text{O}_2\text{H})_2\text{SO}_{14}\cdot 15\text{HO}$. A hydrous basic copper chlorosulphate, containing about 57.6% copper. Crystallization, hexagonal. Hardness, 3. Gravity, 3.36. Lustre, vitreous. Color, fine blue. Is translucent. Is soluble in nitric acid. Occurrence: Cornwall, England.

COPPER. Cu . Native copper. The chemical symbol Cu is an abbreviation of cuprum, the Latin word for copper. The metal, native or refined, has the following names in modern languages: kupfer in German; koppar in Swedish; kobber in Norwegian; cobre in Spanish and Portuguese; cuivre in French, rame in Italian.

Atomic weight, 63.2. Belongs in the first group and is the leader of the

fifth series of Mendeleef's Periodic System. The group is as follows: 1, hydrogen; 2, lithium; 3, sodium; 4, potassium; 5, copper; 6, rubidium; 7, silver; 8, caesium; 9, unknown (possibly terbium, atomic weight 160); 10, gold; 11, unknown. The fifth series, of which copper is the basic leader, is as follows: 1, copper; 2, zinc; 3, gallium; 4, germanium; 5, arsenic; 6, selenium; 7, bromine. The three metallic elements falling between series four and five in Mendeleef's table are iron, cobalt, and nickel. The frequency with which these three elements are found associated with copper, and the ease with which all four metals replace one another, is notable. The general resemblance between copper, silver and gold, which form ascending steps in the same group, is readily apparent.

System of crystallization, isometric. Tetrahexahedral forms are the most common, with much twinning. Crystals often show cavernous faces and occasionally elevations, are often distorted and pass gradually through distortions into filiform and arborescent forms. Native copper also occurs massive, in granular form, and in laminae. In the Lake Superior mines the metal occurs in all observed forms and sizes, including lamellae from microscopic flakes up to sheets of immense size and weight, crystals of greatly varying form and size, grains from microscopic size to considerable nodules, and druses, often of considerable size, show various filiform and arborescent shapes. The finest particles are grains and exceedingly minute flakes, occurring in an upper sandstone of the Keweenaw series, while the largest masses, weighing upwards of 500 tons, have been found in contact and fissure veins.

Cleavage, none; fracture, hackly; tenacity, second only to that of iron. Is perfectly sectile and highly ductile and malleable, ranking in these particulars with the precious metals. Electrical conductivity, 931, as compared with 1,000 for silver, which possesses the most perfect electrical conductivity of any known metal or alloy. Conductivity for heat, 898, as compared with 1,000 for gold, the most perfect conductor of heat.

Hardness, 2.5 to 3. Specific gravity, in vacuo, at 0 degrees Centigrade (equal to 32°, or freezing point, Fahrenheit); when chemically pure and devoid of porosity, is 8.945. Specific gravity of the ordinary copper of commerce, none of which is free from impurities, varies from about 8.75 when cast, to about 8.95 when rolled, hammered or drawn, the exact gravity depending upon how handled, as well as upon the extent and nature of the impurities contained.

Lustre, metallic. Color, copper-red. Streak, copper-red, metallic, shining. Tarnishes upon exposure to air to brownish red, and is liable to form a coating of verdigris or oxide upon long exposure to air. Atmosphere laden with moisture and carbonic acid is especially favorable to the formation of verdigris.

Fusibility: Copper is fusible at approximately 2,000° Fahrenheit, or a trifle less than 1,100° Centigrade. Color, when fused, sea-green. Copper becomes volatile under the high temperature of the electric arc.

Solubility: Copper is soluble in nitric acid, aqua regia, and strong boiling sulphuric acid, also, slowly, in dilute hydrochloric and sulphuric acids, with admission of air. When in solution in nitric or sulphuric acids will deposit metallic copper on iron immersed therein.

Affinities: Copper has a greater affinity for sulphur than for any other element, possessing also marked affinities for oxygen, carbon dioxide, arsenic, antimony and bismuth, and unites with many other elements.

Alterations: Native copper alters on exposure, especially in damp air, to the simpler oxide and carbonate ores, such as cuprite, malachite and azurite, and occasionally, in time, to the more complex ore forms.

Occurrence: Native copper occurs, usually in small quantities, in most of the principal copper districts of the world. The native metal is mined upon a considerable scale only in Lake Superior, U. S. A., and Bolivia. The Lake Superior native copper carries considerable silver, mechanically admixed, though not alloyed, but carries no gold. In districts outside of Lake Superior and Bolivia the metal occurs most frequently in connection with the oxide and carbonate ores, and occasionally with the secondary sulphide ores.

Impurities: Native copper frequently contains silver, arsenic, bismuth, antimony, zinc and occasionally mercury. Commercial copper, refined from ores, may contain any of the elements already named, and also gold, tin, lead, selenium and tellurium, the latter two elements in very minute quantities.

Copper Glance. Common name for chalcocite.

Copper Mica. A miner's name for chalcopyrite.

Copper Nickel. A term sometimes used for niccolite.

Copper Phosphate. Libethenite.

Copper Pyrite. Common name for chalcopyrite.

Copper Vitriol. Trade name for copper sulphate which is called chalcantite in nature; bluestone when manufactured.

Copper Uranite. Trade name for torbernite.

Coppite. A ferruginous variety of tennantite.

Cornwallite. $5\text{CuO} \cdot \text{As}_2\text{O}_5 \cdot 3\text{H}_2\text{O}$. A hydrous basic copper arsenate containing 46.5% copper. Structure, massive. Fracture, conchoidal. Hardness, 4.5. Gravity, 4.16. Color, verdigris-green to emerald green. Occurrence: Cornwall, England.

Cosalite. Empirically lead sulphobismuthite, but usually cupriferous to the extent of from a trace to 8.75% copper.

COVELLITE. Covellite. CuS . A beautiful bright blue copper sulphide containing 66.4% copper. Chemical name, cupric sulphide. Crystallization, hexagonal; also occurs massive. Is flexible in thin layers, with basal cleavage. Hardness, 1.5 to 2. Gravity, 4.6. Lustre, submetallic on crystals, dull when massive. Color, indigo-blue. Streak, lead-gray to black, shining. Occurs in most sulphide copper districts, as a secondary ore and is a valuable commercial ore of copper, when found in sufficient quantities, as in Butte, Mont., Utah, Wyoming and elsewhere.

Crednerite. $3\text{CuO} \cdot 2\text{Mn}_2\text{O}_3$. A copper manganate containing 34.4% copper. Crystallization, monoclinic. Cleavage, basal, perfect, less distinct in other directions. Hardness, 4.5. Gravity, 4.9 to 5.1. Lustre, metallic. Color, iron-black to steel-gray. Streak, brownish black. Is soluble in hydrochloric acid.

Crookesite. $(\text{Cu}, \text{Tl}, \text{Ag})_2\text{Se}$. A copper, thallium, and silver selenide, containing 44 to 46% copper, 17 to 18.5% thallium and 1.5 to 5% silver. Structure is massive, without crystallization, is brittle. Hardness, 2.5 to 3. Gravity, 6.9. Lustre, metallic. Color, lead-gray, finely disseminated. Occurrence: Samaland, Sweden.

Cubanite. $\text{CuS} \cdot \text{Fe}_2\text{S}_3$. An iron and copper sulphide containing 23.3% copper and 41.3% iron. Crystallization, isometric; also occur massive. Cleavage, cubic. Hardness, 4. Gravity, 4.026 to 4.169. Color, bronze to brass-yellow. Streak, dark reddish bronze to black. Occurrence: Cuba, California, and Sweden.

Cumengite. $\text{Pb}(\text{OH})\text{Cl} \cdot \text{Cu}(\text{OH})\text{Cl}$. A hydrous lead and copper oxychloride, related to boléite. Crystallization, tetragonal. Color, indigo blue. Loose texture.

Cupric Oxide. Tenorite, when found in nature; copper monoxide in chemistry.

CUPRITE. Cu_2O . A copper oxide, containing 88.8% copper, being the richest copper ore. Chemical names, cuprous oxide, copper protoxide. Common names, ruby copper, red glassy copper ore, octahedral copper ore. Crystallization, isometric, commonly in octahedrons; also occurs massive, granular and sometimes earthy. Fracture, conchoidal. Is brittle. Hardness, 3.5 to 4. Gravity, 5.85 to 6.15. Lustre, adamantine to earthy. Color, light to dark red; when fresh, usually ruby-red, but fades to duller red. Streak, brownish red, shining. Is subtransparent to subtranslucent. Occurs in most copper districts in the upper oxidized zone, frequently shading into crystals of native copper.

Cuprobismuthite. $3\text{Cu}_2\text{S} \cdot 4\text{Bi}_2\text{S}_3$. A copper sulphobismuthite containing 15% copper and 65.1% bismuth. Occurs in slender prismatic crystals. Gravity, 6.31 to 6.68. Lustre, metallic. Color, dark bluish black. Streak, black. The copper frequently is replaced partially by silver.

Cuprocalcite. Formula perhaps $(\text{Cu}_2\text{O})_2 \cdot \text{CO}_2 + 2\text{CaO} \cdot \text{CO}_2 + \text{H}_2\text{O}$. Ap-

parently merely an intimate mixture of cuprite and calcium carbonate. Hardness, 3. Gravity, 3.9. Color, vermilion-red. Is soluble in hydrochloric acid.

Cuprocassiterite. Formula possibly $4\text{SnO}_2 + \text{Cu}_2\text{Sn}(\text{OH})_2$. Occurrence: Black Hills of South Dakota.

Cuprodescloizite. A cupriferous variety of descloizite, which is a basic lead and zinc vanadate.

Cuproferrite. Pisanite.

Cuprogoslarite. A copper-bearing variety of goslarite, or zinc sulphate.

Cuproiodangyrite. CuI.RgI . A copper and silver iodide. Apparently a decomposition product of stromeyerite. Occurs, as incrustations, at Huantajaya, Chile.

Cupromagnesite. $(\text{Cu,Mg})\text{SO}_4 \cdot 7\text{H}_2\text{O}$. A copper and magnesium sulphate; crystallization monoclinic. Occurs in crust on lava. Color, bluish green. Is alteration product, occurring as incrustations, from Mt. Vesuvius.

Cuproplumbite. $\text{Cu}_2\text{S} \cdot 2\text{PbS}$. A copper and lead sulphide, carrying 61.3% copper and 19% lead. Structure, massive. Lustre, feeble or lacking. Color, lead-gray to indigo-blue. Occurrence: Catemou, Aconcagua, Chile; Butte, Montana; and Semipalatinsk, Siberia.

Cupropyrite. CuFe_2S_4 . An iron and copper sulphide, carrying 24% copper. Is closely related to cubanite.

Cuproscheelite. $(\text{Ca,Co})\text{WO}_4$. A calcium and copper tungstate carrying 3 to 5% copper. Is a variety of cuprotungstite in which copper is mainly replaced by calcium.

Cuprotungstite. CuWO_4 . A copper tungstate carrying 24% copper. Structure, granular and incrustive. Hardness, 4.5 to 5. Color, pistachio-green to leek-green. Streak, greenish gray to greenish yellow. Is soluble in hydrochloric acid. Occurrence: Llamuco, Santiago de Chile; and Seoul, Korea.

Cuprouranite. Torbernite.

Cuprous Oxide. Cuprite in nature. Chemical term for two atoms of copper united with one atom of oxygen.

Cuprovanadite. Chileite.

Cyanochalcite. A phosphoriferous variety of chrysocolla, from Nijnj Tagilsk, Perm, Russia.

Cyanochroite. $\text{CuSO}_4 \cdot \text{K}_2\text{SO}_4 \cdot 6\text{H}_2\text{O}$. A hydrous copper and potassium sulphate, carrying 14.3% copper. Crystallization, monoclinic. Color, clear blue. Is an alteration product from Mt. Vesuvius.

Cyanotrichite. $4\text{CuO} \cdot \text{Al}_2\text{O}_3 \cdot \text{SO}_3 \cdot 8\text{H}_2\text{O}$. A hydrous basic copper and aluminum sulphate, carrying 39.4% copper. Crystallization, orthorhombic. Lustre, pearly. Color, smalt-blue to sky-blue. Occurrence: Hungary, France, Arizona, and Utah.

Darwinite. Whitneyite.

Delafossite. An iron, copper and aluminum oxide containing 37.9% copper 47.99% iron sesquioxide and 3.52% aluminum sesquioxide. Occurrence: Ekaterinburg, Perm, Russia.

Demidovite. A phosphoriferous variety of chrysocolla from Tagilsk, Perm, Russia.

Digenite. Apparently a partly altered chalcocite containing a considerable percentage of covellite.

Dihydrate. $5\text{CuO} \cdot \text{P}_2\text{O}_5 \cdot 2\text{H}_2\text{O}$. A hydrous basic copper phosphate containing 55.2% copper. Crystallization, monoclinic; also occurs massive and fibrous. Fracture, conchoidal to uneven. Tenacity, brittle. Hardness, 4.5 to 5. Gravity, 4 to 4.4. Lustre, adamantine. Color, dark emerald-green. Streak, pale emerald-green. Is translucent. Is soluble in nitric acid. Occurrence: Germany and the Ural Mountains of Russia.

Dillenburgite. An impure chrysocolla containing copper carbonate.

Diopase. $\text{CuO} \cdot \text{SiO}_2 \cdot \text{H}_2\text{O}$. A hydrous copper silicate carrying 40.3% copper. Common names, emerald copper, emerald malachite. Crystallization, rhombohedral; also occurs massive. Fracture, conchoidal to uneven. Tenacity, brittle. Hardness, 5. Gravity, 3.28 to 3.35. Lustre, vitreous. Color, brilliant emerald-green. Streak, green. Is subtranslucent to transparent. Gelatinizes with hydrochloric acid. Is fusible with charcoal and

soda. Occurrence: Chile, Hungary, Siberia, French Congo, and at Superior, Arizona, etc.

Dognacskaité. Formula perhaps $3\text{Cu}_2.5\text{Bi}_2\text{S}_5$. A variety of cuprobismutite carrying slightly less copper and sulphur and slightly more bismuth than the normal mineral. Color, gray.

Dolerophanite. 2CuO.SO_3 . A basic copper sulphate carrying 53.1% copper. Crystallization, monoclinic. Color, brown. Is soluble in nitric acid. Is a sublimation product from Mt. Vesuvius.

Domeykite. Cu_3As . A copper arsenide carrying 71.7% copper. Common name, arsenical copper. Structure, reniform and botryoidal, also massive and disseminated. Fracture, uneven. Hardness, 3 to 3.5. Gravity, 7.2 to 7.75. Lustre, metallic, dulling on exposure. Color, tin-white to steel gray, tarnishing to iridescent bronze, sometimes argentiferous and granular. Is fusible in open tube, yielding a white sublimate of arsenic trioxide. Is soluble in nitric acid. Occurrence: Chile, Bolivia, Saxony, Mexico, and Lake Superior.

Ducktownite. Apparently merely a mechanical mixture of chalcocite and pyrite.

Dürfeldtite. $3(\text{Pb,Ag,Cu,Mn,Fe})\text{S.Sb}_2\text{S}_3$. A lead, silver, copper, manganese and iron sulphobismuthite. Occurs in acicular crystals. Hardness, 2.5. Gravity, 5.4. Lustre, metallic. Color, light gray. Is related to stylopyrite. Found in Perú.

Ehlite. $5\text{CuO.P}_2\text{O}_5.3\text{H}_2\text{O}$. A hydrous basic copper phosphate containing 52 to 55% copper. Is closely related to dihydrite and pseudomalachite. Gravity, 4.2 to 4.4. Occurrence: Cornwall, England, and Nijni Tagilsk, Perm, Russia.

Emerald Copper. Common name for diopside.

Emerald Malachite. Common name for diopside.

Emplectite. $\text{Cu}_2\text{S.Bi}_2\text{S}_3$. A copper sulphobismuthite containing 18.9% copper and 62% bismuth. Crystallization, orthorhombic, in thin prisms. Tenacity, brittle. Hardness, 2. Gravity, 6.3 to 6.5. Lustre, metallic. Color, grayish to tin-white. Occurrence: Chile, Saxony and Norway.

ENARGITE. $3\text{Cu}_2\text{As}_2\text{S}_5$. Enargite grades into famatinite. A copper sulpharsenite containing 48.3% copper. Crystallization, orthorhombic; also occurs massive and granular. Fracture, uneven. Tenacity, brittle. Hardness, 3. Gravity, 4.45. Lustre, metallic. Color and streak, grayish black to iron-black. Is soluble in aqua regia and fusible on charcoal. Occurs in many copper fields, notably at Butte, Montana, where it is a common and valuable ore.

Epigenite. Formula probably $4\text{Cu}_2\text{S.3FeS.As}_2\text{S}_5$. A copper and iron sulpharsenite, carrying about 41% copper. Crystallization, orthorhombic, in short prisms. Fracture, uneven. Hardness, 3.5. Lustre, metallic. Color, steel-gray. Streak, black. Is soluble in nitric acid. Occurrence: Wittichen, Baden, Germany.

Erinite. $5\text{CuO.As}_2\text{O}_5.2\text{H}_2\text{O}$. A hydrous basic copper arsenate, containing 47.8% copper. Occurs in mamillated concentric crystalline groups, also fibrous and rough. Tenacity, brittle. Hardness, 4.5 to 5. Gravity, 4.04. Lustre, slightly resinous. Color, emerald green. Streak, grass-green. Is opaque to subtranslucent. Is soluble in nitric acid. Occurrence: Cornwall and Utah.

Erythrocalcite. $\text{CuCl}_2.n\text{H}_2\text{O}$. A hydrated copper chloride. Is an alteration product from Mt. Vesuvius.

Eucairite. $\text{Cu}_2\text{Se.Ag}_2\text{Se}$. A silver and copper selenide carrying 25.3% copper and 43.1% silver. Crystallization, isometric; also occurs massive and granular. Hardness, 2.5. Gravity, 7.5. Lustre, metallic. Color, silver-white to lead-gray. Streak, shining. Occurrence: Smaland, Sweden; and Copiapó, Chile.

Euchlorine. A compound of copper potash and soda sulphates and cuprous chloride, from Mt. Vesuvius.

Euchroite. $4\text{CuO.As}_2\text{O}_5.7\text{H}_2\text{O}$. A hydrous basic copper arsenate containing 39.7% copper. Crystallization, orthorhombic. Fracture, subconchoidal. Tenacity, brittle. Hardness, 3.5 to 4. Gravity, 3.39. Lustre,

vitreous. Color, emerald-green to leek-green. Is translucent to transparent. Occurrence: Libethen, Hungary.

Fahlore. Common name for tetrahedrite or tennantite.

Falkenhaynite. $3\text{Cu}_2\text{S} \cdot \text{Sb}_2\text{S}_3$. A copper sulphantimonite carrying 39.5% copper. Apparently is related to stylopyrite. Structure, massive. Gravity, 4.88. Color, gray-black. Occurrence: Joachimsthal, Bohemia, Austria.

Famatinite. $3\text{Cu}_2\text{S} \cdot \text{Sb}_2\text{S}_3$. A copper sulphantimonite carrying 43.3% copper. Crystallization, orthorhombic; is isomorphous with enargite; also occurs massive. Fracture, uneven. Tenacity, brittle. Hardness, 3.5. Gravity, 4.57. Color, gray with copper-red tinge. Streak, black. Is fusible on charcoal. Decrepitates in closed tube. Occurrence: Sierra de Famatina, Rioja, Argentina; and Cerro de Pasco, Junin, Perú.

Fieldite. A zinciferous variety of tetrahedrite.

Footeite. $8\text{Cu}(\text{OH})_2 \cdot \text{CuCl}_2 \cdot 4\text{H}_2\text{O}$. A hydrous basic copper oxychloride containing 55.3% copper. Is closely related to tallingite. Crystallization, monoclinic. Color, deep blue. Occurrence: Bisbee, Arizona.

Fournetite. Apparently merely a mechanical mixture of tetrahedrite and galena.

Fredricite. An argentiferous, plumbiferous, and stanniferous variety of tennantite, from Sweden.

Freibergite. An argentiferous tetrahedrite carrying variable percentages of silver as a replacement of the copper found in the normal tetrahedrite.

Frigidite. A ferruginous and nickeliferous variety of tennantite.

Gerhardite. $4\text{CuO} \cdot \text{N}_2\text{O}_5 \cdot 3\text{H}_2\text{O}$. A basic copper nitrate containing 52.9% copper. Crystallization, orthorhombic. Cleavage, yields flexible laminae. Tenacity, fragile and sectile. Hardness, 2. Gravity, 3.426. Lustre, vitreous, brilliant. Color, deep emerald-green. Streak, light green. Is transparent. Is soluble in dilute acids. Occurrence: Jerome, Arizona.

Geradorffite. Empirically nickel sulphoarsenite, but occasionally slightly cupriferous.

GLANCE. Common name for sulphide ores with dark metallic lustre. Copper glance is chalcocite.

Glasbachite. Zorgite.

Glaucopyrite. An iron and cobalt diarsenide, occasionally slightly cupriferous.

Gray Copper. Common name for tetrahedrite; name also is applied to tennantite, which shades into tetrahedrite.

Green Copper. Common name for malachite.

Grunauite. An impure nickel sulphide (polydimitite) carrying copper, lead, cobalt, iron and bismuth, copper ranging 1.69 to 11.56% in tenor in published assays.

Guejarite. $\text{Cu}_2\text{S} \cdot 2\text{Sb}_2\text{S}_3$. A copper sulphoantimonite containing 15.2% copper. Crystallization, orthorhombic. Tenacity, brittle. Hardness, 3.5. Gravity, 5.03. Lustre, metallic. Color, steel-gray, with bluish tinge. Streak, black. Occurrence: Andalusia, Spain.

Harrisite. A pseudomorph of chalcocite after galena.

Henwoodite. Chemical formula uncertain. A hydrous aluminum and copper phosphate carrying about 5.6% copper. Occurs in botryoidal globular masses: Fracture, conchoidal. Hardness, 4.4 to 4.5. Gravity, 2.67. Color, turquoise-blue. Streak, bluish to greenish white. Occurs in Cornwall, England.

Hermesite. An imperfectly established variety of schwartzite.

Herrengrundite. $\text{CaO} \cdot 4\text{CuO} \cdot 2\text{SO}_3 \cdot 6\text{H}_2\text{O}$. A hydrous basic copper and calcium sulphate carrying 39.5% copper. It is related to brochantite. Crystallization, monoclinic. Tenacity, rather brittle. Hardness, 2.5. Gravity, 3.13. Lustre, vitreous. Color, emerald-green to bluish-green. Streak, light green. Is transparent. Occurrence: Herrengrund, Hungary.

Hietzite. $7\text{Bi}_2\text{S}_3 \cdot 2\text{Sb}_2\text{S}_3 \cdot 5\text{CuFeS}_4$ (a variety of Emplectite). Orthorhombic prismatic steel gray.

Homichlinite. Chemical formula uncertain. A copper and iron sulphide carrying about 43.8% copper. Apparently is glaucopyrite partly altered to bornite, and close to barnhardtite. Crystallization, tetragonal; also occurs

massive. Hardness, 4 to 5. Gravity, 4.48. Color, brassy bronze. Streak, black. Occurrence: Chile, Germany, Japan, etc.

Horseflesh Ore. Common name for bornite.

Horsfordite. Cu_2Sb . A copper antimonide carrying 76% copper. Structure, massive. Is brittle. Hardness, 4 to 5. Gravity, 8.8. Lustre, metallic. Color, silver-white, tarnishing easily. Is said to occur in large deposits on the Island of Mitylene, Asia Minor.

Hutchinsonite. $(\text{Ti}, \text{Ag}, \text{Cu})_2\text{S}_2\text{As}_2\text{S}_4 + \text{PbS} \cdot \text{As}_2\text{S}_4$ (?). Crystallization, orthorhombic in flattened prisms; lustre, adamantine; red colored.

Hydrocyanite. $\text{CuO} \cdot \text{SO}_4$. A copper sulphate carrying 39.6% copper. Crystallization, orthorhombic. Color, green. Is soluble in water. Is an alteration product, from Mt. Vesuvius.

Hydrocuprite. Apparently a hydrated cuprite. Is amorphous, occurring in very thin coatings on magnetite. Color, orange-red to orange-yellow. Found at Schapbach, Baden, Germany, and at Cornwall, Pennsylvania.

Indigo Copper. Common name for covellite.

Isopyre. Apparently an impure opal, carrying about 1.6% copper, found at St. Just, Cornwall, England.

Jalpaite. $3\text{Ag}_2\text{S} \cdot \text{Cu}_2\text{S}$. A silver and copper sulphide, carrying 13.1% copper and 71.5% silver. Apparently is a cupriferous argentite. Crystallization, isometric. Tenacity, malleable. Gravity, 6.89. Color, blackish lead-gray. Occurrence: Jalpa, Mexico.

Jamesonite. A lead sulphantimonite, sometimes cupriferous to the extent of about 3.5%.

Johannite. Chemical formula uncertain. A hydrous uranium and copper sulphate, containing about 4.8% copper. Crystallization, monoclinic. Hardness, 2 to 2.5. Gravity, 3.19. Lustre, vitreous. Color, emerald-green to apple-green. Streak, paler green. Is translucent to transparent. Taste, bitter. From Joachimsthal, Bohemia.

Julianite. A slightly argentiferous and ferruginous variety of tennantite, from Silesia, Germany.

Kamarezit. $(\text{CuOH})_2\text{SO}_4 \cdot \text{Cu}(\text{OH})_2 + 6\text{H}_2\text{O}$. A hydrated copper sulphate. Crystallization, probably orthorhombic. Color, grass green. Occurrence: Laurium, Greece.

Karamainite. Chemical formula uncertain. As determined is a weird silicate of aluminum, iron, manganese, copper, calcium, magnesium and potassium, containing about 1.85% copper. Occurrence: Finland.

Keweenawite. $(\text{Cu}, \text{Ni}, \text{Co})_2\text{As}$. A copper and nickel arsenide, related to mohawkite, carrying 39 to 54% copper and 9.7% to 20% nickel, with cobalt replacing nickel to extent of about 0.9%. Structure, massive. Cleavage, subconchoidal. Fracture, uneven. Tenacity, slight. Hardness, 4. Gravity, 7.7. Lustre, metallic. Color, pale pinkish brown red, tarnishing to darker red. Is soluble in nitric acid. Occurrence: Mohawk mine, Keweenaw county, Michigan.

Klarpotholite. $3\text{Cu}_2\text{S} \cdot 2\text{Bi}_2\text{S}_3$. A copper sulphobismuthite containing 25.3% copper and 55.4% bismuth. Crystallization, orthorhombic, in furrowed prisms. Fracture, uneven. Tenacity, brittle. Hardness, 2.5. Gravity, 4.6. Lustre, metallic. Color, steel-gray, tarnishing to iridescent brass-yellow. Occurrence: Baden, Germany.

Kobellite. A lead sulphoantimonite, usually cupriferous to the extent of about 1%.

Krohnkite. $\text{CuSO}_4 \cdot \text{Na}_2\text{SO}_4 + 2\text{H}_2\text{O}$. A hydrous copper and sodium sulphate carrying 18.8% copper. Crystallization, monoclinic. Fracture, conchoidal. Hardness, 2.5. Gravity, 1.98. Lustre, vitreous. Color, azure-blue to bluish green. Occurrence: Chile Copper Co. mine at Chuquicamata, Chile; Atacama, Chile.

Lampadite. A cupriferous wad, an earthy form of manganese oxide with 3 to 15% copper.

Langite. $4\text{CuO} \cdot \text{SO}_4 \cdot 4\text{H}_2\text{O}$. A hydrous basic copper sulphate containing 53% copper. Is closely related to brochantite. Crystallization, orthorhombic. Hardness, 2.5 to 3. Gravity, 3.5. Lustre, vitreous on crystals.

silky on crusts. Color, greenish blue. Is translucent. Occurrence: Cornwall, England.

Lautite. CuAsS . An imperfectly determined copper sulphoarsenite, of the enargite family, from Marienberg, Saxony.

Lavendulan. Chemical formula probably $3(\text{Cu,Co,Ni})\text{O} \cdot \text{As}_2\text{O}_5 + 3\text{H}_2\text{O}$. A hydrous copper, cobalt and nickel arsenate, containing about 32% copper, 2.5% cobalt monoxide and 1.35% nickel monoxide. Is related to trichalcite. Structure, amorphous. Fracture, conchoidal. Hardness, 2.5 to 3. Gravity, 3.01. Lustre, greasy to vitreous. Color, lavender blue. Streak, pale lavender blue. Diaphaneity, translucent. Is soluble in warm hydrochloric acid. Occurrence: Chile and Saxony.

Laxmannite. Vauquelinite.

Ledouxite. Cu_2As . Massive, silver white.

Lengenbachite. $6\text{PbS}(\text{Ag,Cu})_2\text{S} \cdot \text{As}_2\text{S}_5$. Crystallization, triclinic, bladed, steel gray.

Lepidophaeite. A varietal form of cupriferous wad or lampadite.

Lettsomite. Cyanotrichite.

Leucochalcite. $4\text{CuO} \cdot \text{As}_2\text{O}_5 \cdot 3\text{H}_2\text{O}$. A hydrous basic copper arsenate, carrying about 39.8% copper. Structure, acicular. Lustre, silky. Color, light greenish white.

Libethenite. $4\text{CuOP} \cdot \text{O}_2 \cdot \text{H}_2\text{O}$. A hydrous copper phosphate carrying 51.1% copper. Common name, copper phosphate. Crystallization, orthorhombic. Fracture, subconchoidal to uneven. Tenacity, brittle. Hardness, 4. Gravity, 3.6 to 3.8. Lustre, resinous. Color and streak, olive-green. Diaphaneity, subtranslucent. Is soluble in nitric acid. Occurrence: Chile, Bolivia, England, Germany, and Hungary.

Lillianite. A lead sulphobismuthite, sometimes cupriferous to the extent of about 1.5%.

Lime-Malachite. Apparently merely a malachite carrying gypsum or calcite, or both, as impurities.

Linarite. $\text{PbO} \cdot \text{CuO} \cdot \text{SO}_3 \cdot \text{H}_2\text{O}$. A basic lead and copper sulphate carrying 15.8% copper and 55.7% lead oxide. Crystallization, monoclinic. Fracture, conchoidal. Tenacity, brittle. Hardness, 2.5. Gravity, 5.3 to 5.45. Lustre, vitreous to adamantine. Color, deep azure-blue. Streak, pale blue. Diaphaneity, translucent. Occurs in many lead and copper districts.

Lindackerite. Chemical formula probably $3\text{NiO} \cdot 6\text{CuO} \cdot \text{SO}_3 \cdot 2\text{As}_2\text{O}_5 \cdot 7\text{H}_2\text{O}$. A hydrous copper and nickel sulphoarsenate containing 27.8% copper. Crystallization, orthorhombic. Hardness, 2 to 2.5. Gravity, 2 to 2.5. Lustre, vitreous. Color, verdigris-green to apple-green. Streak, pale green to white.

Linnaeite. A cobalt sulphide in which cobalt frequently is replaced partly by nickel, iron or copper, latter to the extent of 1 to 8%.

Liroconite. $18\text{CuO} \cdot 4\text{Al}_2\text{O}_3 \cdot 5\text{As}_2\text{O}_5 \cdot 55\text{H}_2\text{O}$. A hydrous basic copper and aluminum arsenate carrying 28.7% copper. Crystallization, monoclinic; also occurs rarely, granular. Cleavage, subconchoidal. Is imperfectly sectile. Hardness, 2 to 2.5. Gravity, 2.88 to 2.98. Lustre, vitreous. Color and streak, sky-blue to verdigris-green. Is soluble in nitric acid. Occurrence: Hungary, and Cornwall, England.

Lithidionite. A copper, iron, potassium and sodium silicate carrying circa 5.2% copper. Is an alteration product from Mt. Vesuvius.

Lunnite. A name proposed for dihydrite, pseudomalachite, and their varietal forms.

Luzonite. A dimorphous form of enargite, found in the Mancayan-Suyoc district, Lepanto, Luzon, Philippines.

Lyellite. Langite.

MALACHITE. $2\text{CuO} \cdot \text{CO}_2 \cdot \text{H}_2\text{O}$. A basic copper carbonate carrying 57.5% copper. Common names, green copper carbonate, basic cupric carbonate. Crystallization, monoclinic. Commonly massive, but frequently incrustive and sometimes granular or earthy, and disseminated as stains. Fracture, subconchoidal to uneven. Tenacity, brittle. Hardness, 3.5 to 4. Gravity, 3.9 to 4.03. Lustre, of crystals, adamantine, frequently with concretionary bands of varying shades from pistachio-green to bluish green. Streak, green. Is opaque to translucent. Is soluble in nitric acid. Occurs

in most copper districts, in the upper portions of the oxidized zones of ore bodies, and frequently is an important commercial ore. When massive and beautifully marked is a semi-precious stone, used for table tops, etc.

Malinowskite. A plumbiferous and usually argentiferous variety of tennantite.

Marcylite. An imperfectly determined alteration product from copper sulphides, consisting of hydrated copper oxides and sulphides. Occurrence: Perú and Arkansas, U. S. A.

Marshite. Cu_2I_2 . A copper iodide containing 33.4% copper. Crystallization, tetragonal. Fracture, subconchoidal. Tenacity, brittle. Lustre, adamantine. Color, oil-brown. Streak, orange-yellow. Is translucent. Occurrence: Broken Hill mines, New South Wales, Australia.

MELACONITE. Massive, compact, shining or earthy dull, black copper oxide of same composition as tenorite. Tenorite.

Melanochalcite. Chiefly Cu_2O with some $\text{SiO}_2, \text{CO}_2, \text{H}_2\text{O}$. A massive black mineral. $\text{Cu}_2(\text{Si}_2\text{C})\text{O}_4 \cdot \text{Cu}(\text{OH})_2$. A copper silicate containing 61.4% copper. Structure, amorphous or cryptocrystalline, habit of crystals being undetermined. Hardness, 4. Gravity, 4.14. Lustre, vitreous. Color, jet black, powder is coffee-brown.

Melanothallite. Chemical formula probably $\text{CuCl}_2 \cdot \text{CuO} \cdot 2\text{H}_2\text{O}$. A copper oxychloride. Is an alteration product at Mt. Vesuvius.

Miargyrite. A silver sulphoantimonite, frequently cupriferous to the extent of one-half to one per cent.

Mixite. Chemical formula probably $20\text{CuO} \cdot \text{Bi}_2\text{O}_3 \cdot 5\text{As}_2\text{O}_3 \cdot 22\text{H}_2\text{O}$. A hydrated basic copper arsenobismuthite, carrying 35.2% copper. Occurs in tufts of minute acicular crystals. Hardness, 3 to 4. Gravity, 3.79. Color, whitish green to emerald-green or bluish-green. Streak, lighter green. Is translucent, and, in fine particles, transparent. Occurrence: Baden, Germany, and Utah.

Mohawkite. $(\text{Cu}, \text{Ni}, \text{Co})_2\text{As}$. A copper, nickel and cobalt arsenide, carrying 63 to 69% copper, 3 to 7% nickel and 0.5 to 2% cobalt, usually somewhat argentiferous. Crystallization, hexagonal, by synthesis, no crystals being found in nature. Cleavage, indistinct. Fracture, uneven. Tenacity, slight. Hardness, 4. Gravity, 8.05. Color, light gray on fresh fractures, tarnishing to purple or brassy yellow. Streak, gray. Is soluble in nitric acid. Occurrence: Mohawk mine, Keweenaw county, Michigan.

Mohawk-Whitneyite. Cu_2As . A copper arsenide, carrying 83 to 87% copper. Is a mere name of convenience for an intimate blending of mohawkite and whitneyite, or keweenawite and whitneyite, indistinguishable to the eye, but determined chemically. Cleavage, none. Fracture, hackly. Tenacity, is malleable to only a slightly less extent than copper. Hardness, about 5. Gravity, 8.6. Color, gray, with a yellowish tinge, tarnishing to coffee-brown. Streak, gray. Is soluble in nitric acid, with a small residue of gray powder. Occurrence: at Mohawk mine, Keweenaw county, Michigan.

Mottramite. Chemical formula undetermined. A hydrous basic lead and copper vanadate containing about 16.3% copper. Form resinous, velvety black crystalline incrustation. Is very closely related to psittacinite.

Mountain Blue. Common name for azurite.

Mountain Green. Common name for malachite. Name sometimes is applied to chrysocolla also.

Mysorin. An impure malachite from Mysore, India.

Namaqualite. Chemical formula probably $2\text{Cu}(\text{OH})_2 \cdot \text{Al}(\text{OH})_3 \cdot 2\text{H}_2\text{O}$. A hydrated copper and aluminum oxide, carrying 35.8% copper. Occurrence: Little Namaqualand, Cape Colony.

Nantokite. Cu_2Cl_2 . A copper chloride, carrying 84.1% copper. Crystallization, isometric; also occurs massive and granular. Cleavage, cubic. Fracture, conchoidal. Hardness, 2 to 2.5. Gravity, 3.9. Lustre, adamantine. Color, grayish white to colorless. Is translucent to transparent. Is soluble in nitric or hydrochloric acids, and in ammonia. Yields chlorine when sharply struck. Oxidizes readily on exposure to atmosphere. Occurrence: Carmen Bajo mine, Chile, and Broken Hill mines, New South Wales.

Natrochalcite. $\text{Na}_2\text{SO}_4 \cdot \text{Cu}_2(\text{OH})_2(\text{SO}_4)_2 + 2\text{H}_2\text{O}$. A sodium-copper

sulphate of the copperas group. Crystallization, monoclinic. Lustre, brilliant. Translucent. Color, emerald-green.

Neocianite. Anhydrous copper silicate. Crystallization, monoclinic, in microscopic tables as a blue sublimate on lava.

Octahedral Copper Ore. Common name for cuprite.

Olive Green Copper Ore. Common name for olivenite.

Olivenite. $4\text{CuO} \cdot \text{As}_2\text{O}_5 \cdot \text{H}_2\text{O}$. A hydrous basic copper arsenate, carrying 44.8% copper. Common name, olive green copper ore. Crystallization, orthorhombic, with prismatic and acicular crystals; also occurs globular and granular. Fracture, conchoidal to uneven. Tenacity, brittle. Hardness, 3. Gravity, 4.1 to 4.4. Lustre, adamantine to vitreous. Color, olive-green to blackish green, also earthy, felt-like whitish mass. Is opaque to subtransparent. Is soluble in nitric acid. Occurrence: Nijni Tagilsk, Perm, Russia, Cornwall and Devon, England, Chile, Utah, etc.

Orileyite. $(\text{Cu}, \text{Fe})_2(\text{As}, \text{Sb})_2$. A copper and iron arsenoantimonite, carrying 12.13% copper. Is related to stibiodomeykite. Structure, massive. Hardness, 5.5. Gravity, 7.4. Lustre, metallic. Color, steel-gray, with purplish tinge on fresh fracture. Streak, dark gray. Occurrence: Burma.

Paramelaconite. $\text{CuO} + \text{Fe}_2\text{O}_3$. A copper oxide carrying 79.3% copper. Is a dimorphous form of melaconite. Crystallization, tetragonal. Hardness, 5. Gravity, 5.83. Lustre, brilliant. Color, purplish black on faces, pitch-black on fractures. Occurrence, with footite, at Bisbee, Arizona.

Paratacamite. $\text{CuCl}_2 \cdot 3\text{Cu}(\text{OH})_2$. Crystallization, rhombohedral. Color bright green.

Partzite. $\text{Cu}, \text{Sb}, \text{H}_2\text{O}$. Chemical formula uncertain. A hydrous copper antimonite, carrying about 28.7% copper. Fracture, conchoidal. Hardness, 3 to 4. Gravity, 3.8. Color, yellowish green to blackish green. Occurrence: Mono county, California.

Peacock Ore. Common name for bornite. Sometimes is applied also to chalcopyrite when showing an iridescent tarnish.

Pearceite. Chemical formula probably $9(\text{Ag}, \text{Cu})_2\text{S} \cdot \text{As}_2\text{S}_3$. A silver and copper sulphoantimonite. Crystallization, rhombohedral; also occurs massive. Cleavage, none. Fracture, conchoidal. Tenacity, brittle. Hardness, 3. Gravity, 6.125. Lustre, metallic. Color and streak, black. Occurrence: Aspen, Colorado.

Pelocoonite. A varietal form of lampadite, a copper-bearing earthy form of manganese oxide.

Pentlandite. An iron and nickel sulphide carrying up to 1.75% copper.

Percylite. Chemical formula probably $\text{PbCuO} \cdot \text{Cl}_2 \cdot \text{H}_2\text{O}$. A hydrous lead and copper oxychloride carrying about 17% copper. Crystallization, isometric. Hardness, 2.5. Color and streak, sky-blue. Occurrence: Chile, Bolivia, South Africa, and Mexico.

Phillipite. $\text{CuSO}_4 \cdot \text{Fe}_2(\text{SO}_4)_3 \cdot n\text{H}_2\text{O}$. A hydrous copper and iron sulphate, carrying 11.5% copper. Structure, granular and fibrous. Lustre, vitreous. Color, azure-blue. Diaphaneity, translucent. Taste, astringent. Is soluble in water. A variety of Kröhnkite. Occurrence: Los Condes, Santiago de Chile.

Phosphorochalcite. $6\text{CuO} \cdot \text{P}_2\text{O}_5 \cdot 3\text{H}_2\text{O}$. A hydrous basic copper phosphate, closely related to dihydrite and pseudomalachite.

Phosphochromite. Vaquelinite.

Pilarite. An aluminous variety of chrysocolla, from Chile.

Pisanite. $(\text{Fe}, \text{Cu})\text{SO}_4 \cdot 7\text{H}_2\text{O}$. A hydrous iron and copper sulphate, carrying variable percentages of copper. Practically is a cupriferous melanterite, or copperas. Crystallization, monoclinic. Lustre, vitreous. Color, bright blue. Occurrence: Old Jordan mine, Bingham, Utah.

Plancheite. $15\text{CuO} \cdot 12\text{SiO}_2 \cdot 5\text{H}_2\text{O}$. A fibrous blue hydrated silicate of silver.

Planerite. A hydrous aluminum, copper and iron phosphate, carrying about 2.8%. Occurrence: Gumishevsk, Perm, Russia.

Plumbocuprite. Cuproplumbite.

Plush Copper Ore. Common name for capillary cuprite.

Polybasite. $9(\text{Ag}, \text{Cu})_2\text{S} \cdot \text{Sb}_2\text{S}_3$. A silver and copper sulphoantimonite carrying 3 to 10% copper and 62 to 72% silver. Crystallization, orthorhombic.

bic. Fracture, uneven. Hardness, 2 to 3. Gravity, 6 to 6.2. Lustre, metallic. Color, iron-black, in thin splinters, cherry-red. Streak, black. Is nearly opaque. Occurrence: Neihart, Mont., Mollie Gibson mine, Aspen, Colorado.

Prasine. A varietal form of dihydrite, containing alumina, silica and arsenic in small amounts, apparently merely as impurities.

Pseudobolite. Cumengite.

Pseudolibethenite. Libethenite.

Pseudomalachite. $6\text{CuO} \cdot \text{P}_2\text{O}_5 \cdot 3\text{H}_2\text{O}$. A hydrous basic copper phosphate containing 53.5% copper. Is closely related to dihydrite, but has one extra unit each of cupric oxide and water. Structure, massive, reniform and botryoidal. Hardness, 4.5 to 5. Gravity, 3.4 to 4.4. Lustre, vitreous. Color, emerald-green to blackish green. Streak, paler green.

Psittacinite. Chemical formula probably $4(\text{Pb}, \text{Cu}) \cdot \text{V}_2\text{O}_5 \cdot 2\text{H}_2\text{O}$. A hydrous basic lead and copper vanadate, containing about 15.4% copper. Cryptocrystalline coating. Structure, pulverulent. Color, olive-green. Occurrence: Argentina and Montana.

Purple Copper Ore. Common name for bornite.

Pyrites of Copper. Common name for chalcocryprite.

Rabdionite. Chemical formula uncertain. A hydrated iron, manganese and copper oxide, containing 11.2% copper. Is very soft. Gravity, 2.8. Lustre, dull. Color, black. Streak, dark brown. Occurrence: Nijni Tagilsk, Perm, Russia.

Rahite. An impure cupriferous sphalerite.

Ramirite. Cuprodescliozite.

Red Copper Ore. Common name for cuprite.

Red Glassy Copper Ore. Common name for cuprite.

Redruthite. Chalcocite; prismatic in pseudo-hexagonal twin crystals.

Regnolite. $5\text{CuS} \cdot \text{FeS} \cdot \text{ZnS} \cdot \text{As}_2\text{S}_3$. A copper, iron and zinc sulphoarsenite containing 32.6% copper. Is closely related to epigenite, sandbergerite. Crystallization, tetragonal. Occurrence: Cajamarca, Perú.

Resanite. Chemical formula uncertain. A hydrous copper and iron silicate, containing about 18.5% copper. Structure, massive. Color, olive-green. Is soluble in hydrochloric acid. Occurrence: Liquillo, Porto Rico, associated with chrysocolla and malachite.

Rezbanyite. A lead sulphobismuthite, usually cupriferous to the extent of 1.75 to 3.75%.

Richmondite. A cupriferous variety of beegerite, which is, normally, a lead sulphobismuthite.

Rickardite. Cu_2Te . A copper telluride containing 40.5% copper. Structure, massive. Fracture, irregular. Hardness, 3.5. Gravity, 7.54. Color, brilliant, purple, rivaling bornite tarnish, even on a fresh fracture, and showing deep color when pulverized. Is fusible on charcoal and soluble in nitric acid. Occurrence: Good Hope mine, Vulcan, Colorado.

Rionite. A bismuthiferous variety of tennantite. 13% bismuth.

Rivotite. Chemical formula uncertain. A copper and antimony carbonate and oxide carrying about 31.6% copper. Structure, amorphous, compact. Fracture, uneven. Tenacity, fragile. Hardness, 3.5 to 4. Gravity, 3.55 to 3.62. Color, yellowish green to grayish green. Streak, grayish green. Occurrence: Lerida, Spain.

Rosasite. (Variety of Aurichalcite.) $2\text{CuO} \cdot 3\text{CuCO}_3 \cdot 5\text{ZnCO}_3$. A fibrous greenish blue mineral.

Ruby Copper. Common name for cuprite.

Safflorite. A cobalt diarsenide, usually cupriferous to the extent of 0.25 to 4.25%.

Salvadorite. $\text{FeSO}_4 \cdot 7\text{H}_2\text{O} \cdot 2(\text{CuSO}_4) \cdot 7\text{H}_2\text{O}$. A hydrous copper and iron sulphate carrying about 14.5% copper. Is near pisanite. Crystallization, monoclinic. Lustre, vitreous. Color, bluish green. Occurrence: Calama, Antofagasta, Chile.

Sandbergerite. A zinciferous variety of tennantite, from Peru. Contains about 8% zinc.

Schulzenite. Chemical formula probably $\text{CuO} \cdot 2\text{CoO} \cdot \text{Co}_2\text{O}_3 + 4\text{H}_2\text{O}$. A hydrous copper and cobalt oxide. Structure, amorphous. Fracture, con-

choidal. Hardness, 3.5. Gravity, 3.39. Color and streak, black. Occurrence, Chile.

Schwartzite. A mercurial tetrahedrite, in which mercury replaces copper variably, usually to the extent of about 15% of the total. Gravity, 5.10. Lustre, dull. Color, dark gray to iron-black.

Seligmannite. $\text{Cu}_2\text{S}_2 \cdot \text{PbS} \cdot \text{As}_2\text{S}_5$. Orthorhombic, in small crystals. Color, lead gray. Is a variety of bournonite.

Serpierite. $3(\text{Cu}, \text{Zn}, \text{Ca})\text{SO} \cdot 3\text{H}_2\text{O}$. A hydrous basic copper, zinc and calcium sulphate, containing 28.8% copper. Crystallization, orthorhombic. Hardness, 2.5. Color, bluish green. Is transparent. Occurrence: Laurium, Greece.

Siegenite. A nickeliferous variety of linnæite, frequently carrying small percentages of copper.

Smaltite. Empirically cobalt disulphide, but frequently carrying copper in quantities from a mere trace to 3.25%.

Somervillite. $\text{CuSiO}_4 \cdot 4\text{H}_2\text{O}$. A hydrous copper silicate, corresponding in formula with chrysocolla and asperolite, except as to excess of water. From Somerville, Somerset County, New Jersey.

Spangolite. Chemical formula probably $(\text{AlCl})\text{SO}_4 \cdot 6\text{Cu}(\text{OH})_2 \cdot 3\text{H}_2\text{O}$. A basic copper and aluminum chlorosulphate, carrying about 47.7% copper. Crystallization, rhombohedral. Fracture, conchoidal. Hardness, 2 to 3. Gravity, 3.14. Lustre, vitreous. Color, dark green. Occurrence: Cochise county, Arizona.

Spaniolite. An imperfectly established variety of schwartzite.

Stannite. Chemical formula probably $\text{Cu}_2\text{S} \cdot \text{FeS} \cdot \text{SnS}_2$. A copper, iron and tin sulphide, containing 29.5% copper, 13.1% iron and 27.5% tin. Structure, massive, granular and disseminated. Crystallization, scalenohedral, tetragonal symmetry. Cleavage, cubic, indistinct. Fracture, uneven. Tenacity, brittle. Hardness, 4. Gravity, 4.3 to 4.5. Lustre, brilliant, metallic. Color, olive steel-gray when pure, ranging to iron-black when impure, latter with bluish to yellowish tarnish. Streak, blackish. Occurrence: County Wicklow, Ireland, and Cornwall, England.

Stelznerite. $\text{CuSO}_4 \cdot 2\text{Cu}(\text{OH})_2$. Chemical formula uncertain. A basic copper sulphate, closely related to brochantite. Crystallization, orthorhombic. Hardness, 3.5 to 4. Gravity, 3.9. Luster, vitreous. Color, dark emerald-green to blackish green. Streak, lighter green. Is translucent to transparent. Occurrence: Chile, associated with brochantite and atacamite, and frequently mistaken for both.

Stetefeldite. Chiefly $\text{Sb}_2\text{O}_3 \cdot \text{AgCu}$ and H_2O . A hydrous copper antimonite, carrying about 12.8% copper. Structure, massive. Hardness, 3.5 to 4.5. Gravity, 4.12 to 4.24. Color, brown to blackish. Streak, shining. Occurrence: Nevada.

Stibiodomeykite. $\text{Cu}_2(\text{As}, \text{Sb})$. A copper arsenoantimonite containing about 65% copper. Apparently is an antimonial domeykite. Crystallization, hexagonal in synthetic crystals, none being found in nature. Cleavage, none. Fracture, uneven. Tenacity, very slight. Hardness, 4. Gravity, 8.1. Lustre, metallic. Color, gray, with yellowish tinge, like domeykite. Streak, gray. Is soluble in nitric acid, with small residue of gray powder. Occurrence: Mohawk mine, Keweenaw county, Michigan.

Stromeyerite. $(\text{Cu}, \text{Ag})_2\text{S}$. A silver and copper sulphide, carrying 31.1% copper and 53.1% silver. Crystallization, orthorhombic. Fracture, subconchoidal. Generally compact, massive. Hardness, 2.5 to 3. Gravity, 6.15 to 6.3. Lustre, metallic. Color and streak, dark steel-gray. Occurrence: Chile, Perú, Siberia, Colorado, California, and Silver King mines, Arizona.

Stubelite. Chemical formula undetermined. A hydrous manganese, copper, iron and aluminum silicate, carrying about 12% copper. Structure, massive, reniform and botryoidal. Fracture, conchoidal. Tenacity, brittle. Hardness, 4 to 5. Gravity, 2.22 to 2.26. Lustre, vitreous, brilliant. Color, velvet-black to pitch-black. Streak, dark brown.

Studerite. A varietal form of tennantite, containing, as partial replacement of normal copper content, silver, lead, zinc and iron.

Stylopyrite. $3(\text{Cu}_2\text{Ag}, \text{Fe})\text{S} \cdot \text{Sb}_2\text{S}_3$. A copper, silver and iron sulpho-

bismuthite carrying 28.3% copper and 8.1% silver. Apparently is an argenteriferous and ferruginous bournonite. Crystallization, orthorhombic, columnar prisms. Fracture, imperfectly conchoidal. Tenacity, brittle. Hardness, 3. Gravity, 4.8. Lustre, metallic. Color, iron-black. Streak, black. Occurrence, Copiapó, Chile.

Sub-Oxide of Copper. Cuprite in mineralogy; cuprous oxide in chemistry.

Sulvanite. $3\text{Cu}_2\text{S}_3\text{S}_2$. Massive, bronze yellow, tarnishing on exposure. Is a variety of famatinite.

Sychnodymite. $(\text{Co},\text{Cu})_4\text{S}_8$. A cobalt and copper sulphide, containing about 14.5% copper. Crystallization, isometric. Gravity, 4.75. Lustre, metallic. Color, steel-gray. Is soluble in nitric acid. Occurrence: Eiserfeld, Siegen, Germany.

Tagilite. $4\text{CuO}\cdot\text{P}_2\text{O}_5\cdot 3\text{H}_2\text{O}$. A hydrous basic copper phosphate containing 49.4% copper. Crystallization, monoclinic; also occurs in spheroidal concretions with structure fibrous to earthy. Fracture, uneven. Tenacity, brittle. Hardness, 3 to 4. Gravity, 4.08. Lustre, vitreous. Color, verdigris-green to emerald-green. Diaphaneity, subtranslucent. Is soluble in nitric acid. Occurrence: Coquimbo, Chile, and Nijni Tagilsk, Perm, Russia.

Tallingite. Chemical formula probably $\text{Cu}_2(\text{OH})_2\text{Cl}_2\cdot 4\text{H}_2\text{O}$. A hydrated copper oxychloride containing about 64% copper. Structure, subcrystalline. Hardness, 3. Gravity, about 3.5. Color, greenish blue. Streak, white. Is subtranslucent. Thin crusts of minute greenish blue globules. Occurrence: Botallack mine, Cornwall, England.

Targionite. Apparently merely an impure galena carrying circa 1% each of copper, silver and zinc, from Tuscany, Italy.

Tennantite. $4\text{Cu}_2\text{S}_3\text{As}_2\text{S}_8$. A copper sulpharsenite containing 57.5% copper when pure, but shading into a great number of varietal forms. Common name, gray copper ore, in common with tetrahedrite, to which tennantite is closely related and joined by a chain of rather obscure minerals shading gradually from tennantite into tetrahedrite. The many varietal forms of this mineral are brought about by part replacement of copper by silver, lead, zinc, iron, mercury, cobalt, nickel, tin, and platinum, with a marked tendency toward mutual substitution of the antimony of tetrahedrite for the arsenic of tennantite, and vice versa, rendering the tetrahedrite-tennantite group unusually prolific. Crystallization, isometric; also occurs massive and granular, compact. Cleavage, none. Fracture, subconchoidal. Tenacity, brittle. Hardness, 3.5 to 4.5. Gravity, 4.4 to 5.1. Lustre, metallic. Color and streak, flint-gray to iron-black. Diaphaneity, opaque to subtranslucent in small splinters. Is soluble in nitric acid and fusible on charcoal. Occurrence: at numerous points, being found in greater or less profusion in most copper districts. Is not regarded usually as a commercial ore, except where argentiferous, which is commonly the case.

TENORITE. Earthy form is known as melaconite. CuO . A copper oxide, containing 79.8% copper. Common names, **Black Copper**, **Black Oxide of Copper**. Chemical names, copper monoxide, copper peroxide, cupric oxide. Crystallization, monoclinic; also occurs massive, pulverulent and earthy. Fracture, conchoidal to uneven. Hardness, 3 to 4. Gravity, 5.8 to 6.25. Lustre, metallic. Color, dull grayish-black when massive, steel-gray in flakes. Is soluble in nitric and hydrochloric acids. Is found in most copper districts, and is a valuable ore of copper when occurring in quantities, but much of what has been considered tenorite in the past really was chalcocite, for which it is easily mistaken when disseminated. Found in very thin, long, flexible, minute scales of glistening gray color in Vesuvian lavas.

TETRAHEDRITE. $4\text{Cu}_2\text{S}_3\text{Sb}_2\text{S}_8$. A copper sulphoantimonite containing 52.1% copper. Shades into tennantite, which see, for reference to protean forms of these two closely related and frequently indistinguishable minerals. Common name, gray copper ore. Crystallization, isometric; also occurs massive and granular, coarse to fine, compact. Cleavage, none. Fracture, subconchoidal to uneven. Tenacity, brittle. Hardness, 3.5 to 4.5. Gravity, 4.4 to 5.1. Lustre, metallic, brilliant. Color, flint-gray to iron-black. Streak, grayish-brown to cherry red. Opaque in quantity, but occa-

sionally subtranslucent in very thin splinters, giving cherry red transmitted light. Is soluble in nitric acid and fusible on charcoal. Occurrence: in most copper districts, but commonly is not regarded as a commercial ore, except when argentiferous, which frequently is the case.

Thrombolite. An imperfectly determined hydrous copper antimonate, carrying about 31.5% copper. Structure, amorphous. Color, emerald-green. Occurrence: Rezbánya, Hungary.

Tiemannite. An imperfectly determined silver, mercury and copper selenide, carrying about 8.8% copper. Occurrence: with eucairite and umangite, in the Sierra de Umango, Rioja, Argentina.

Torbernite. $\text{CuO} \cdot 2\text{UO}_3 \cdot \text{P}_2\text{O}_5 \cdot 8\text{H}_2\text{O}$. A hydrous uranium and copper phosphate, carrying 6.9% copper. Common name, uranium mica. Crystallization, tetragonal. Cleavage, micaceous, with brittle laminae. Hardness, 2 to 2.5. Gravity, 3.4 to 3.6. Lustre, pearly on cleavage planes and subadamantine on other faces. Color, emerald-green to grass-green. Streak, apple-green. Diaphaneity, translucent to transparent. Is soluble in nitric acid. Occurrence: Cornwall, Saxony, etc.

Trichalcite. $3\text{CuO} \cdot \text{As}_2\text{O}_5 + 5\text{H}_2\text{O}$. A hydrous copper arsenate containing 34% copper. Structure, in radiated groups, columnar, also dendritic. Hardness, 2.5. Lustre, silky. Color, verdigris-green. Is soluble in hydrochloric acid. Occurrence: Russia.

Trippkeite. ($n\text{CuO} \cdot \text{As}_2\text{O}_5$) A copper arsenite. Crystallization, tetragonal. Color, bluish-green. Is soluble in acids. Occurrence: Copiapó, Chile, in druses.

Tritochorite. Cuprodescloizite.

Turquoise. $[\text{Al}(\text{OH})_2 \cdot \text{Fe}(\text{OH})_2 \cdot \text{Cu}(\text{OH})_2] \text{P}_2\text{O}_7$. A gemstone, essentially a hydrous aluminum phosphate, colored by 2 to 6% of copper, which probably is included as a hydrous basic copper phosphate.

Tyrolite. $5\text{CuO} \cdot \text{As}_2\text{O}_5 \cdot 9\text{H}_2\text{O}$. A hydrous basic copper arsenate carrying 40.1% copper. Crystallization, orthorhombic. Cleavage, micaceous. Tenacity, highly sectile and flexible in thin laminae. Hardness, 1 to 1.5. Gravity, 3.02 to 3.1. Lustre, pearly to vitreous. Color, verdigris-green to apple-green. Diaphaneity, subtranslucent to translucent. Occurrence: Libethen, Hungary, Utah, etc.

Umangite. Cu_2Se_2 . A copper selenide containing 54.6% copper. Structure, massive. Cleavage, none. Fracture, subconchoidal to uneven. Hardness, 3. Gravity, 5.62. Lustre, metallic. Color, dark cherry-red, with violet tinges on fresh fracture, soon tarnishing to violet-blue. Streak, black. Occurrence: with tiemannite and eucairite, in the Sierra de Umango, Rioja, Argentina.

Uranium Mica. Common name for torbernite.

Uranochalcite. Chemical formula undetermined. A hydrous basic uranium and copper sulphate carrying about 5% copper. Occurs in acicular crystals. Hardness, 2 to 2.5. Color, grass-green. Occurrence: Joachimstal, Bohemia.

Valleriite. A sulphate of copper, iron, aluminum and magnesium. Apparently is a mixture of covellite, pyrrhotite and several aluminum and magnesium minerals. Occurrence: Nya Kopparberg, Sweden.

Variegated Copper Ore. Common name for bornite.

Vauquelinite. Chemical formula probably $2(\text{Pb}, \text{Cu})\text{CrO}_4 \cdot (\text{Pb}, \text{Cu})_2\text{P}_2\text{O}_7$. A lead and copper phosphochromate carrying 3.9 to 10% copper. Crystallization, monoclinic; also occurs amorphous. Fracture, uneven. Tenacity, brittle. Hardness, 2.5 to 3. Gravity, 5.8 to 6.1. Lustre, adamantine to resinous. Color, apple-green to liver-brown. Streak, greenish to brownish. Diaphaneity, opaque to faintly translucent. Occurrence: Berezov, Russia.

Velvet Copper Ore. Common name for chalcotrichite.

Venerite. A hydrous copper, aluminum, iron and magnesium silicate containing about 14% copper. Occurrence: Springfield, Berkshire county, Pennsylvania.

Verdigris. Copper carbonate. Is formed from metallic copper by the action of carbon dioxide and moisture in the atmosphere. The verdigris of the pharmacist is a copper acetate, and care should be taken not to confuse these widely varying compounds bearing the same name.

Veszelyite. Chemical formula probably $(\text{CuZn})_2(\text{OH})_2(\text{AsP})_2\text{O}_8 \cdot 5\text{H}_2\text{O}$. A hydrous copper arsenophosphate carrying about 30% copper. Crystallization, monoclinic. Hardness, 3.5 to 4. Gravity, 3.53. Color and streak, greenish blue. Occurrence: Moravitz, Hungary.

Voglite. Chemical formula uncertain. A hydrous uranium, lime and copper carbonate carrying about 6.9% copper. Occurs in aggregations of crystalline scales. Lustre, pearly. Color, emerald-green to bright grass-green.

Volforthite. Chemical formula probably $(\text{Cu,Ca,Ba})_2(\text{OH})_2\text{VO}_4 \cdot 6\text{H}_2\text{O}$. A hydrous basic copper, calcium and barium vanadate carrying about 30.9% copper. Hardness, 3 to 3.5. Gravity, 3.55. Lustre, pearly to vitreous. Color, olive-green to citron-yellow. Streak, greenish yellow. Is translucent in thin splinters. Occurrence: Perm, Russia, and at Henrietta mine, Yavapai Co., Ariz.

Warringtonite. A varietal form of brochantite.

Whitneyite. Cu_2As . A copper arsenide containing 88.4% copper. Structure, massive, crystalline, very finely granular. Tenacity, malleable. Hardness, 3.5. Gravity, 8.4 to 8.6. Lustre, dull and submetallic on fresh fracture, strongly metallic when scratched, soon tarnishing. Color, pale reddish to grayish white, pale reddish white on a rubbed surface, tarnishing to yellowish bronze, brown and brownish black, sometimes with iridescence. Is soluble in nitric acid. Occurrence: Osceola mine, Calumet, Michigan; Sonora, Mexico; and Chile.

Winklerite. Chemical formula uncertain. A hydrous cobalt, nickel and copper arsenate carrying about 11 to 12% copper. Structure, amorphous, massive. Fracture, conchoidal. Hardness, 3. Gravity, 3.43. Lustre, dull. Color, bluish black to violet black. Streak, dark brown. Occurrence: Almeria, Spain.

Wittichenite. $3\text{Cu}_2\text{S} \cdot \text{Bi}_2\text{S}_3$. A copper sulphobismuthite, carrying 38.4% copper. Crystallization, orthorhombic. Fracture, conchoidal. Hardness, 3.5. Gravity, 4.3 to 5. Color, steel-gray to tin-white, tarnishing to pale lead-gray. Streak, black. Is soluble in nitric or hydrochloric acids. Decomposes easily on charcoal. Occurrence: Wittichen, Baden, Germany.

Wolchite. A varietal form of bournonite.

Wolfsbergite. Chalcocite.

Wood Copper. Common name for olivenite.

Woodwardite. Chemical formula uncertain. An aluminum and copper sulphate containing about 38.4% copper. Is closely related to langite.

Yellow Copper Ore. Common name for chalcopryite.

Ypoléime. Chemical formula perhaps $5\text{CuO} \cdot 2\text{P}_2\text{O}_5 \cdot 5\text{H}_2\text{O}$. A doubtful hydrous basic copper phosphate of the dihydrite-pseudomalachite group.

Zeunerite. $\text{CuO} \cdot 2\text{UO}_2 \cdot \text{As}_2\text{O}_5 \cdot 8\text{H}_2\text{O}$. A hydrous uranium and copper arsenate containing 6.1% copper. Crystallization, tetragonal. Fracture, uneven. Tenacity, brittle. Hardness, 2 to 2.5. Color, grass-green to emerald-green. Occurrence: Saxony and Cornwall, England.

Zinkazurite. Apparently merely a hydrous mixture of copper carbonate and zinc sulphate in small blue crystals, from the Sierra Almagrera, Spain.

Zinkenite. A lead sulphoantimonite, usually slightly cupriferous.

Zippeite. Chemical formula undetermined. A hydrous basic uranium, copper and calcium sulphate. Occurs in acicular crystals and crusts. Hardness, 3. Color, lemon-yellow to orange-yellow. Occurrence: Joachimstal, Bohemia.

Zorgite. Chemical formula uncertain. A lead and copper selenide, carrying 4 to 15.5% copper and 41 to 64% lead, with traces of silver, mercury and iron. Structure, massive and granular. Tenacity, brittle. Hardness, 2.5. Gravity, 7 to 7.5. Lustre, metallic. Color, lead-gray, tarnishing. Streak, darker lead-gray. Occurrence: Cacheuta, Mendoza, Argentina.

CHAPTER IV

OBSOLETE SECURITIES AND CORPORATIONS

A LIST OF DORMANT OR DEAD MINING COMPANIES

This is a list of mining companies that are merged, dead, liquidated, dissolved, bankrupt or otherwise out of business. It possibly also includes a few companies that have been inactive for years and have been reported by local authorities as dead. As complete sets of the Copper Handbook are not accessible to many readers, excerpts from former volumes, describing any company in this list, when the volume is in stock, will be furnished for 50 cents each by the Mines Handbook office, 29 Broadway, New York.

Any errors will be gladly corrected on receipt of authentic information.

- Abbey Mng. Co.** N. M. Apparently dead. See Vol. XI.
Aberdeen C. Co. Lordsburg, N. M. See Vol. V.
Accidental M. & M. Co. Granite, Colo. See Vol. VI.
Acme M. & M. Co. Cotopaxi, Colo. See Vol. X.
Ada Copper Mining Co. Basin, Mont.
Adams C. Co. Saratoga, Wyo.
Adams C. M. & Ref. Co. Steamboat Springs, Colo. See Vol. X.
Admiral Togo-Ely C. Co. Formerly at Ely, Nev. See Vol. VIII.
Aduddell Mines Co. Merged, 1910, in Frontenac Cons. Mines, Central City, Colo.
Advance Dev. & M. Co. Bisbee, Ariz. See Vol. VIII.
Aeolian Copper Cons. Mng. Co., Ltd. Succeeded by Columbia Copper Co.
Aetna G. & C. M. Co. Bingham Canyon, Utah. See Vol. X.
Aetna M. Co. Bonanza, Colo. See Vol. X.
African Noble Duke G. & C. M. Co. Bisbee, Ariz.
Afro-American M. & M. Co. Butte, Mont. See Vol. VIII.
Afterthought M. Co. Lands sold to Great Western G. Co., succeeded, 1909, by Afterthought C. Co., Redding, Cal.
Afton M. & S. Co. Helena, Mont. See Vol. V.
Agassiz M. Co. Ray, Ariz. See Vol. VI.
Aguila Amalgamated Mng. Co. Mexico. Succeeded by Aguila Cons. Mng. Co., which see.
Ajax M. Co. Merged, 1909, in Gold Chain M. Co. See Vol. VIII.
Ajo C. Co. Ajo, Ariz. See Vol. X.
Ajo C. Mountain Mines Co. Property sold, 1907, to Rendall Ore Red. Co. See Vol. VIII.
Ak-Sar-Ben C. Co. Merged, 1907, in Shawnee-Wyo. C. Mng. Co. Carbon, Wyo.
Alabama G. & C. Co. Orogrande, N. M. See Vol. VIII.
Aladdin Mng. Co. Clinton, Mont. See Vol. XI.
Aladdin Mng. Co. Northport, Wash. See Vol. XII.
Alamo C. Co. Tucson, Ariz.

- Alamos Silver & C. Co.** Succeeded by Alamos M. Co. Alamos, Mex.
Alaska Amalgamated C. Co. Succeeded, 1907, by Alaska United C. Ex. Co.
Alaska C. Ass'n. Valdez, Alaska. See Vol. VIII.
Alaska C. Co. Ely, Nev. See Vol. VIII.
Alaska Copper & Coal Co. Dissolved 1915. Formerly owned Kennecott mines.
Alaska Dev. Co. McCarthy's Creek, Alaska. See Vol. VIII.
Alaska-Galena M. Co. Ketchikan, Alaska. See Vol. X.
Alaska G. & C. Co. Succeeded, 1907, by Chisna Cons. Mines Co. McCarthy's Creek, Alas.
Alaska Gold & Copper Mng. Co. Alaska. Apparently dead. See Vol. XI.
Alaska Gold Expl'n & Dev. Co. Seward, Alaska. See Vol. XII.
Alaska Imperial M. Co. Ketchikan, Alaska. See Vol. VI.
Alaska Mines Securities Co. Hadley, Alaska. See Vol. VIII.
Alaska M. Co. Silver City, Utah. See Vol. VIII.
Alaska Northwest C. Co. Sidney Inlet, Victoria, B. C. See Vol. V.
Alaska S. & R. Co. Hadley, Alaska. See Vol. VIII.
Albany Copper Co. Morningstar, Nev. Supposedly dead; mail returned.
Albayaide; Cia Min. De. Gomez del Palacio, Mex. See Vol. X.
Alberni G. & C. Co., Ltd. Alberni, B. C. See Vol. V.
Alessandro C. M. Co. Lands sold, 1908, to Copper Gulf M. Co. See Vol. VI.
Alexandria G. & C. M. Co. Randsburg, Cal. See Vol. VIII.
Algoma Commercial Co., Ltd. Property sold, 1912, to Dominion Nickel C. Co. Sault Ste. Marie.
Alice Dev. Co. Succeeded by Alice G. Mills Corp. See Vol. IX.
Alice G. M. Co. Chewelah, Wash. See Vol. VI.
Allegheny M. Co. Belvidere, N. J. See Vol. VIII.
Allen M. Co. Old Glory, Ariz. See Vol. X.
Alliance C.-G. Co. Greenwood, B. C. See Vol. VIII.
Alliance C. M. Co. Absorbed, 1902, by Iconoclast Cons. Mines Co., Keller, Wash.
Alma May C. Co. Lost lands, 1908. Holmes, Wyo. See Vol. VIII.
Alma M. & M. Co. Cañitas, Mex. See Vol. VIII.
Almado & Terito Cons. M. Co. Succeeded by Neg. Min. de Clemente Ybarra. Alamos, Mex. See Vol. V.
Almeda M. Co. Succeeded, 1905, by Almeda Cons. Mines Co., Galice, Ore.
Almolya Y Anexas; Cia De. Ameca. Jalisco, Mex. See Vol. XII.
Almonte C. Co. Hanover, N. M. See Vol. VIII.
Alpena Copper Mng. Co. Saltese, Mont. Dead, 1914.
Alpha C. Co. Property sold at sheriff's sale, June, 1912, to Geo. H. Gardner, for \$5,000, subject to \$315,000 mortgage of Manhattan Trust Co., N. Y., and \$2,500 mtge. of Camden Safe Deposit, N. Y. City. Somerville, N. J. See Vol. X.
Alphabet C. Co. Courtland, Ariz. See Vol. VIII.
Alpha Mining Co. Dolomi, Alaska. See Vol. XI.
Alsacia Dev. Co. Reorganized, 1905, as Alsacia M. Co., Fronteras, Sa. Mex.
Alsacia M. Co. Fronteras, Mex. See Vol. VIII.
Alta C. Co. Succeeded, 1908, by Alta Montana C. Co. Corbin, Mont.
Alta C. Mines. Succeeded, 1909, by Boston & Alta C. Co. Corbin, Mont.
Alta C. M. Co. Ketchum, Idaho. See Vol. VIII.
Alta C. Mng. Co. Mackay, Idaho. Presumably dead. See Vol. XII.
Alta Crown C. Co. Ivanpah, Cal. See Vol. VIII.
Alta & Hecla M. & M. Co. Merged, 1910, in South Hecla M. Co. See Vol. VIII.
Alta M. & M. Co. Merged, 1907, in Ibex M. Co., Eureka, Utah.

- Alta M. & M. Co. Lusk, Wyo. See Vol. VIII.
- Alta Mirpah C. & G. M. Co. Alta, Utah. See Vol. VIII.
- Alta-Montana Co. Succeeded by Helena M. & Red. Co. Shares worthless.
- Alta-Montana C. Co. Succeeded, 1909, by Boston & Alta C. Co. Corbin, Mont.
- Alta-Quincy M. Co. Merged, 1906, in South Columbus M. Co. Alta, Utah.
- Alta-St. Louis M. Co. Alta, Utah. See Vol. X.
- Alta-Superior M. Co. Alta, Utah. See Vol. VIII.
- Alta-Zoani Mining Co. Hamilton, Nev.
- Altata M. Co. Chloride, Ariz. See Vol. X.
- Alto C. Co. Reorganized, 1909, as Cons. Mines, Smelter & Trans. Co. Patagonia, Ariz.
- Alto M. Co. Lands sold, 1908, to Leontine Cons. M. Co. Poland, Ariz.
- Alton M. Co. Needles, Cal. See Vol. X.
- Altona M. Co. Grand Forks, Idaho. See Vol. X.
- Amador Copper & Gold Mng. & Mllg. Co. Iron Mountain, Mont. Property held by Intermountain Copper Mining Co.
- Amalgamated Arizona C. Co. at Swansea, Ariz. See Vol. X.
- Amalgamated C. M. & Extr'n. Co. Merged, 1909, in Hecla Cons. Mines Co., Hecla, Wyo.
- Amalgamated G. & C. Co. Huron, Ariz. See Vol. VI.
- Amalgamated Greenwater C. Co. Greenwater, Cal. See Vol. VIII.
- Amalgamated Metal & Expl'n Co. Reorganized, 1910, as Amalgamated Metals Co., Jerome, Ariz.
- Amalgamated Metals Co. Liquidated, 1913. Jerome, Ariz.
- Amarillo M. Co. Property sold to Jarilla Cons. C. Co., 1912. Jarilla, N. M.
- Amazon-Butte C. Co. Property relinquished. Butte, Mont. See Vol. X.
- Amazon C. M. Co. Victorville, Cal. See Vol. VIII.
- Amazon-Montana Dev. Co. Property reverted to former owners. Amazon, Mont. See Vol. X.
- America-Britannia M. Co. Baring, Wash.
- America M. Co., S. A. Transferred property to San Pedro C. Co., S. A. Cananea, Mex.
- American Banner C. Co. Property sold, 1910, to Inspiration C. Co., Globe, Ariz.
- American Cons. C. Co. Butte, Mont. See Vol. VIII.
- American Cons. C. Co. Santa Fé, N. M. See Vol. V.
- American C. Co. Succeeded, 1905, by American C. & G. Co., also dead. See Vol. X.
- American C. M. Co. Succeeded, 1909, by Alpha C. Co. Somerville, N. J. See Vol. VIII.
- American C. M. & Extr'n. Co. Denver, Colo. See Vol. V.
- American C. M. & S. Co. Was a swindle, promoted by J. R. Keer & Co.
- American Dev. Co. Merged, 1906, in American-Saginaw Dev. Co. See Vol. VI.
- American Dev., M. & Red. Co. Silver City, N. M. See Vol. X.
- American Eagle C. M. Co. Encampment, Wyo. See Vol. X.
- American G. & C. Co. Globe, Ariz. See Vol. X.
- American G. & C. Co. Merged, 1904, in Poland-American G. M. & M. Co. Morristown, Ariz. See Vol. XI.
- American G. & C. M. Co. Jelm, Wyo. See Vol. VI.
- American G. M. Co. of New Mexico. Nogal, N. M. See Vol. VIII.
- American Gulch M. Co. Bingham Canyon, Utah. See Vol. VIII.
- American Metals Co. Organ, N. M. See Vol. VIII.
- American Mines Dev. Ass'n. Needles, Cal. See Vol. X.
- American Mines Dev. Co., Ltd. Globe, Ariz. See Vol. VIII.

- American Mines & Expl'n Co.** Hillside, Ariz. See Vol. X.
American M. Co. Central Mine, Mich. See Vol. VIII.
American M. Co. Callao, Utah. See Vol. VI.
American M. Co. Monte Cristo, Wash. See Vol. X.
American M. & Dev. Co. French Corral and Sweetland, Cal. See Vol. X.
American M. & Dev. Co. Naco, Mex. See Vol. VIII.
American M., M. & S. Co. Was a brazen swindle. See Vols. VI and VII.
American M. & S. Co. Twisp, Wash. See Vol. X.
American Prospecting & Dev. Co. Jerome, Ariz. See Vol. X.
American Queen M. Co. Lands passed to Colorado-Arizona Mines Co. Gold Hill, Colo.
American-Saginaw Dev. Co. Liquidated, property sold to Calumet. & Ariz. M. Co., Warren, Ariz.
American Smelters Expl'n Co. Changed name, 1905, to American Sm. Sec. Co.
American Venture Co. Ayutla, Mex. See Vol. VIII.
American Zinc Extraction Co. Tucson, Ariz. See Vol. VI.
Amygdaloid M. Co. Lands sold, 1905, to Calumet & Hecla M. Co. Central Mine, Mich.
Anaconda Cons. C. Co. of Greenwater. Greenwater, Cal. See Vol. VIII.
Anaconda-Corral Cons. Mines Co. Bouse, Ariz. See Vol. VIII.
Anaconda M. Co. Dissolved, 1907. Parent of Anaconda C. M. Co. Butte, Mont.
Anaconda Mizpah C. Co. Merged, 1907, in Ely-National C. Co. Ely, Nev.
Anaconda-Sonora C. Co. Sahuaripa, Mex. See Vol. VIII.
Anderson M. Co. Alberní, B. C. See Vol. X.
Angang C. Co. Chiranganguero, Mex. See Vol. X.
Anganguero; Cia. Met. de. Anganguero, Mex. See Vol. VIII.
Angel M. Co. Wickenburg, Ariz. See Vol. X.
Anglo-American C. Co., Ltd. Succeeded, 1907, by Ray Cons. C. Co. Kelvin, Ariz.
Anglo-American C. M. Co. of Parry Sound, Ltd. Parry Sound, Ont. See Vol. VIII.
Anglo-American Dev. Co. Barranca de Cobre, Mex. See Vol. X.
Anglo-American G. & C. Co. Cananea, Mex. See Vol. IV.
Anglo-Butte C., Ltd. Liquidated, 1909. Butte, Mont.
Anglo-Mexican M. & Ex. Co. Guachinango, Mex. See Vol. X.
Animas M. & S. Co. Llano, Mex. See Vol. VIII.
Anita Cons. C. Co. Reorganized, 1903, as Anita C. Co. Williams, Ariz.
Anita C. Co. Properly sold, under foreclosure. Succeeded by Titanic C. Co. Williams, Ariz.
Anita M. Co. Ocotlán, Jalisco, Mex. See Vol. VI.
Annabel M. Co. Merged, 1909, in Hillside Cons. M. Co. Cherry, Ariz.
Antelope Mining Co. Eureka, Utah.
Apache Chief M. Co. Lands sold, 1907, to Ariz. Success. M. Co. Salome, Ariz.
Apache C. Co. Bouse, Ariz. See Vol. VIII.
Apache Cons. C. Co. Globe, Ariz. Fully described, Vol. XII.
Apache Dev. Co. Lands sold, 1907, to Anderson-Apache C. Co. Hachita, N. M.
Apex C. Co. Lost River, Idaho. See Vol. VIII.
Apex Cons. Mng. Co. Silver City, Utah. See Vol. XII.
Apex C. Co. Hayman, Colo. See Vol. XII.
Apollo C. M. & M. Co. Frisco, Utah. See Vol. V.
Arapahoe Copper Mng. Co. Oro Blanco, N. M. See Vol. XI.
Arcade-Ariz. M. Co. Silver Bell, Ariz. See Vol. X.

- Arcadian C. Co.** Succeeded by New Arcadian C. Co. Houghton, Mich.
Arc Group M. Co. Kettle Falls, Wash. See Vol. X.
Arctic C. M. Co. Lake Mine, Mich. See Vol. I.
Arctic M. Co. Absorbed by Victoria C. M. Co., Mich.
Argenta Mines Co. Ainsworth, B. C. See Vol. VIII.
Argo C. M. Co. Merger, 1904, in Eclipse-Argo M. Co. Canyon Ferry, Mont.
Argo Tunnel & M. Co., Ltd. Reorganized, 1905, as Argo Trans. & Tunnel Co., Ltd., also dead; succeeded, 1909, by Argo M. & Tunnel Co. Idaho Springs, Colo.
Arichise Copper Co. Property in Arizona transferred to San Chez Copper Corporation, 1916. Company wound up. See Vols. X and XI.
Arizona Alpha Mng. Co. Kingman, Ariz. See Vol. XI.
Arizona Amalgamated C. Co. Property sold, 1907, to Coppermines Co. of Ariz., Ltd.
Arizona-Apache M. Co. Tucson, Ariz. See Vol. VIII.
Arizona & Arkansas Lead, Zinc & C. M. Co. Gila Bend, Ariz. See Vol. V.
Arizona Banner C. Co. Globe, Ariz. See Vol. VI.
Arizona Belle M. Co. Vail, Ariz. See Vol. VI.
Arizona-Boston C. Co. Globe, Ariz. See Vol. VIII.
Arizona-Bouse C. Co. Reorganized, 1909, as Little Butte Cons. Mines Co. Bouse, Ariz.
Arizona Cananea Mines Corp. Cananea, Son., Mex. See Vol. XI.
Arizona Central Copper Co. Prescott, Ariz. See Vol. XI.
Ariz.-Colo. C. Belt & G. M. & M. Co. Succeeded, 1911, by German C. Co. Globe, Ariz.
Ariz. Commercial Co. Succeeded, 1904, by Ariz. Comm. C. Co., also dead; succeeded, 1912, by Ariz. Comm. M. Co., Globe, Ariz.
Ariz. Cons. M. Co. Succeeded, 1909, by Ariz. United M. Co., Johnson, Ariz.
Ariz. C. Chief Sm. Co. No trace of operations secured.
Ariz. C. Hill M. Co. Property sold under foreclosure. Oracle, Ariz. See Vol. VI.
Ariz. C., Ltd. Clifton, Ariz. See Vol. X.
Ariz. C. Mountain M. Co. Peach Springs, Ariz. See Vol. VIII.
Ariz. C. Mountain M. Co. Title changed, 1904, to C. Butte Mines, Ray, Ariz.
Ariz. C. Placer M. & M. Co. Quartzite, Ariz. See Vol. X.
Ariz. C. Sm. Co. Kelvin, Ariz. See Vol. VIII.
Ariz. C. Syn. Clifton, Ariz. See Vol. V.
Ariz. C. Syn., Ltd. Was an English twin of Ariz. C. Syn.
Ariz. C. Syn. of Providence. Succeeded, 1910, by Copperox M. Co. Pearce, Ariz.
Ariz. Dev. Co. Safford, Ariz. See Vol. X.
Ariz. & Eastern Cons. M. Co. Property owned by Ray Cons. C. Co. Globe, Ariz.
Ariz. Eastern & Mont. Sm. & Ore Purch. Co. A swindle, promoted by Dr. R. C. Flower, Montana.
Ariz.-Echo C. M. Co. Planet, Ariz. See Vol. X.
Ariz. & Ely C. Co. Wickenburg, Ariz. See Vol. VIII.
Ariz. Empire Copper Mines Co. Parker, Ariz. See Vol. XI.
Ariz. Expl'n. & Dev. Co. Globe, Ariz. See Vol. VIII.
Ariz. G. & C. Co. Lands sold, 1907, to Trenton M. Co. Patagonia, Ariz.
Ariz. G. & C. Mines Co. Wickenburg, Ariz. See Vol. IV.
Ariz. G. & C. M. Co. Prescott, Ariz.
Ariz. G. & C. Red. Co. A swindle, perpetrated by Theodore Stegner, Ariz.
Ariz. G. Lode M. Co. Reorganized, 1906, as Ariz. C.-G. Mines Co.

- Ariz. G. M. Co.** Clifton, Ariz.
Ariz. Gold Mines Co. Wickenburg, Ariz. See Vol. XI.
Ariz. G. M. Co. Wickenburg, Ariz. See Vol. VI.
Ariz. G. M. & Dev. Co. Bisbee, Ariz. See Vol. VIII.
Ariz. G. M. & M. Co. Briggs, Ariz. See Vol. IV.
Ariz. & Hancock M. Co. Succeeded, 1903, by Ariz.-Hancock Cons. M. Co., also dead. Florence, Ariz.
Ariz. Independent Vacuum Sm. Co. Process and claims of company fully described under Cornelia C. Co., Vol. VI.
Ariz. Intern'l M. Co. Yucca, Ariz. See Vol. VIII.
Ariz. Mercantile Trans. & Dev. Co. Mayer, Ariz. See Vol. XI.
Ariz. Metals Co. Teviston, Ariz. See Vol. X.
Ariz.-Mexican C. Co. Caborca, Mex. Described Vol. X.
Ariz.-Mexican M. & S. Co. Property sold, 1909, to Needles M. & S. Co. Needles, Cal. See Vol. VIII.
Ariz. & Mich. M. Co. Globe, Ariz. See Vol. X.
Ariz. Mines Co. Casa Grande, Ariz.
Ariz. Mines Co. Wickenburg, Ariz. See Vol. XI and Tomboy Grp.
Ariz. M. Co. Pinos Altos, N. M.
Ariz. M. & M. Co. Bankrupt, June, 1911. Judge J. J. Hawkins, Poland, Ariz., trustee. See Vol. X.
Ariz. M. & Trading Co. Nacozari, Mex. See Vol. XII.
Ariz. & Mo. C. M. Co. Humboldt, Ariz. See Vol. X.
Ariz. National Copper Co. Globe, Ariz.
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- British American G. & C. M. Co.** Hornblende, S. D. See Vol. X.
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- British Columbia Chartered Co.** Summit, B. C. See Vol. VI.
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Bronze Monarch M. Co., Ltd. Merged in Mt. St. Helen's Cons. Mg. Co., St. Helen's, Wash.
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Buckeye Cons. G. & C. M. Co. Socorro, N. M.
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Buckskin Mountain C. Co. Ryan, Ariz. See Vol. VIII.
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- Burton Cons. C. Co. Encampment, Wyo.
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- Butte Minnesota Mng. Co.** Butte, Mont.
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- Cabinet Range M. Co.** Succeeded by Fern Cliff M. Co. Coolin, Idaho. See Vol. VIII.
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- Cactus Dev. Co.** Reorganized, Aug., 1909, as Cactus C. Co. Globe, Ariz. See Vol. VIII.
- Cactus Sm. & C. Co.** Absorbed by Royal C. M. Co., Newhouse, Beaver Co., Utah.
- Calabasas C. Co., Ltd.** Patagonia, Santa Cruz, Ariz. See Vol. IV.
- Calaveras M. Ass'n.** Charter forfeited, 1910. Alamagordo, N. M. See Vol. X.
- Calaveras M. Co.** Jarilla, Otero Co., N. M. See Vol. VIII.
- Calcite C. Co.** Vicksburg, Ariz. See Vol. IX.
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- California; Cia. Mina de.** Sonora, Mex. See Vol. X.
- California-Alaska M. & Dev. Co.** Alaska. See Vol. X.
- California & Ariz. C. M. Co.** Cochise, Ariz. See Vol. IV.
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- California C. Co.** Succeeded, Aug., 1906, by Cal.-Nev. C. Co. Daulton, Cal. See Vol. V.
- California Corona M. & M. Co.** Manvel, Cal. See Vol. X.
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- California M. Co.** Park City, Utah. See Vol. VI.
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- California-Nev. C. Co.** Succeeded, 1912, by Alaska-Ebner G. Mines Co. Madera, Cal. See Vol. X.
- California & Paradise Cons. M. Co.** Paradise, Ariz. See Vol. X.
- California & Paradise M. Co.** Reorganized, June 25, 1910, as Cal. & Paradise Cons. M. Co. Cochise, Ariz. See Vol. X.
- Californian C. Syn., Ltd.** Succeeded, Apr., 1902, by Fresno C. Co., Ltd., Clovis, Cal.

- Callahan Mng. Co.** Idaho. Dissolved, 1916. See Cons. Interstate Callahan Mng. Co.
- Calumet & Algoma Dev. Co.** Succeeded, 1903, by Hermina M. Co., Ltd., Massey, Ont.
- Calumet & Bisbee Dev. Co.** Arizona. Liquidated. See Vols. XI & XII.
- Calumet & Boston C. Co.** Bisbee, Cochise Co., Ariz. See Vol. VIII.
- Calumet & Butte Dev. Co.** Reorganized, 1907, as Cal. & Butte M. Co. Butte, Mont. See Vol. VI.
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- Calumet-Clifton C. Co.** Reorganized, Feb. 27, 1907, as Clifton Ariz. C. Co., Ltd. Clifton, Ariz. See Vol. VIII.
- Calumet & Cochise Dev. Co.** Liquidated, 1906. Bisbee, Ariz. Described, Vol. IV.
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- Calumet C. Co.** Turret, Colo. See Vol. VIII.
- Calumet & C. Creek M. Co.** Copper Creek, Ariz.
- Calumet C. M. Co.** Merged, 1907, in Kelvin-Calumet C. M. Co. Kelvin, Ariz.
- Calumet C. M. Co.** Property sold, under foreclosure, to Mount St. Helen's Cons. M. Co. Spirit Lake, Wash.
- Calumet C. M. & S. Co.** Rollinsville, Colo. See Vol. VIII.
- Calumet & Duluth Dev. Co.** Bisbee, Ariz. See Vol. IV.
- Calumet & Globe M. Co.** Wound up, 1908. Globe, Ariz. Described, Vol. VIII.
- Calumet Montana Mng. Co.** Reorganized as Cal.-Mont. Cons. Mng. Co.
- Calumet M., M. & S. Co.** Encampment, Wyo. Described, Vol. VI.
- Calumet & Montana Dev. Co.** Helena, Mont.
- Calumet & Ontario Dev. Co.** Massey, Ont. See Vol. VIII.
- Calumet-Pinal M. Co.** Succeeded, May, 1912, by Tortillita C. Co.
- Calumet & Pittsburg M. Co.** Merged, 1907, in Superior & Pittsburg C. Co. Bisbee, Ariz. Described, Vol. VII.
- Calumet & Sault Ste. Marie Dev. Co.** Massey, Ont. See Vol. X.
- Calumet & Sonora M. Co.** Succeeded, June, 1912, by Calumet-Sonora M. & M. Co. of Ariz. Cananea, Mex.
- Calumet Sonora Mng. & Mllg. Co.** Reorg'd as Carnegie Lead & Zinc Co.
- Calumet & Texas M. Co.** See Vol. X.
- Cambrian M. & M. Co.** Placerville, Cal. See Vol. VI.
- Cambridge C. M. Co.** Jamestown, N. C.
- Camos No. 1 M. Co.** Doniphan, Idaho. See Vol. X.
- Campo Bonito M. & M. Co.** Reorganized, 1911, as Cody-Dwyer M. & M. Co. See Vol. X.
- Campo Seco Copper Co.** Campo Seco, Calif. See Vol. XI.
- Cañada del Oro M. & Dev. Co.** Oracle, Ariz.
- Canada Nickel Co.** Lands sold, 1906, to Ontario Nickel Co. Worthington, Ontario.
- Canadian-American M. Co.** Cassiar district, B. C. See Vol. VIII.
- Canadian M. & Dev. Co.** Basin, Mont.
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- Cananea-Arizona Cons. C. Co.** Globe, Ariz., and Cananea, Mex. See Vol. VIII.
- Cananea-Bisbee Dev. Co.** Arizpe, Mex. See Vol. VIII.
- Cananea Central C. Co.** Property sold to Greene-Cananea C. Co. Liquidated.
- Cananea Dev. Co.** Was a Mexican subsidiary company of the Greene-Cananea C. Co. Property transferred to San Pedro C. Co., S. A., and company dissolved, 1912.

- Cananea-Duluth M. Co.** Assets acquired, Feb., 1912, by Greene-Cananea C. Co. Liquidated.
- Cananea-Eastern M. Co.** Arizpe, Mex. See Vols. VIII & XII.
- Cananea & Globe Expl'n. & Dev. Co.** Globe, Ariz., and Arizpe, Mex. See Vol. VIII.
- Cananea Manzanal M. Co.** Arizpe, Mex. See Vol. X.
- Cananea Midland C. Co.** Arizpe, Mex. See Vol. VIII.
- Cananea Northern M. Co.** Cananea, Mex. See Vol. X.
- Cananea Northern M. & Dev. Co.** Merged, 1909, in Arizona-Cananea Mines Corp. Arizpe, Mex. See Vol. X.
- Cananea Nueva M. Co.** Cananea, Sonora. See Vol. X.
- Cananea Ore Co.** Cananea, Mex. See Vol. X.
- Cananea Queen C. M. Co.** Cananea, Mex. See Vol. X.
- Cananea-Sonora Dev. Co.** Cananea, Mex. See Vol. VIII.
- Cananea West M. Co.** Succeeded, April, 1907, by Cananea Western C. Co. Cananea, Mex.
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- Cañas Mines, Ltd.** Zimapán, Mex. See Vol. VIII.
- Candelaria M. & Expl'n. Co.** Lands sold to Mexican Standard M. Co. Hidalgo del Parral, Mex. See Vol. V.
- Canton M. Co.** Succeeded by McKinley M. & S. Co. Ely, Nev. See Vol. X.
- Canyon G. & C. Co.** Canyon Ferry, Mont. See Vol. VIII.
- Canyon M. Co.** Mayer, Ariz. See Vol. X.
- Cape Breton C. Co., Ltd.** Coxheath, Nova Scotia.
- Cape Breton Prospecting, M. & Dev. Co., Ltd.** Inverness, Nova Scotia.
- Capitol Cons. M. Co.** Helena, Mont. See Vol. X.
- Cap Sheaf C. & G. Co.** Van Anda, B. C.
- Carbonate Ely C. Co.** Preston, Nev. See Vol. X.
- Carbonate Center Mng. Co.** Mullan, Ida.
- Carbonate Lead Mines Co.** California. See Vol. XII.
- Carbon County G. M. & M. Co.** Morgan, Wyo. See Vol. X.
- Cardenas C. Co.** Absorbed, 1903, by Anita Cons. C. Co. Williams, Ariz.
- Caribbean M. Co.** Ophir, Colo.
- Caribou Gold & Copper Co.** Gray, Ida.
- Caridad; Compania Minera.** Guanajuato, Mex. See Vol. XII.
- Carney C. Co.** Carney, Mich. See Vol. X.
- Carisa C. & G. M. Co.** Succeeded, 1907, by Carisa G. & C. M. Co. of Maine. Mammoth, Utah. See Vol. VI.
- Carlisle C. Co.** Butte, Mont.
- Carmack G. & C. M. Co.** North Bend, Wash. See Vol. VIII.
- Carmen Cons. Copper Co.** Arizpe, Son., Mex.
- Carmen-Guanajuato Gold Mng. Co. Mex.** See Guanajuato Cons. M. & M. Co.
- Carnation M. Co.** Lands sold, 1909, to Ariz. Empire C. Mines Co. Parker, Ariz.
- Carnegie Copper Co.** Jeffress, Va. See Vol. XII.
- Carney C. Co.** Carney, Mich.
- Carolina G. & C. Co.** New London, N. C., and Gap Creek, N. C. See Vol. VI.
- Carolina King. M. Co.** Virgilina, Va. See Vol. VIII.
- Carp Lake M. Co.** Ontonagon, Mich. See Vol. II.
- Carrie C. Co.** Globe, Ariz. See Vol. X.
- Carr Mine & Colorado Co., Ltd.** Wound up, Apr., 1903. Black Hawk, Colo. See Vol. VIII.
- Carroll G. & C. Co.** Humboldt, Ariz. See Vol. X.

- Carter C. Co.** Name changed, 1903, to Manassas-Gap Copper Mines. Reager, Va.
- Carter Mng. Co.** Ohio City, Colo. See Vol. XII.
- Cartwright Gold Fields, Ltd.** Ontario. See Vol. XII.
- Casa Grande C. & G. M. Co.** Succeeded by Producer M. & S. Co. Casa Grande, Ariz. See Vol. VI.
- Casa Grande Dev. Co.** Merged in Copper Gulf M. Co. Vekol, Ariz. See Vol. VIII.
- Casa Grande M. & S. Co.** A swindle perpetrated by Douglas, Lacy & Co. Casa Grande, Ariz. See Vol. VI.
- Cascade C. M. Co.** Merged, 1902, in Mt. Helen's Cons. M. Co. Spirit Lake, Wash.
- Cascade C. M. Co.** Gordon, Wis. See Vol. VIII.
- Cascade C. M. Co.** Encampment, Wyo. See Vol. V.
- Cascade C. M. Co., Ltd.** Alberni, B. C. See Vol. VIII.
- Cascade G. & C. M. Co.** Chelan, Wash.
- Cascade M. Co.** Santa Fé, N. M. See Vol. VIII.
- Cascades Cons. C. Co.** Encampment, Wyo. See Vol. VIII.
- Cascades C. Co.** Succeeded, 1902, by Cascades Cons. C. Co. Encampment, Wyo.
- Cash Mine Co.** Groom Creek, Ariz. See Vol. VIII.
- Cash M. & M. Co.** Succeeded by American Queen M. Co. Gold Hill, Colo.
- Castle Dome C. Co.** Reorganized, 1909, as Castle Dome M. Co. Globe, Ariz. See Vol. VIII.
- Castle Dome Dev. Co.** Globe, Ariz. See Vol. VIII.
- Castle Dome Expl'n. & Red. Co.** Dome, Ariz. See Vol. VIII.
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- Catas Viejas C. Co.** Tepezalá, Ocampo, Mex. See Vol. X.
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- Cave Creek M. Co.** Cave Creek, Ariz. See Vol. VIII.
- Cedar Forest G. & C. Co.** Kingman, Ariz. See Vol. VI.
- Cedar M. Co.** Merged, 1909, in Cedar-Talisman Cons. Mines Co. Milford, Utah. See Vol. X.
- Cedar Valley G. & S. M. Co.** Cedar, Ariz. See Vol. VIII.
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- Centennial-Bingham M. Co.** Succeeded, 1904, by South Columbus M. Co. Alta, Utah.
- Centennial M. Co.** Reorganized, 1896, as Centennial C. M. Co. Calumet, Mich.
- Central Alaska G. & C. Co.** Succeeded, 1907, by Chisna Cons. Mines Co. Landlock, Alas. See Vol. VI.
- Central Black Hills C. Co.** Custer, S. D. See Vol. VIII.
- Central Cons. C. Co.** Fronteras, Mex. See Vol. X.
- Central C. Co.** Globe, Ariz. See Vol. X.
- Central G. & C. Co.** Mineral Hill, N. M.
- Central M. C.** Sold, 1905, to Frontenac C. Co. See Vols. I and II.
- Central M. Co.** Keller, Wash. See Vol. X.
- Central M. & Dev. Co.** Winkelman, Ariz. Property bought for \$6,000 and capitalized at \$10,000,000. Three chief promoters were convicted of

- fraud in connection with company's affairs and sentenced to Leavenworth. See Vols. X and XI.
- Centre Star Cons. M. Co.** Merged, 1910, in Cons. M. & S. Co. of Canada, Ltd. See Vol. VIII.
- Centre Star M. Co., Ltd.** Succeeded, Jan., 1906, by Centre Star Cons. M. Co. Rossland, B. C. See Vol. V.
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- Cerro Colorado M. & M. Co.** Succeeded by Cerro Colo. Mines Co. of Arizona. Tucson, Ariz. See Vol. VIII.
- Cerro del Cobre M. Co.** Charcas, Mex. See Vol. X.
- Cerro de Pasco Investment Co.** Dissolved Dec. 23, 1915.
- Cerulean C. M. Co.** Copperton, Wyo.
- Chaffee G. & C. M. Co.** Black Hawk, Colo., and Tie Siding, Wyo. See Vol. VIII.
- Chainman Cons. Copper Co.** Succeeded by Cons. Copper Mines Co.
- Chainman M. & Electric Co.** Succeeded, 1906, by Chainman Cons. C. Co. Ely, Nev.
- Chalchihuites Mines Co.** Chalchihuites, Mex. See Vol. X.
- Chalchihuites Mng. Co., S. A.** Chalchihuites, Zacatecas, Mex. See Vol. XII.
- Champion Group M. Co.** Yreka, Cal. See Vol. X.
- Champion M. & M. Co.** Was a swindle, promoted from 608 Hoist Bldg., Kansas City, Mo. See Vol. VIII.
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- Chemainus C. Mine Co., Ltd.** Ladysmith, B. C. See Vol. X.
- Chemung C. Co.** Sold, Sept., 1912, to Phelps Dodge & Co. Tyrone, N. M.
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- Cherokee C. M. Co.** Encampment, Wyo.
- Chesterfield Copper Co.** Bankrupt. Succeeded by Blanche Rose Mng. Co.
- Chewelah C. Co.** Chewelah, Wash. See Vol. VIII.
- Chiapas M. Co., Ltd.** Salto de Agua, Mex. See Vol. V.
- Chiapas Zone Expl'n Co., Ltd.** Pichucalco, Mex.
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Corbin-Mont. C. Co. Name changed, 1910, to Corbin Metal M. Co. Jefferson City, Mont. See Vol. VIII.
Corbin-Mont. Mines Co. Succeeded by Corbin-Mont. C. Co. Corbin, Mont. See Vol. VIII.
Cordillero M. Co. Van Anda, B. C. See Vol. VIII.
Cordova Copper Co. Cordova, Alaska. See Vol. VIII.
Cordova-Tacoma C. Co. Cordova, Alaska.
Corinth Copper Co. Corinth, Vt.
Cornelia Copper Co. Reorganized, 1909, as New Cornelia C. Co. Ajo, Ariz. See Vol. VIII.
Cornelia Mng. Co. Sheridan, Mont.
Cornell G., S. & C. M. Co. Silver City, N. M. See Vol. VI.
Cornell Operating Co. Van Anda, B. C.
Cornucopia C. Co. Cornucopia, Ore.
Cornucopia G. & C. M. Co. Cherry, Ariz.
Cornwall Copper Mng. & Sm'g Co. St. Genevieve, Mo.
Corona Cons. G. & C. Co. Turkey, Ariz. See Vol. X.
Corona Copper Co. Clifton, Ariz.
Corona Copper Co. Superior, Wis. See Vol. VI.
Corona G. & C. Co. Santa Rita, N. M.
Coronado Copper Co. Clayton, N. M. See Vol. VIII.
Coronado G. & C. M. Co. Prescott, Ariz.
Corra-Rock Island M. Co. Butte, Mont. See Vol. V.
Cortez Mining Co. Operated in Ontonagon Co., Mich., 1852.
Cortland G. & S. M. Co. Ohio, Colo. See Vol. VIII.
Cory Bros. Mining Co. Helena, Mont.
Cotton Belt M. Co. Kamloops, B. C.
Cottonwood C. Co. Groom Creek, Ariz. See Vol. VIII.
Cottonwood Creek C. Co. Colo. See Vol. X.
Courtland Mining Co. Courtland, Ariz. See Vol. X.
Cove Copper Mines, Ltd. Liquidated, 1911. Goose Cove, Newfoundland.
Cow Creek Copper M. Co. Encampment, Wyo.
Cowles Electric Sm. & Alum. Co. Succeeded, 1895, by Electric Sm. & Alum. Co.
Coyote Copper Co. New York. No trace of operations secured.
Crackerjack Cons. C. Co. Los Angeles, Cal.
Crawford Copper Co. Los Angeles, Cal.
Crawford Copper Co. Prairie du Chien, Wis. See Vol. VIII.
Crawford Gold M. Co. Clifton, Ariz.
Creede Copper M. Co. Rawlins, Wyo.
Creo M. & M. Co. Irapah, Utah. See Vol. X.
Crescendo Copper Co. Operated in Lander Co., Nev., 1907.
Crescent Copper Co. Boulder, Colo.
Crescent Copper Co. Encampment, Wyo. See Vol. VI.
Crescent C. M. Co. Bisbee, Ariz. See Vol. VIII.
Crescent Mines, Ltd. Phoenix, B. C. See Vol. VIII.
Creston Cons. Mines Co. Loreto, Mex.
Crona Copper Co. Lyons, Colo.
Crown Copper Co. Valdez, Alaska. See Vol. X.
Crown G. & C. Co. Leavenworth, Wash.
Crown Mining Co. Keller, Wash. See Vol. X.
Crown Point Copper Co. Globe, Ariz. See Vol. VIII.
Crown Point M. Co. Chelan, Wash.

- Crown Princess M. Co.** Merged, 1908, in Clara Cons. G. & C. M. Co. Planet, Ariz.
Crown Queen Mines Co. Merged, 1908, in Clara Cons. G. & C. M. Co. Planet, Ariz.
Crusader Cons. M. Co. Eureka, Utah.
Cruz; Cia. Min. de la. La Cruz, Mex.
Crystal Copper Co. Ingot, Cal. See Vol. VIII.
Crystal C. M. Co. Merged, 1906, in Bristol Cons. Mines & Sm. Co. Nevada.
Crystal Lake G. & C. M. & Sm. Co. Lake City, Colo. See Vol. VIII.
Crystal Mining Co. Bolster, Wash. See Vol. VIII.
Crystal Mountain M. & Drainage Co. Crystal, Colo.
Crystalina C. Co. Clifton, Ariz.
Cuartas Mining Co. Ayutla, Autlán, Mex.
Cuarto Señores, S. A. Cia. Min. Coyamé, Iturbide, Mex. See Vol. VIII.
Cuahtemoc M. Co. Ocotlan, Mex. See Vol. X.
Cuba M, Co. Bingham Canyon, Utah. See Vol. X.
Cubana Cons. C. Co. Arizpe, Mex. See Vol. VIII.
Culligan M. Co. West Superior, Wis.
Culowhee Copper Co. Reorganized, 1905, as Cullowhee M. & Red. Co. Cullowhee, N. C. See Vol. V.
Cumalar Mines & Dev. Co. Old Glory, Ariz. See Vol. VIII.
Cumberland C. Co., Ltd. Ely, Nev. See Vol. X.
Cumberland-Ely C. Co. Property sold, 1909, to Nev. Cons. Co. Ely, Nev. See Vol. VIII.
Cumberland M. Co. Turkey, Ariz.
Cumora M. Co. Property sold, 1913, to Melcher M. & M. Co.
Cunningham Pass Copper Mng. Co. Arizona. See Vol. XI.
Cuprite C. Co. Sulzer, Alaska.
Cuprite Copper Co. Vail, Ariz. See Vol. III.
Cuprite Copper M. Co. Goldfield, Nev. See Vol. VIII.
Cuprite Mining Co. Holmes, Wyo.
Cuprite M. & S. Co. Vail, Ariz. See Vol. VIII.
Cutter Copper Co. Cutter, N. M. See Vol. X.
- Dacotah Mining Co.** Houghton, Mich. See Vol. III.
Daggett Lead Mining Co. San Bernardino, Cal. See Vol. X.
Daisy Bell Gold & Copper Dev. Co. Montana. See Vol. XI.
Daisy Bell G. & C. Dev. Co. Whitehall, Mont. See Vol. VIII.
Daisy Bell G. & C. M. Co. Whitehall, Mont. See Vol. VIII.
Dakota Calumet Co. Succeeded, 1913, by Continental C. M. & S. Co. Hill City, S. D.
Dakota Heights Co. Succeeded by Naumkeag Cop. Co. in 1912.
Dalton & Lark G. S. & L. M. & M. Co. Utah. Dissolved by order of court, 1911. See Bingham Mines Co.
Daly Mines Co. Probably defunt. Bouse, Ariz. See Vol. XI.
Daly Mining Co. Owned by Marcus Daly Estate, Butte, Mont. See Vol. X.
Dan Creek Gold Co. Alaska. See Vol. XII.
Dandy Mining & Milling Co. Sandpoint, Bonner Co., Idaho.
Dane Copper Mining Co. Dane, Ont. See Vol. XI.
Danville & Virginia C. M. Co. Merged, 1903, in Carolina King Mg. Co. Virgilina, Va.
Darnell M. & M. Co. Kalama, Wash. See Vol. VI.
Darrington-Indiana Mining Co. Darrington, Wash. See Vol. VIII.
David Harum Copper Co. Van Horn, Texas. See Vol. X.

- Davis-Daly Estates C. Co.** Succeeded, 1908, by Davis-Daly Co. See Vol. VIII.
- Davis Mining & Smelting Co.** Succeeded by Southwestern Sm. Co., 1903. Cal.
- Dawson Mining Co.** Moctezuma, Son., Mex. See Vol. X.
- Deadwood Gold & Copper Mines Co.** Deadwood, S. D.
- Death Valley Copper Glance Mining Co.** Greenwater, Calif.
- Death Valley Cop. Mines & Smelter Co.** Greenwater, Calif.
- Decatur Cop. Mng. Co.** Jerome, Ariz.
- Dedham Copper Mining Co.** Superior, Wis. See Vol. VIII.
- Deems Mining Co.** Bingham Canyon, Utah. See Vol. VIII.
- Deep Mines Co.** Goldfield, Nev. See Vol. XII.
- Deer Creek Gold & Copper Mining Co.** Silverton, Wash.
- Deerfly Mng. Co.** Lucerne, Wash. See Vol. XII.
- Deerlodge Cons. Mines, Ltd.** Liquidated voluntarily 1910. Anaconda, Mont. See Vol. VIII.
- De Lamar's Copper Ref. Co.** Succeeded, Oct. 15, 1906, by U. S. Metals Ref. Co. N. J. See Vol. VI.
- De Lamar-Wall M. & M. Co.** Lands sold, 1903, to Utah Copper Co., Bingham Canyon, Utah. See Vol. III.
- Delaware Mining Co.** Reorganized, 1880, as Conglomerate M. Co. Mich.
- Del Cobre Cons. Mining Co.** Red Rock, Pinal Co., Ariz. See Vol. VIII.
- Delfina Mining Co.** Chilpancingo, Guerrero, Mex. See Vol. X.
- Delmas Copper Co.** Succeeded, 1908, by Delmas Cons. Copper Co., also dead. Lee, Nev. See Vol. VIII.
- Del Norte Copper Co.** Kirkland, Yavapai Co., Ariz. See Vol. V.
- Del Norte Copper Co.** Smith River, Del Norte Co., Cal.
- Del Roy Copper M. & S. Co.** A swindle. Alamogordo, N. M. See Vol. VI.
- Democrata Mining Co.** Succeeded, 1905, by Democrata Cananea Sonora C. Co. Cananea, Son., Mex. See Vol. V.
- Denn-Arizona Dev. Co.** Reorganized, 1907, by Denn Arizona C. Co. Bisbee, Ariz. See Vol. VI.
- Denny Dulin Gold & Silver Mining Co.** Nevada. Probably dead. See Vol. XII.
- Denoro Mines, Ltd.** Trail district, B. C. See Vol. VI.
- Denver C. M. & Leasing Co.** Morrison, Colo. See Vol. X.
- Denver & Globe M. & S. Co.** Globe, Ariz. See Vol. VIII.
- Denver Group Gold & Copper Co.** Wickenburg, Ariz. See Vol. X.
- Denver & Rock Island M. Co.** Mullan, Idaho. See Vol. X.
- De Soto Mining Co.** Charter forfeited, 1910. See Vol. X.
- Deseret Mining & Reduction Co.** Leastalk, Cal. See Vol. X.
- Deseret Mountain Copper King M. Co.** Eureka, Utah. See Vol. VIII.
- Deseret View Mining Co.** Lucin, Ariz. See Vol. VIII.
- Despatch Copper-Gold M. Co.** Morrison, Colo. See Vol. X.
- Dessie Boyer Copper-Gold Mine, Ltd.** Vontrigger, Cal. See Vol. VIII.
- Detroit & Parry Sound M. Co., Ltd.** Parry Sound, Ont. See Vol. X.
- Detroit Quo Vadis Copper Co.** Moctezuma, Mex. See Vol. VIII.
- Detroit Sonora Mining Co.** Cananea, Mex. See Vol. X.
- Devlin Arizona Copper Co.** Bouse, Ariz. See Vol. VIII.
- Dewey Cons. Copper & Gold M. & M. Co.** Grangeville, Idaho.
- Dewey Mining Co.** Bear, Ida.
- Dewey Mining Co.** Ibapah, Utah.
- Dexter Mining Co.** Globe, Ariz.
- Diana Gold & Copper Expl'n. Co.** Brighton, Utah.
- Diaz; Fernando.** Tuxpan, Tepic, Mex.
- Dill Gold & Copper Mining Co.** Rambler, Wyo. See Vol. X.

- Dillon-Argenta M. Co.** Lands sold 1910, by sheriff, Argenta, Mont. See Vol. VIII.
- Dillon Cons. Mining & Tunnel Co.** Dillon, Wyo. See Vol. VIII.
- Diluvio Gold & Copper Mining Co.** Bouse, Ariz. See Vol. X.
- Dipper Gold M. & M. Co.** Alta, Utah. See Vol. X.
- Dirigo-La Sal Gold & Copper M. Co.** Castleton, Utah, sold to Boston & Utah C. Co. See Vol. VIII.
- Dixie M. & S. Co.** Succeeded by Utah & Eastern C. Co., Utah.
- Dixie Queen Copper Co.** Mancos, Colo. See Vol. X.
- Doane-Verde Mining Co.** Rambler, Wyo.
- Dold & Voelker.** Ayutla, Jalisco, Mex.
- Dolly Varden Copper Co.** Currie, Nev. See Vol. X.
- Dolly Varden United Copper Co.** Currie, Nev. See Vol. X.
- Dolores Copper M. Co.** Sold to American Smelters Securities Co. Mat-huala, Mex. See Vol. V.
- Domingo M., M. & S. Co.** Republic, Wash. See Vol. VIII.
- Dominguez Copper M. Co.** Delta, Colo. See Vol. X.
- Dominion Copper Co., Ltd.** Phoenix, B. C. See Vols. VIII and X.
- Dominion Smelting Co., Ltd.** Parry Sound, Ont. See Vol. VIII.
- Donald Copper Co.** Midway, Boundary district, B. C. See Vol. X.
- Dona Louisa Cons. Copper Co.** Coapa, Michoacán, Mex. See Vol. VIII.
- Dona Louisa Copper & Gold M. Co.** A swindle, Coapa, Michoacán, Mex. See Vol. VIII.
- Don Carlos & Eureka Cons. C. M. Co.** Nombre de Dios, Durango, Mex. See Vol. X.
- Don Juan Mining Co.** Fronteras, Mex. See Vol. X.
- Donna Dora Mining Co.** New Mexico. Succeeded by Mineral Hill Mining Co.
- Dorotea M. Co.** Lands sold, 1905, to Fay-Cananea C. Co., Cananea, Son., Mex.
- Dos Cabezos Cons. Mines Co.** Sold lands, 1907, to Mascot Copper Co., Dos Cabezos, Ariz. See Vol. VI.
- Dos Estrellas Mines & Dev. Co.** Taxco de Alarcón, Guerrero, Mex. A swindle, for which Geo. W. Emanuel was given a prison sentence; Louis A. Prince was arrested, but jumped a \$6,000 bail bond, and Mark J. Samuels, indicted under United States laws, stayed out of reach in Mexico. See Vol. VIII.
- Dos Naciones M. Co.** Lands sold to Cananea-Duluth M. Co., Cananea, Son., Mex. See Vol. VI.
- Double Sunset M. & M. Co.** Paradise, Ariz.
- Douglas-Arizona-Sonora Dev. Co.** Patagonia, Ariz. See Vol. VIII.
- Douglas Copper Co.** Succeeded by Pacific Sm. Co., Alamos, Son., Mex. See Vols. VIII & X.
- Douglas Copper M. Co.** Succeeded, 1906, by Nevada-Douglas C. Co. Yerington, Nev. See Vol. VI.
- Douglas M. & M. Co.** Rambler, Wyo. See Vol. VI.
- Douglas M. & S. Co.** Succeeded by Douglas Copper M. Co., latter bankrupt, 1905. Yerington, Nev. See Vol. IV.
- Douglas Mountain Gold M. & Tunnel Co.** Loomis, Wash. See Vol. VIII.
- Dover Mining Co.** Idaho Springs, Colo. See Vol. X.
- Dragon M. & Dev. Co.** Succeeded by San Rafael C. Co. Terrazas, Chih., Mex.
- Dragon Copper M. & S. Co.** Tombstone, Ariz. See Vol. X.
- Dragon M. C.** Lands sold, 1907, to Bonanza Belt C. Co. Johnson, Ariz.
- Dragon Mountain M. Co.** Pearce, Ariz. See Vol. X.

- Dripping Springs Mines & Smelters. Succeeded, 1907, by London-Arizona C. Co. Kelvin, Ariz. See Vol. VIII.
- Drummers Development Co. Chelan, Wash. See Vol. X.
- Duchess M., M. & S. Co. Holmes, Wyo.
- Duluth & Arizona Copper M. Co. Prescott, Ariz. See Vol. VIII.
- Duluth-Arizona M. Co. Wickenburg, Ariz. See Vol. X.
- Duluth & Chiricahua Development Co. Arizona. Reorganized, 1912, as Sullivan Development Co., which see.
- Duluth Cons. C. Co. Succeeded, 1907, by Red Warrior M. Co. Baker, Idaho, and Milford, Utah.
- Duluth-Lemhi Mng. Co. Baker, Ida. See Vol. XII.
- Duluth-Pacific Copper Co. Chelan, Wash. See Vol. X.
- Duncan M. & Dev. Co., Ltd. Duncans, B. C. See Vol. X.
- Dunkirk G. & S. M. Co. Lands sold to Mt. Tritle C. Co. Prescott, Ariz. See Vol. VI.
- Durango; Cia. Minera De Cobre De. Ortiz, Durango, Mex.
- Durango Copper Syn., Ltd. Sold property, 1899, to Avino Mines of Mex., Ltd., since reorganized as Avino Mines, Ltd. Avino, Dur., Mex.
- Durango Inv. & Dev. Co. San Francisco del Mezquital, Durango, Mex. See Vol. X.
- Dutch Miller M. & S. Co. Skykomish, Wash. See Vol. VIII.
- Eagle Bird M. & M. Co. Bingham Canyon, Utah. See Vol. X.
- Eagle Cons. Gold M. & M. Co. Lands sold, 1908, to Blue Star M. Co. Chewelah, Wash.
- Eagle Cons. Mines Co. Wenden, Ariz. See Vol. VIII.
- Eagle Copper Co. Encampment, Wyo. See Vol. VI.
- Eagle Copper & Gold M. Co. Wickenburg, Ariz.
- Eagle Copper-Gold Mng. Co. Arizona. See Vol. XI. Property now owned by J. L. Zesiger, former treasurer, 2072 E. 40th Street, Cleveland, O.
- Eagle Copper M. Co. Chewelah, Wash. See Vol. X.
- Eagle Mining Co. Ketchikan, Alaska. See Vol. VIII.
- Eagle M. Co. Lands sold, 1909, to Arizona Empire Copper Mines Co. Parker, Ariz.
- Eagle M. & S. Co. Title changed, 1907, to Copper Eagle M. & S. Co. Butte, Mont.
- Eagle Mountain C. M. Co. A swindle. Harrisburg, Ore. See Vol. VIII.
- Eagle River C. Co. Lands sold, 1905, to a subsidiary company of the Calumet & Hecla. Eagle River, Mich. See Vol. II.
- East Buffalo M. Co. Salt Lake, Mont.
- East Cumberland Ely Co. Ely, Nev. See Vol. X.
- East Greenwater Copper Co. Greenwater, Cal. See Vol. VIII.
- East-Side Gold M. Co. Bisbee, Ariz. See Vol. VII.
- East Snowstorm-Coeur D'Alene M. Co. Fraudulent. Mullan, Idaho. See Vol. VIII.
- East Tintic Terminal M. Co. Eureka, Utah. See Vol. VIII.
- Easter Sunday M. Co. Bisbee, Ariz.
- Echo Copper M. & M. Co. Rudefeha, Wyo. See Vol. X.
- Eclipse G. & C. M. Co. Merged, 1904, in Eclipse-Argo M. Co. Argo, Mont.
- Edison M. Co. Yreka, Vancouver Id., B. C.
- Edna May M. Co. Winfield, Colo.
- Eighty-Five M. & M. Co. Reorganized, 1909, as Eighty-Five M. Co. Lordsburg, N. M. See Vol. VIII.
- El Aguaje M. Co. Moctezuma, Sonora, Mex. See Vol. VIII.

- El Capitan C. Co.** Douglas, Lacey & Co. Swindle. Kirkland, Ariz. See Vol. IV.
El Capitan Dev. Co. Globe, Ariz.
El Capitan M. Co. Kirkland, Ariz. See Vol. VIII.
El Carmen M. Co. San Javier, Sonora, Mex.
El Cobre M. Co. A swindle. Hermosillo, Sonora, Mex. See Vol. VIII.
El Corral G. & C. Co. Rosario, Mex. See Vol. X.
El Diaz G. & C. Co. San Martin Hidalgo, Jalisco, Mex. See Vol. V.
El Dorado Copper Co. Globe, Ariz. See Vol. VIII.
El Dorado C. M. Co. Succeeded, 1906, by Woodside-Eureka M. Co. Georgetown, Cal. See Vol. V.
El Paso Home M. Co. Chloride, N. M.
El Paso M. Co. Orogrande, N. M.
El Porvenir M. & M. Co. Cuatro Ciénegas, Coah., Mex. See Vol. VIII.
El Progreso C. M. Co. Stockholders were given shares of Imperial Corona Gold Min. Co. in exchange. Ayutla, Jalisco, Mex. See Vol. III.
El Rey Gold & Copper M. Co. Encampment, Wyo.
El Rico Copper M. Co. Tepezala, Aguascalientes, Mex.
El Sueño M. Co. Tijuana, Baja Cal., Mex. See Vol. X.
El Verde Grande C. Co. Imuris, Son., Mex. See Vol. VIII.
Elder M. Co. Waldo, Ore.
Electra M. & M. Co. Wickenburg, Ariz.
Electric M. & M. Co. Orogrande, N. M.
Electric Mng. & Smg. Co. Idanha, Ore. See Vol. XII.
Electrolytic Copper Co. White Bird, Ida.
Electrolytic Copper M. & S. Co. Imnaha, Ore.
Elite Gold & Copper M. Co. Index, Wash. See Vol. V.
Elizabeth Copper Co. Succeeded, 1907, by Vermont Copper Co. South Strafford, Vermont. See Vol. VI.
Elizabeth C. M. Co. Succeeded by Elisabeth Gold Hill M. Co. No. Yakima, Wash.
Elizabeth M. Co. Succeeded, 1905, by Elizabeth C. Co. South Strafford, Vermont. See Vol. V.
Elkhorn C. M. Co. Reorganized as Penobscot M. Co. Argenta, Mont. See Vol. VIII.
Elkhorn M. Co. Twin Buttes, Ariz.
Elkhorn Mng. Co. Elkhorn, Mont.
Ella Copper M. & Dev. Co. New Almaden, Cal. See Vol. X.
Ella M. Co. Lands passed to Reins Copper Co. Butte, Mont. See Vol. VIII.
Elliston Copper Mng. Co. Elliston, Mont.
Elsie M. Co. Winfield, Colo.
Ely Amalgamated Copper Co. Ely, Nev.
Ely Blackhorse M. Co. Blackhorse, Nev. See Vol. VIII.
Ely-Bonanza Copper Co. Ely, Nev. See Vol. VIII.
Ely-Calumet Copper Co. Ely, Nev. See Vol. XII.
Ely Centennial C. Co. Succeeded, 1911, by Centennial Dev. Co., Ely Nevada. See Vol. X.
Ely Central Copper Co. Succeeded, 1912, by New Ely Central C. Co. Ely, Nev. See Vol. X.
Ely Cons. Co. Ely, Nev. See Vol. X.
Ely Copper Queen M. Co. Ely, Nev. See Vol. VIII.
Ely-Copperton M. Co. McGill, Nev. See Vol. VIII.
Ely-Duck Creek Lead & Copper Co. Ely, Nev. See Vol. X.
Ely-Giroux Extens. C. Co. Lands sold, 1909, to Giroux Cons. Mines Co. Ely, Nev. See Vol. VIII.

- Ely Globe Copper Co. Ely, Nev. See Vol. VIII.
- Ely Golden Ledge M. Co. Ely, Nev., and Callao, Utah. See Vol. VIII.
- Ely-Grand Central C. M. Co. Ely, Nev. See Vol. X.
- Ely-Hercules M. Co. Lake City, Colo., and Blackhorse, Nev. See Vol. VIII.
- Ely-Homestake Copper Co. Ely, Nev.
- Ely-Jackpot M. Co. Ely, Nev. See Vol. VIII.
- Ely Jumbo Copper Co. Merged, 1907, in Ely National C. Co. Ely, Nev.
- Ely King Copper & Lead Co. Ely, Nev. See Vol. VIII.
- Ely Mines Co. Property sold, 1907, to Cons. Copper Co. Ely, Nev.
- Ely M. Co. Ely, Nev. See Vol. VIII.
- Ely M. & M. Co. Lands sold, 1906, Ely, Nev. See Vol. VI.
- Ely Nevada Copper Co. Ely, Nev.
- Ely Nev. Exploration Co. Ely, Nev.
- Ely Northern Copper Co. Ely, Nev. See Vol. VIII.
- Ely-Ogden M. Co. Ely, Nev.
- Ely & Osceola Ledge M. & M. Co. Ely and Osceola, Nev. See Vol. VIII.
- Ely-Phoenix Copper M. Co. Ely, Nev. See Vol. VIII.
- Ely-Rand Copper Co. Ely, Nev.
- Ely-Resurrection Copper Co. Deeded property, 1911, to C. W. Freed for judgment of \$13,408.07. Resurrected as Princess C. Co. Ely, Nev. See Vol. VIII.
- Ely-Rochelle Copper Co. Kimberley, Nev.
- Ely Standard Copper Co. Ely, Nev.
- Ely Sulphide Copper Co. Ely, Nev.
- Ely Superior Co. Ely, Nev.
- Ely-Verde C. Co. Succeeded, 1912, by new company of same name. Ely, Nev.
- Ely-Waneta M. & M. Co. Utah charter forfeited, 1910. Ely, Nev.
- Ely Western C. Co. Absorbed by Boston Ely, 1909. Ely, Nev.
- Ely-Wildhorse Copper Co. Ely, Nev. See Vol. VIII.
- Emerald M. & S. Co. Succeeded by Esmeralda C. M. & S. Co. Santa Catarina del Norte, Baja Cal., Mex. See Vol. V.
- Emma M. & Dev. Co. Butte, Mont.
- Empire Copper Co. Reno, Nev. See Vol. III.
- Empire Copper M. & M. Co. Tusas, N. M.
- Empire Copper Syn., Ltd. Rainy Hollow, B. C. See Vol. VIII.
- Empire Gold Bug M. Co. Empire, Colo. See Vol. VI.
- Empire Gold & Copper Co. Central City, Colo. See Vol. VIII.
- Empire Mines Co. Hanover, N. M. See Vol. V.
- Empire M. Co. Lands sold, 1905, to Keweenaw C. Co. Delaware Mine, Mich.
- Empire M. Co. Whitefish, Algoma, Ont.
- Empire Mining & Dev. Co. Arizona. See Vols. X and XI.
- Empire Sm. Co. Property sold, under foreclosure, 1906, to W. F. Willie, Benson, Ariz. See Vol. V.
- Empire & Star M., M. & S. Co. Succeeded by Hecla M. Co. Hecla, Wyo. See Vol. V.
- Empire Tun. & G. M., M. & Trans. Co. Empire and Leadville, Colo. See Vol. VIII.
- Empress M. Co. Merged in Great Belcher of Arizona Co. Belcher, Ariz.
- Encampment Boss M. & M. Co. Apparently succeeded by Boss M. Co. Encampment, Wyo. See Vol. VIII.
- Encampment M. Co. Lost lands, 1913. Encampment, Wyo.
- Encinillas Mines, Ltd. Santa Rosalia, Chih., Mex. See Vol. V.

- Encinito Copper Co.** Succeeded, 1905, by Encinitas C. & Sm. Co., also dead. Encinitas, Cal.
- Enterprise Dev. Co.** Cananea, Sonora, Mex. See Vol. VIII.
- Enterprise M. & M. Co.** Succeeded by Enterprise M. Co., which was merged, 1907, in Swarthmore Cons. M. Co. Eldorado, Colo. See Vol. VI.
- Enterprise M. Co.** Tonopah, Nev. See Vol. VIII.
- Ephia Dev. Co.** Succeeded, 1906, by Ephia M. Co., also defunct. Fronteras, Son., Mex.
- Equitable Copper C.** Encampment, Wyo.
- Erie Cons. M. & Red. Co.** Name changed from Wahnitza Copper Co. Both fraudulent. Matchwood, Mich.
- Erie Copper M. Co.** Milford, Utah. See Vol. VI.
- Erie Gold & Copper M. Co.** Calzona, Cal.
- Erie-Ontario Dev. Co.** Liquidated voluntarily. Winona, Mich. See Vol. VIII.
- Eriega Copper & Coal M. & S. Co.** Bozeman, Mont. See Vol. VI.
- Erik M. Co.** Cananea, Son., Mex. See Vol. VIII.
- Esmeralda Copper Co.** Luning, Nev. See Vol. VIII.
- Esmeralda Copper Precipitating Co.** Ryan, Ariz. See Vol. VII.
- Essex Copper Co.** Matchwood, Mich. See Vol. VIII.
- Esterbrook M. Co.** Property sold to Boston-Wyo. C. Co. Esterbrook, Wyo. See Vol. VIII.
- Estey M. & M. Co.** Succeeded, 1902, by Dividend M. & M. Co. Estey, N. M. See Vol. V.
- Estrella M. Co.** Milford, Utah. See Vol. VI.
- Ethel Cons. Mines Co.** Index, Wash. See Vol. VIII.
- Ethel C. M. Co.** Succeeded, 1902, by Ethel Cons. Mines Co. Index, Wash. See Vol. II.
- Ethel Gold M. Co.** Turret, Colo. See Vol. VI.
- Ethel M. Co.** Callao, Utah. See Vol. X.
- Euclid Dev. Co.** Benson, Ariz. See Vol. VI.
- Eureka Cons. Copper Co.** Gold Hill, N. C.
- Eureka Cons. M. Co.** Merged, 1905, in Richmond-Eureka M. Co. Eureka, Nev.
- Eureka Copper Co.** Globe, Ariz. See Vol. V.
- Eureka Copper M. Co.** Encampment, Wyo. See Vol. VI.
- Eureka Diamond Drill M. Co.** Jackson, Cal. See Vol. X.
- Eureka Mines Co.** Reorganized, 1910, as Eureka Mines Co. Cons. Orogrande, N. M. See Vol. IX.
- Eureka Mines Co. Consolidated.** N. M. Property sold to Jarilla Cons. Copper Co., Dec., 1912. See Vol. X.
- Eureka M. Co.** Succeeded Eureka Dev. Co. Property sold, 1909, to Bisbee Coalition M. Co. Bisbee, Ariz.
- Eureka M. & M. Co.** Ft. Huachuca, Ariz. See Vol. X.
- Evans-Tanzer Cons. Copper Co.** Lavic, Cal. See Vol. V.
- Evanston Mng. Co.** Gabriel, San Juan del Rio, Durango, Mex.
- Evelyn M. & Leasing Co.** Lost charter. Leadville, Colo. See Vol. X.
- Evening Star M. Co.** Riverside, Wyo. See Vol. VII.
- Evening Star Mng. & Mlg. Co.** Colorado. See Vol. XII.
- Evergreen-Eureka Gold & Copper Co.** Was a fake. Former office, 31 Union Square, New York City.
- Evergreen M. & Tun. Co.** Alta, Utah. See Vol. VIII.
- Excelsior Copper Co.** West Broughton, Quebec.
- Excelsior C. & G. M. Co.** Riverside, Wyo.
- Excelsior G. & C. M. Co.** Flagstaff, Ariz.

- Excelsior G. & C. M. Co.** Bouse, Ariz.
Excelsior M. Co. Organ, N. M. See Vol. V.
Excelsior M. & S. Co. Yerington, Nev. See Vol. VI.
- Fairbairn Ex. Co.** Utah. See Vol. XII.
Fairview Mng. Co. Dragoon, Ariz. See Vol. XI.
Fairview M. Co. Basin, Mont.
Falls Creek Copper M. Co., Ltd. Nelson, B. C. See Vol. X.
Fargo Gold & Copper M. Co. Imnaha, Ore. See Vol. VII.
Farmington Gold & Copper M. & M. Co. Farmington, Utah.
Farrell C. Co. Succeeded, 1902, by Pittsburg & Mont. C. Co. Butte, Mont. See Vol. II.
Fauquier Copper Co. Warrenton, Va. See Vol. X.
Federal C. Co. Lands sold to Ojibway M. Co.. Phoenix, Mich. See Vol. VII.
Federal Copper Co. Laramie, Wyo.
Federal C. Co., Ltd. Succeeded, 1902, by Federal G. & C. Co. Superior, Wis. See Vol. IV.
Federal Copper M. & S. Co. Wound up by receiver, 1907; property sold. El Paso, Tex. See Vol. VI.
Federal Exploration Co. Dissolved in 1911. Ingot, Calif.
Federal G. & C. Co. Eureka, Nev. See Vol. VIII.
Federal G. & C. M. Co. Blue Acre, Utah. See Vol. VII.
Federal M. Co. Reorganized, 1905, as Gila Valley C. Co. Safford, Ariz. See Vol. V.
Felix Basin Copper Mines. Montana. Location forfeited in 1915. See Vol. XI.
Fenochia M. Co. Magdalena, Mex. See Vol. IV.
Fentress M. Co. Succeeded by Century Dev. Co. Center, N. C. See Vol. VI.
Fernando M. Co. San Fernando, Mex. See Vol. VI.
Fidelity Copper Co. Ontario. See Vol. XII.
Fidelity M. Co., Ltd. Victoria, Mich. See Vol. VIII.
Fifty Five Cons. M. Co. Lands sold to Magus M. Co., Silverton, Wash.
Fifty Gold Mines Corp'n. Colo. Liquidated.
Finance Mng. Co. St. Thomas, Nev. See Vol. XII.
Findlay Copper Chief Mng. Co. Nevada. See Vol. XII.
Finley G. & C. M. & M. Co. Castleton, Utah. See Vol. VI.
First Chance M. Co. Excelsior, Wash. See Vol. X.
First Chance Mng. & Mlg. Co. Ibapah, Utah. See Vol. XII.
First National Mining Co. New Mexico. See Vol. XI.
Fitts Copper Co. Clifton, Ariz.
Five Points C. M. Co. Merged, March, 1911, in Maniton Hill Co. Globe, Ariz.
Flagstaff Copper Mng. Co. Consolidated with Columbus Cons. and Superior Alta, under name of Wasatch Mines Co., which see. Described, Vols. X and XI.
Flagstaff District Silver M. Co., Ltd. Alta, Utah. See Vol. X.
Flor De Nieve; Cia Min. Concepción del Oro, Mex. See Vol. IX.
Floredia Copper M. Co. Promoted by notorious Financial Securities & Trust Co., Denver. See Vol. X.
Florence Copper Co. Newhouse, Utah.
Florence Copper Mng. Co. Florence, Ariz. See Vol. XII.
Florence M. Co. Property passed to Uteland M. Co. Ouray, Utah.
Florence M., M. S. & Ref. Co. Westcliffe, Mont.
Florence Sm., M. & M. Co. Price, Ariz. See Vol. X.

- Florencia M. Co. Chih., Mex. See Vol. X.
- Flying Dutchman M. Co. Property presumably sold to Copper Jack M. Co. Ibadah, Utah.
- F. M. & D. Copper M. Co. Abandoned. Near Morrison, Colo.
- Fort Pitt Copper Co. N. M. Practically out of business. Was unfavorably regarded. See Vol. XI.
- Forest Hill Cons. M. & M. Co. Foreclosed by bondholders. Tin Cup, Colo. See Vol. VI.
- Fortuna Copper Co. Fortuna, Calif. See Vol. XII.
- Fortuna Gold & Copper Co. Reorganized as Sturdy Gold Mng. Co.
- Fortuna Grande Copper Co. Ely, Nev. See Vol. X.
- Fortuna M. Co. Cananea, Mex. See Vol. X.
- Foss River Cons. C. Co. Everett, Wash. See Vol. XI.
- Foster Cobalt M. Co., Ltd. Ontario. See Glen Lake Cobalt Mines, Ltd.
- Four B's M. Co. Turret, Colo.
- Four Metals Mng. Co. Reorganized as Red Mtn. Mng. Co. Washington, Ariz. See Vol. VIII.
- Four Metals Mng. Co. Telluride, Colo.
- Four Metals Mining Co. Callao, Utah.
- Four Metals Smelter & Mng. Co. Property now owned by Cerro Gordo Mines Co., which see.
- Fourth of July Mng. Co. Boulder, Colo. Property now owned by Cons. C. M. & Sm. Co., which see.
- Fox C. Mng. & M. Co. Mullan, Idaho. See Vol. XI.
- Fraser Mountain Copper Co. Twining, N. M. Property now owned by Taos Mng. Co. See Vol. VI.
- Fraser River Copper M. Co. Kamloops, B. C. See Vol. VIII.
- Fraternity Copper Co. A stockjobbing enterprise. Ely, Nev. See Vol. VIII.
- Frederick Warde G. & C. M. Co. Goodsprings, Nev.
- Free Gold M. & M. Co. Mont. Formerly owned Gold Hill mine, 10 claims, in Moose Creek district (Highland), Red Mtn., south of Butte, Mont.
- Freeland Cons. Mines Co. Succeeded, 1904, by Freeland Dev. & Trans. Co. Freeland, Colo. See Vol. IV.
- Freeland Cons. Mng. Co. Oregon. Property now owned by Cons. Copper Mng. & Power Co. See Vol. XII.
- Freeland Extens. M. & M. Co. Idaho Springs, Colo.
- Freeland Mercantile & M. Co. Freeland, Colo. See Vol. V.
- Fremont Copper Co. Riverside, Wyo. See Vol. X.
- Fremont Copper Mines Co. Copperfield, Colo. See Vol. X.
- Fremont C. M. Co. Lands sold, 1905, to St. Joe M. & M. Co. Riverside, Wyo. See Vol. VI.
- Fremont Development Co. Houghton, Mich., and Shoshone, Wyoming. See Vol. XI.
- Fremont M. & M. Co. Ariz. Was not favorably regarded. See Vol. XI., Copper Handbook.
- French Creek Copper Co. French Creek, Pa.
- French Creek M. Co. Centennial, Wyo. See Vol. VIII.
- Fresno Copper Co., Ltd. Clovis, Calif. Company had a ranch, not a mine, and is another case of much too gullible Englishmen. See Vol. XI.
- Frisco Cons. Mng. Co. Utah. See Vol. XI.
- Frisco M. Co. Title changed, 1903, to Frisco Contact M. Co., and merged, 1909, in Frisco Cons. M. Co., Frisco, Utah. See Vol. VIII.
- Frisco Mines & Tunnel Co. Animas Forks, Colo. See Vol. XII.
- Frontenac Cons. Mines, Ltd. Colo. Bankrupt. Property sold at sheriff's sale, 1915. See Vol. XII.

- Frontenac Copper Co. Calumet, Mich. Property conveyed to Calumet & Hecla Mng. Co.
- Frontenac M. Co., Ltd. Succeeded, 1910, by Frontenac Cons. Mines, Ltd., also dead. See Vol. XI. Central City, Colo. See Vol. VIII.
- Fronteriza Copper M. Co. Ascension, Chih., Mex.
- Furlough Dev. Co. Ariz. Property abandoned, July, 1916, and company dissolved. See Vol. XII.
- Furnace Creek Cons. C. Co. Greenwater, Cal.
- Furnace Creek C. Co. Calif. See Vol. XI.
- Furnace Creek Copper Co. Greenwater, Cal., and Spokane.
- Furnace Creek Extens. C. M. Co. Greenwater, Cal. See Vol. VIII.
- Furnace Creek G. & C. Co. Greenwater, Cal. See Vol. VIII.
- Furnace Creek Oxide C. Co. Greenwater, Cal. See Vol. VIII.
- Furnace Creek So. Extens. Co. Was a fake. Greenwater, Cal. See Vol. VIII.
- Furnace Valley Copper Co. Greenwater, Cal. Address Hon. Patrick Clark, Spokane, Wash.
- Futurity M. & M. Co. Newett, Colo. See Vol. VI.
- Galena Ridge Mng. Co. Meteetse, Wyo. Property owned by Thos. J. Grier, Lead, S. Dak. See Vol. XI.
- Galice Cons. M. Co. Galice, Ore.
- Gallaher, M. & M. Co. Property sold by receiver, 1909, for \$2,800, to Lee A. Johnson. Cle Elum, Wash. See Vol. VIII.
- Gallatin County Basin Copper M. Co. Bozeman, Mont.
- Garcia; Tiburcio. Galeana, Mex.
- Gardiner, Worthen & Goss Co. Tucson, Ariz.
- Garduño y Anexas; Cia Min. Placeres del Oro, Mex.
- Garfield M. Co. Mont. See Vol. XII.
- Garfield M. Co. Brigham, Utah.
- Garfield M. & M. Co. Former address, Harvard, Idaho. See Vol. XII.
- Garfield-Salvador M. Co. Butte, Mont. See Vol. VIII.
- Garland Copper Mng. Co. Encampment, Wyo. See Vol. XI.
- Garrison G. & C. M. Co. Merged, 1907, in Garrison-Monster M. Co. Ibapah, Utah. See Vol. V.
- Gem Cons. M. Co. Property sold, 1909, to Tenabo M. & S. Co. Tenabo, Nev. See Vols. IX and X.
- Gem M. Co. Coolin, Idaho.
- Gen. Grant M. Co. West Creek, Colo.
- George A. Treadwell M. Co. Property sold to satisfy \$130,000 mortgage in 1911. Stockholders asked, May, 1912, to pay 75 cts. a share for stock in a new company, Iron Queen M. & S. Co., which proposed to take up former Treadwell holdings and develop them. Plans regarded unfavorably. Property still a prospect. Address Wm. T. Read, 15 William St., New York City. See Vol. VIII.
- Georgetown M., M. & S. Co. Carson, Colo. See Vol. III.
- Georgetown Gold M. Co. Georgetown, Colo. See Vol. X.
- Geronimo C. M. Co. Was a swindle, "succeeded," 1909, by Am. Dev., M. & Red. Co. Silver City, N. M. See Vol. VIII.
- German American Cop. Co. Alamos, Sin., Mex. See Vol. XI.
- German-American Pioneer Cons. Co. Ariz. See Vol. XII.
- Gertrude M. Co. Succeeded by Eagle Copper Co. Battle, Wyo.
- Geyman M. Co. Butte, Mont. See Vol. VIII.
- Giant-California Mng. Co., Ltd. British Columbia. See Vol. XI.
- Giant Chief Cons. M. Co. Succeeded Giant Chief M. Co. Property sold, 1908, to Utah-Bingham M. Co. Bingham Canyon, Utah.

- Giant M. Co., Ltd.** Rosseano, B. C. See Vol. X.
- Gibosa y Anexas; Cia Min. La.** Lands sold to American Sm., Sec. Co. Jimenez, Chih., Mex.
- Gibraltar Copper M. Co.,** Encampment, Wyo.
- Gila Canyon Copper Co.** Winkelman, Ariz. See Vol. X.
- Gila Copper Co.** Was a twin of the Ray Cons. Co., and merged therein, 1910. Ray, Ariz.
- Gila County M. Co.** Globe, Ariz.
- Gila Monster C. Co.** Ariz. Probably dead. Owned the Confidence mine, near Kelvin, Ariz.
- Gila Mountain C. Co.** Ariz. See Vol. XII and description, Vol. XI.
- Gila River Copper Mines Co.** Alaska & Mont. See Vol. XI.
- Gila Valley C. Co.** Succeeded by Gila Mountain C. Co. See Vol. X.
- Giles M. & M. Co.** Utah. See description, Vol. XII.
- Giroux-Ely Extens. C. Co.** Property sold, 1910, to Giroux Cons. Mines Co., Ely, Nev.
- Gladstone Dev. Co.** Iron Bridge, Algoma, Ont.
- Gladstone-Greenwater C. Dev. Co.** Greenwater, Cal. See Vol. VIII.
- Gladys M. Co.,** Alberni, B. C. See Vol. VIII.
- Gladys Proprietary Gold Mines, Ltd.** Vencedora, Mex. See Vol. IX.
- Globe-Amalgamated Copper Co.** Globe, Ariz. See Vol. VIII.
- Globe-Arizona Copper Co.** Globe, Ariz.
- Globe & Arizona Dev. Co.** Lands sold, 1906, to Superior & Boston C. Co. Globe, Ariz. See Vol. VI.
- Globe-Boston C. M. Co.** Lands sold, 1906, to Globe Cons. C. Co. Globe, Ariz. See Vol. V.
- Globe Cons. C. Co.** Merged, May, 1909, in Cordova C. Co. Globe, Ariz. See Vol. VIII.
- Globe Copper Co.** Ely, Nev.
- Globe Copper M. Co.** Property sold to Old Dominion M. & S. Co. Globe, Ariz.
- Globe Copper M. Co.** Hecla, Wyo. See Vol. VIII.
- Globe Mines Exploration Co.** Ely, Nev. See Vol. X.
- Globe & Pinto M. Co.** Globe, Ariz. See Vol. VIII.
- Globe Standard M. Co.** Globe, Ariz. See Vol. VIII.
- Globe Sulphide C. Co.** Globe, Ariz. See Vol. VIII.
- Globe Western C. Co.** Lost lands, 1908. No relation to company of same name, organized, 1911. Globe, Ariz. See Vol. VIII.
- Globe-Wheatfields M. Co.** Globe, Ariz. See Vol. VIII.
- Glorio Gold & Copper M. Co.** Wenden, Ariz.
- Golconda Cons. Co., Ltd.** Title changed, 1909, to Silverfields M. Co., Ltd. Golconda, Nev. See Vol. VIII.
- Gold Basin M. Co.** Montrose, Colo. See Vol. VIII.
- Gold Belt Dev. & Red'n Co.** Morenci, Ariz. Property sold, 1911, to Eagle Gold & Copper Mng. Co.
- Gold Belt M. Co.** Empire, Mont. See Vol. VIII.
- Gold Bug Cons. M. Co.** Bossburg, Wash.
- Gold & Copper Co. of Bingham.** Succeeded, 1901, by Bingham Cons. M. & S. Co. Bingham Canyon, Utah.
- Gold & Copper Cons. M. & M. Co.** Was a bad egg. Succeeded, 1907, by Hassayampa C. Co. Groom Creek, Ariz. See Vol. VI.
- Gold & Copper Crown M. Co.** Needles, Calif.
- Gold-Copper M. Co.** Lands sold, 1909, to Aztec Mines Co. Prescott, Ariz. See Vol. VIII.
- Gold-Copper M. Co.** Lincoln, Cal.

- Gold & Copper M. Co. Rociada, N. M.
 Gold-Copper M. & Dev. Co. Deadwood, S. D. See Vol. V.
 Gold Cross M. & M. Co. Pitkin, Colo. See Vol. VIII.
 Gold Flint M. Co. Succeeded, 1907, by Lion Gulch Dev. Co. Homestake, Mont.
 Gold Hill Copper Co. Sold by receiver, 1909, for \$45,000, to Wm. H. Geraghty and Frank Van Wagenen, and practically reorganized as Gold Hill Cons. Co. Gold Hill, N. C. See Vol. VIII.
 Gold Hill Quartz M. Co. Gold Hill, Jackson Co., Ore.
 Gold Hyacinth M. Co. Needles, Cal. See Vol. X.
 Gold King Cons. Mines Co. Succeeded by New Gold King Mines, Silverton, Colo. See Vol. VIII.
 Gold Leaf Cons. M. Co. Idaho. Reorganized as Wisconsin M. Co.
 Gold Quartz M. Co. Bullion, Nev.
 Gold Ridge M. Co. Merged, 1910, in Copper Prince Cons. M. & M. Co. of Idaho. Coeur d'Alene, Idaho.
 Gold Rose M. & M. Co. Helena, Mont. See Vol. VIII.
 Golden Desert M. & M. Co. Quartzite, Ariz.
 Golden Eagle Copper Co. Cima, Cal.
 Golden Eagle Gold Mng. Co. Keswick (Copley), Calif. See Vol. XI.
 Golden Eagle M. Co. Rambler, Wyo.
 Golden Gate M. & Dev. Co. Cle Elum, Wash. See Vol. VIII.
 Golden Marguerite S. & C. M. Co. Mullan, Idaho. See Vol. VIII.
 Golden Queen M. Co. Osburn, Idaho. See Vol. X.
 Golden Rule Copper M. & S. Co. Was a swindle. Vail, Ariz. See Vol. VI.
 Golden Shower Copper Co. Tucson, Ariz. See Vol. VIII.
 Golden Star M. Co. Doniphan, Idaho.
 Golden State Mines, Ltd. Dragoon, Ariz.
 Golden Sun M. & M. Co. Dissolved, 1911. Property now owned by Sun Tunnel M. & Trans Co. Denver, Colo.
 Goldfield Copper-Gold M. Co. Hawthorne, Nev. See Vol. VIII.
 Goldfield Copperopolis M. Co. Goldfield, Nev.
 Goldfield Ely Fairview Wonder M. Co. Was a stock-jobbing scheme. Ely, Nev.
 Goldsmith Copper Co., Ltd. Howe Sound, B. C.
 Goldsmith M. Co. Butte, Mont. See Vol. VIII.
 Golden Curry Cons. Mng. Co. Elkhorn, Mont.
 Goleta Cons. Mines. Jordan, Cal. See Vol. VII.
 Goodlander M. & M. Co. Succeeded by Sonora Dev. Co. Moctezuma, Son., Mex. See Vol. VI.
 Good Springs Cons. M. & S. Co. Goodsprings, Nev. See Vol. VIII.
 Goodsprings Sm. & Dev. Co. Goodsprings, Nev. See Vol. VI.
 Goon Venture Copper M. Co. Woodsville, N. H.
 Goodventure M. & M. Co. Hecla, Wyo.
 Goose Lake Copper Co. Cooke, Mont. See Vol. VIII.
 Gothic M., M. & Power Co. Crested Butte, Colo. See Vol. VI.
 Goulais Bay M. Co. Sault Ste. Marie, Ont. See Vol. VIII.
 Gould M. Co. Centennial, Wyo. See Vol. VII.
 Governor Greenwater C. Co., Greenwater, Cal. See Vol. X.
 Gower Mines Syn., Ltd. Blackhawk, Colo. See Vol. VIII.
 Graham County Copper Co. Cedar Springs, Navajo Co., Ariz.
 Graham County M. Co. Succeeded, 1906, by Advance M. Co. Ft. Grant, Ariz. See Vol. VIII.
 Grand Arizona C. Co. Property sold for debt, 1912. Address C. M. Iverson, Sec., Douglas, Ariz. See Vol. X.

- Grand Canyon Copper Co. Grand View, Ariz. See Vol. VII.
 Grand Cons. Dev. Co. Kingman, Ariz. See Vol. X.
 Grand Deposit Copper Co. Cherry Creek, Nev. See Vol. X.
 Grand Eastern Mng. Co. Eureka, Utah.
 Grand Gulch Mng. Co. St. Thomas, Nev. See Vol. XI.
 Grand Island M. Co. Lands passed to Louisiana M. Co. See Vol. VIII.
 Grand Junction Sm. Co. Grand Junction, Colo. See Vol. X.
 Grand La Sal M. Co. Castleton, Utah. See Vol. VIII.
 Grand Marais Copper M. Co. Grand Marais, Minn.
 Grand National Sm. Co. San Juan de Allende, Mex.
 Grand Prize Copper M. Co. Lost lands, 1902. See Vol. III.
 Grand Rapids C. Co. Sold lands to Saginaw Valley C. M. Co. See Vol. III.
 Grand Republic Copper M. Co. Pearl, Colo. See Vol. VIII.
 Grand View M. Co. Lands sold, 1907, to Night Hawk M. Co. Loomis, Wash.
 Granite Creek Sm. & Red. Co. Golconda, Nev.
 Granite Wells M. Co. Daggett, Cal. See Vol. VIII.
 Grant Copper M. Co. Pearl, Colo. See Vol. VI.
 Gray Copper M. Co., Ltd. Absorbed, 1911, by Lead King M. Co. Osburn, Idaho.
 Great Belcher G. & C. Co. Merged in Great Belcher of Ariz. Co., also dead. See Vol. V.
 Great Bonanza Gold Mng. Co., Ltd. Central City, Colo. See Vol. XI.
 Great Copper Flat M. Co. Draper, Utah.
 Great Divide G. Co. Redding, Cal.
 Great Eastern Dev. Co. Globe, Ariz. See Vol. X.
 Great Hope M. Co. Mojave, Cal. See Vol. VIII.
 Great Lakes Copper Co. Algoma, Ont. See Vol. VIII.
 Great Lakes M. & M. Co. Encampment, Wyo.
 Great Lakes M. & S. Co. Encampment, Wyo. See Vol. VI.
 Great Mammoth C. M. Co. Index, Wash.
 Great Northern C. M. Co. Utah Hot Springs, Utah. See Vol. X.
 Great Northern G. & C. Mfg. Co. Lostine, Ore.
 Great Northern M. Co. Burke, Idaho.
 Great Northern M. Co. Baring, Wash.
 Great Peck Mine Co. Providence, Ariz. See Vol. VIII.
 Great Republic C. & G. M. Co. Succeeded, 1912, by Buckeye C. & G. M. Co. Turkey, Ariz.
 Great Standard Copper Mng. Co. Wyoming. See Vol. XI.
 Great Western C. Co. Globe, Ariz. See Vol. VIII.
 Great Western C. Co. Butte, Mont. See Vol. VI.
 Great Western C. Co. Reno, Nev. See Vol. VI.
 Great Western G. Co. Succeeded, 1909, by Afterthought C. Co. at Ingot, Cal. See Vol. VIII.
 Great Western G. & C. M. Co. Butte, Mont.
 Great Western M., M. & S. Co., Ltd. Pocatello, Idaho. See Vol. X.
 Green C. Co. Put out of business, 1906, by injunction secured by Amalgamated C. Co.
 Green Dragon C. Co. Greenwater, Cal. See Vol. VIII.
 Greene Gold-Silver Co. Temósachic, Mex. See Vol. VIII.
 Green Hope M. & M. Co. Guernsey, Wyo. See Vol. VI.
 Greenhorn C. M. Co. Cañon City, Colo. See Vol. VIII.
 Green Mountain C. Co. Raymond, Cal. See Vol. VIII.
 Green Mountain C. Co. Rinconada, N. M. See Vol. VII.

Green Mountain C. M. Co. Property sold, 1904, to Saginaw Valley C. M. Co.

Green Mountain Mng. & Mlg. Co. Howardsville, Colo. See Vol. X.

Green River C. Co. Superior, Ariz. See Vol. VIII.

Greenwater, Arcturus C. M. Co. Greenwater, Cal. See Vol. VII.

Greenwater Bimetallic C. M. Co. Greenwater, Cal. See Vol. VIII.

Greenwater Black Jack C. M. Co. Greenwater, Cal. See Vol. VIII.

Greenwater Black Oxide C. M. Co. Greenwater, Cal. See Vol. VIII.

Greenwater & Boston C. Co. Greenwater, Cal.

Greenwater, Calif. C. Co. Greenwater, Cal. See Vol. VIII.

Greenwater-Calumet C. Co. Greenwater, Cal. See Vol. VIII.

Greenwater Central C. Co. Greenwater, Cal. See Vol. X.

Greenwater Cons. M. Co. Greenwater and Cima, Cal. See Vol. VIII.

Greenwater C. Co. Greenwater, Cal. See Vol. VIII.

Greenwater C. Helmet Co. Greenwater, Cal.

Greenwater C. M. Co. Formerly at Greenwater, Cal. See Vol. VIII.

Greenwater C. M. Syn. Greenwater, Cal. See Vol. VIII.

Greenwater C. Queen M. Co. Greenwater, Cal.

Greenwater C. Range M. Co. Greenwater, Cal. See Vol. VIII.

Greenwater & Death Valley C. Co. Greenwater, Cal. See Vol. X.

Greenwater Death Valley C. M. Co. Greenwater, Cal. See Vol. VIII.

Greenwater & Death Valley Extens. Co. Greenwater, Cal.

Greenwater El Captain C. Co. Greenwater, Cal.

Greenwater Ely Cons. C. Co. Greenwater, Cal., and Ely, Nev. See Vol. VIII.

Greenwater-Etna C. Co. Greenwater, Cal. See Vol. VIII.

Greenwater Furnace Creek C. Co. Greenwater, Cal. See Vol. VIII.

Greenwater Ibox C. & G. M. Co. Greenwater, Cal.

Greenwater-Mohawk Mines Co. Greenwater, Cal. See Vol. VIII.

Greenwater Pay C. Co. Greenwater, Cal. See Vol. VIII.

Greenwater Polaris Co. Co. Greenwater, Cal. See Vol. VIII.

Greenwater Prospectors Ex. Co. Merged, 1907, in C. Mines & Smelters Corp. of America. Greenwater, Cal. See Vol. VIII.

Greenwater Red Boy C. Co. Greenwater, Cal. See Vol. VIII.

Greenwater-Saratoga C. Co. Greenwater, Cal. See Vol. VIII.

Greenwater Sunset C. Co. Greenwater, Cal. See Vol. VIII.

Greenwater Superior C. M. Co. Greenwater, Cal. See Vol. VIII.

Greenwater Victor C. Co. Greenwater, Cal. See Vol. VIII.

Greenwater-Vindicator C. Co. Greenwater, Cal. See Vol. VIII.

Greenwater Willow Creek C. Co. Greenwater, Cal. See Vol. VIII.

Greenwood-Phoenix Tun. Co., Ltd. Reorganized, 1909, as Greenwood-Phoenix Tramway Co., Ltd. Phoenix, B. C. See Vol. VIII.

Grey Eagle G. M. Co. Merged, 1901, in Granby Cons. M., S. & Power Co., Ltd.

Grey's Siding Development Co., Ltd. Ontario. See Vol. XII.

Greylon C. Mines Co. Pearl, Colo.

Grindall M. & S. Co. Kasaan, Alaska. See Vol. VIII.

Grizzly Mining Co. Utah. Succeeded by Michigan-Utah Mining Co., March, 1912.

Growler C. Co. Was a reorganization of the Boston G.-C. Co. Succeeded by Colonial C. Co. Gila Bend, Ariz. See Vol. VIII.

Guadalajara, S. A.; Fundición Metalúrgica De. Guadalajara, Mex. See Vol. VIII.

Guadalupaño M. Co. Torres, Sonora, Mex.

Guadalupe; Cia. Min. De La. Santa Engracia, Mex.

- Guardian C. M. Co.** Lands sold, 1906, to Butte Coalitlon M. Co. See Vol. V.
- Guaynopa Dev. Co.** Temósachic, Mex. See Vol. VIII.
- Guaynopa S. & Red. Co.** Merged, 1904, in Internat'l. Cons. S. & M. Co. See Vol. IV.
- Guaynopita C. Co.** Temósachic, Mex. See Vol. VIII.
- Guerrero Dev. Co.** Chilpancingo, Mex. See Vol. VI.
- Guggenheim-Greenwater C. Co.** Property sold, 1908, to Lee Cons. Mines Co. See Vol. VIII.
- Gum Tree G. M. & M. Co.** Succeeded by Gum Tree Cons. M. & M. Co. See Vol. VI.
- Gwin Mine Development Co.** California. See Vol. X.
- Gypsy Blair M. Co.** Sold lands, 1905, to Kennebec M. Co. Brighton, Utah.
- Hackberry M., M. & Dev. Co.** Dewey, Ariz. See Vol. VIII.
- Hadley Cons. C. Co.** Ketchikan, Alaska. See Vol. VIII.
- Haggarty Copper M. Co.** Rudefeha, Wyo.
- Haggarty-Jordan Copper M. Co.** Was a bad egg. Battle, Wyo. See Vol. VIII.
- Hague & Hulbert Expl'n. Co.** Laurium, Mich. See Vol. VIII.
- Halifax Copper Co.** Virgilina, Va.
- Halliwell Copper Co.** Ontonagon, Mich. See Vol. VIII.
- Hall Mines, Ltd.** Succeeded, 1900, by Hall M. Co., Ltd. Nelson, B. C.
- Hall Mining & Smelting Co., Ltd.** Nelson, B. C. See Vol. VIII.
- Ham; Clemente.** Promontorio, Mex.
- Hamilton Mining Co.** Matchwood, Mich. See Vol. II.
- Hamilton M., M. & Trans Co.** Winfield, Colo.
- Hancock Copper M. Co.** Succeeded, 1906, by Hancock Cons. M. Co. Hancock, Mich. See Vol. II.
- Hancock Mines Co.** Organ, N. M. See Vol. III.
- Hancock Mining Co.** Succeeded, 1880, by Hancock C. M. Co. Hancock, Mich.
- Handspike C. M. Co.** Succeeded by Little North Fork C. M. & M. Co. Shoshone, Idaho. See Vol. X.
- Hane Copper M. Co.** Butte, Mont.
- Hannibal Cons. M. Co.** Silver City, Utah. See Vol. IX.
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Lawson Dev. Co. Operated in Mascota district, Jalisco, Mex., 1906-1909.
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- Madera M. Co. Ariz. Machinery has been removed and property is idle. No funds. See Vol. XI.
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- Madora M. Co. Ariz. Operated in Santa Rita Mts., Ariz., 1907.
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- Major M. & M. Co. Ariz. Absorbed, 1916, by Sheldon Mng. Co., which see.
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- Mancayan C. Syn., Ltd. Mancayán, Philippines.
- Mandan M. Co. Mich. Lands sold at receiver's sale, 1899, for \$8,000.
- Manhattan C. Co. Operated in Ontonagon Co., Mich., about 1845.
- Manhattan C. & G. M. Co. Pioche, Nev.
- Manhattan C. M. Co. Merged, 1902, in Troy-Manhattan C. Co. Troy, Ariz.
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- Maricopa C. Co. Ariz. No trace of operations secured.
- Maricopa C. Mines Co. Wickenburg, Ariz.
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- Mary Schultz C. King M. & S. Co. Cripple Creek, Colo.
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- Mashell C. M. & Red'n. Co. Etonville, Wash. See Vol. VIII.
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- Mason Valley C. Co. Succeeded, 1907, by Mason Valley Mines Co. Yerington, Nev.
- Massachusetts C. Land & M. Co. No trace of operations secured.
- Massasoit G. & C. Co. No trace of operations secured.
- Mass M. Co. Mich. Succeeded, 1899, by Mass Cons. M. Co.
- Mastodon G. & C. Co. Idaho. Succeeded by Pennsylvania M. & M. Co.

- Matilda M. Co. Utah. Lands sold, 1910, to Chief Cons. M. Co.
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- Michoacán C. M., Trad. & Trans. Co.** Mex. Delaware charter repealed, 1905.
- Michoacán San Francisco C. Mines Syn., Ltd.** Liquidated, voluntarily, 1902, Michoacán, Mex.
- Midas C. Co.** Alaska. Property now owned by Granby Cons. M., S. & P. Co., which see.
- Midland G. & C. M. & Red'n. Co.** Hot Springs, Utah. See Vol. X.
- Midland L. & Z. Co.** Wisc. Property has been abandoned. See Vol. XII.
- Midway M. & Sm. Co.** Fallon, Nev. See Vol. X.
- Milan Mining & Milling Co.** Milan, N. H.
- Milford C. M. & Sm. Co.** Milford, Utah. See Vol. X.

- Milford G. & C. M. Co. Milford, Utah. See Vol. X.
 Milford-Utah C. Co. Milford, Utah. See Vol. X.
 Military M. & M. Co., Ltd. Inactive corporation. Burke, Ida. See Vol. XII.
 Millard County G. & C. M. Co. Utah. No trace of operations secured.
 Mill Canyon C. Co. Kelly, N. M.
 Miller M. Co. Succeeded, 1908, by Kansas-Cananea C. Co. Cananea, Mex.
 Milton C. Co. Victoria, Mich. See Vol. II.
 Milwaukee-Montana Natural Bridge G. & C. M. Co. Contact, Mont. See Vol. V.
 Milwaukee & New Mex. M. Co. Tres Piedras, N. M. See Vol. VIII.
 Milwaukee-Palmer Mt. G. & C. M. Co. Loomis, Wash.
 Mina Grande Cons. M. & M. Co. Forfeited N. J. charter, 1906.
 Mina Grande M. Co. Operated near San Antonio de Huerta, Mex., 1905.
 Minaret M. Co. Nacozari, Mex. See Vol. X.
 Minaret Mines Co. Mex. Succeeded, 1910, by Harris C. Co.
 Mine Dev. Ass'n. Socorro, N. M. See Vol. X.
 Mine La Motte Dev. Co. of N. Y. Fredericktown, Mo.
 Mineral Creek C. Co. Globe, Ariz. See Vol. III.
 Mineral Creek Mines Co. Globe, Ariz. See Vol. VIII.
 Mineral Creek M. Co. Red Rock, Ariz.
 Mineral Creek M. & S. Co. Mineral, Wash.
 Mineral Dev. Co. Worthington, Ont.
 Mineral Hill C. Syn., Ltd. Huron, Ariz. See Vol. III.
 Mineral Hill M. Co. Porthill, Idaho. See Vol. X.
 Mineral Hill M. Co. Merged, 1908, in Penn-Wash Cons. Mines Co. Conconully, Wash. See Vol. VIII.
 Mineral Hill M. & S. Co. Spenceville, Cal. See Vol. X.
 Mineral Hill Tunnel & C. M. Co. Danville, Wash. See Vols. XI and XII.
 Mineral M. Co. Huntington, Ore.
 Mineral Mt. C. Co. Operated near Safford, Ariz., 1905.
 Mineral Mt. M. Co. Calabasas, Ariz.
 Mineral Mountain M. Co. Canyon Ferry and Austin, Mont. See Vol. IX.
 Mineral Mt. M. Co. Lucin, Utah.
 Mineral Mt. M. Co., Ltd. Steins, N. M.
 Mineral Pt. Mng. Dev. Co. Junction, Ariz.
 Mineral Point M. Co. Marble, Colo. See Vol. X.
 Mineral Point M. Co. Osborn, Idaho.
 Mineral Ridge M. & M. Co. Coeur d'Alene, Idaho.
 Mineral Union M. Co. of Lake Superior. No trace of operations secured.
 Miners C. Co. Merged, 1899, in Isle Royale C. Co. Houghton, Mich.
 Miners' Smelting Co. Milford, Utah.
 Mines Finance Co. Happy Camp, Cal. See Vol. IX.
 Mines Venture Syn. Alturas, Cal., and Oregon. See Vol. VIII.
 Mining Issues Co. N. Y. Dissolved, 1911. See Vol. XI.
 Minneapolis C. M. & M. Co. Boulder, Mont., and Encampment, Wyo. See Vol. IV.
 Minneapolis Cuprite M. Co. Cuprite, Nev.
 Minneapolis & Radersburg M. & M. Co. Radersburg, Mont.
 Minnehaha C. G. M. Co. Danville, Wash. See Vol. VI.
 Minnesota-Arizona Copper Co. Was a Sibley scheme, n. g. Copper Crk., Ariz.
 Minnesota M. Co. Rockland, Mich. See Mich. C. M. Co., Vol. II.
 Minnie-Belle M. & Dev. Co. Bouse, Ariz. See Vol. X.
 Minnie Gulch M. & Tunnel Co. Silverton, Colo.
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- Minnie Mabel G. & C. M. Co.** Rambler, Wyo. See Vol. V.
Minnie M. & M. Co. Bingham, Utah.
Minong M. Co. Isle Royale, Mich. See Vol. II.
Minong Range C. Co. Succeeded, 1906, by Rudolph Land Co. Gordon, Wis. See Vol. III.
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Missizona G. & C. Co. Las Vegas, Nev.
Missoula & Coeur D'Alene C. Co. Murray, Idaho. See Vol. X.
Missoula Copper Mng. Co. Mullan, Idaho.
Missouri & Ariz. C. M. Co. Mayer, Ariz. See Vol. VIII.
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Missouri C. Co. Fredericktown, Mo.
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Mitchell C. M. Co. Florence, Mont. See Vol. VIII.
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Mizpah Cons. C. & G. Mng. Co. Ely, Nev. Mine worked by Jersey Cons. C. & G. Mng. Co.
Mizpah C. Co. Succeeded, 1907, by Ely National C. Co. Ely, Nev.
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Mizpah Mines & Realty Co. Ely, Nev.
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Money Metals M. Co. Poland, Ariz. See Vol. X.
Monida G. & C. M. Co. Mullan, Idaho. See Vol. X.
Monitor C. M. Co. Organized, 1907, to operate in the Hoodoo district, Latah Co., Idaho.
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Monitor C. M. & S. Co. Idaho. No trace of operations secured.

- Monitor Consol. Copper Mng. Co.** Saltese, Mont. Reorganized as **Montana-Idaho Copper Co.**
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Monster M. Co. Irapah, Utah.
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Montana & Ariz. Cons. C. Co. No trace of operations secured.
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Montana Copper & Gold Mng. Co. Another of the Sonora Central litter of wild cats.
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Montana Cons. M. Co. Saltese, Mont.
Montana C. Co. Helena, Mont. See Vol. VIII.
Montana C. M. Co. Mont. N. J. charter forfeited, 1907.
Montana-Corbin M. Co. Mont. Succeeded, 1912, by the **Corbin-Copper King M. Co.**
Montana Furnace Creek C. Co. Greenwater, Cal. See Vol. VIII.
Montana Mineral Land Dev. Co. Basin, Mont. Succeeded, 1912, by the **Betty Alden M. Co.**
Montana M. Co. Succeeded, 1910, by **Missouri M. Co.** Eureka, Utah. See Vol. VIII.
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Montana Overland C. Co. Sheridan, Mont.
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Montana & St. Paul M. Co. Mont. Succeeded, 1905, by **Mont.-Overland C. Co.**, also dead.
Montana S. & Ref. Co. No trace of operations secured.
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Monterey G. & C. M. Co. No trace of operations secured.
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Montezuma C. M. Co. Ariz. Property sold to **Southwestern Miami Development Co.** See Vols. VII and IX.
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Montpelier C. M. & S. Co. Merged, 1905, in **Bonanza M. Co.** Montpelier, Idaho. See Vol. V.
Montpelier Mines, Ltd. Montpelier, Utah.

- Montreal & Boston Cons. M. & S. Co.** Greenwood, B. C. See Vol. V.
- Montreal M. Co.** Price, Ariz.
- Montreal M. Co.** Operated, 1846-1854, in Algoma Co., Ont.
- Montreal M. & S. Co.** Utah. Forfeited Utah charter, 1910.
- Monument C. M. Co.** Dillon, Mont. See Vol. X.
- Moon-Anchor C. M. Co.** Encampment, Wyo.
- Morancy M. Co.** Operated, 1880, near Sullivan, Maine.
- Morelos, S. A.; Cia. Cobre de. Mex.** Was the Mexican incorporation of the Royal Morelos C. Co.
- Morelos C. Dev. Co.** Maine. No trace of operations secured.
- Morenci-Ariz. M. Co.** Clifton, Ariz.
- Morenci C. Co.** Morenci, Ariz. See Vol. V.
- Morenci C. Mines, Ltd.** Merged, 1903, in Clifton C. Mines of Ariz., Ltd. Morenci, Ariz.
- Moresby Island M. Co.** Jedway, B. C.
- Morman M. & M. Co.** Las Cruces, N. M.
- Mormon Girl M. Co.** Was a bad egg. Cave Creek, Ariz. See Vols. V and VI.
- Morning Bell C. M. & S. Co.** B. C. No trace of operations secured.
- Morning Star M. Co.** Dewey, Ariz.
- Morris M. Co.** Merged, 1908, in Continental-Morris C. M. Co. Battle, Wyo. See Vol. VIII.
- Morrison Mines, Ltd.** Greenwood, B. C. See Vol. IV.
- Morrison M. Co.** Humboldt House, Nev.
- Morrow C. Co.** Merged, 1908, in Clara Cons. G. & C. M. Co. Planet, Ariz.
- Moscow Bonanza M. Co.** Frisco, Utah. See Vol. X.
- Moss C. M. Co.** Provo, Utah. See Vol. X.
- Mount Alcott C. Co.** Utah. No trace of operations secured.
- Mount Baker G., C. & Tin Co.** Glacier, Wash. See Vol. IX.
- Mount Eddy M. & Dev. Co.** Sisson, Cal.
- Mount Goddard C. M. Co.** San Bernardino Co., Cal.
- Mount Hope M. & M. Co.** Thompson, Mont. See Vol. X.
- Mount Shasta G. Mines Corp.** Shasta, Cal. See Vol. IV.
- Mount Stanley Butte M. Co.** San Carlos, Ariz.
- Mount Tritle C. Co.** Prescott, Ariz. See Vol. VIII.
- Mount Turnbull C. M. & S. Co.** Safford, Ariz. See Vol. X.
- Mount Union M. Co.** Merged, 1904, in Mount Union Cons. M. Co. Prescott, Ariz.
- Mount Washington C. Co.** Mount Washington, Md.
- Mount Whipple M. Co.** Needles, Cal. See Vol. X.
- Mount Zirkel C. M. Co.** Was a bad egg. Pearl, Colo. See Vol. VIII.
- Mountain Chief Mine.** Butte, Mont.
- Mountain Cons. M. Co.** N. Y. Ceased business, 1884.
- Mountain Dell Cons. Mng. Co.** Sold out by sheriff, 1914.
- Mountain Gem M. Co.** Saltese, Mont.
- Mountain Key G. M. Co.** Pinos Altos, N. M.
- Mountain Lake M. Co.** Utah. In 1916 merged with Great Western G. & C. Co. and Thor M. Co., under title of Great Western Mines Co., which see.
- Mountain Lyon G. & C. Co.** Operated, 1905, in the Magdalena district, Mex.
- Mountain M. Co.** Colo. See Salida Copper Co. Property is the Griffith mine.
- Mountain Queen M. & M. Co.** Animas Fork, Colo. See Vol. X.
- Mountain Top Cons. M. Co.** Operated, 1864, in Calaveras, Cal.
- Mountain View C. Co.** Kerby, Josephine, Ore. See Vol. III.

- Mountain View M. Co.** Eureka, Utah.
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Mullan M. Co. Mullan, Idaho. See Vol. X.
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Murray C. M. Co. Utah. No trace of operations secured.
Murray Hill M. Co. Eureka, Utah.
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- Nevada British Mng. Co., Ltd. Cherry Creek, White Pine Co., Nev. Idle and probably dead. See Copper Handbook, Vol. XI.
- Nevada Buckskin Combination M. Co. Buckskin, Nev. See Vol. X.
- Nevada-Cal. Prosp. Co. Greenwater, Cal. See Vol. VIII.
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- Nevada-Commonwealth M. & M. Co. Galena, Nev.
- Nevada Cons. C. & G. M. & M. Co. Yerington, Nev. See Vol. VI.
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- Nevada C. Co. - Merged, 1902, in Nev. Bell C. M. & Red. Co. Lovelock, Nev. See Vol. II.
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- Nevada C. Co. Succeeded by Azurite M. Co., 1911. Sandy, Nev.
- Nevada C. M. & S. Co. Cuprite, Nev. See Vol. VIII.
- Nevada Copper Co. Former address, Smyths, Utah. Presumably dead. Described in Copper Handbook, Vol. XI.
- Nevada Copper Platinum & Nickel Co. Bunkerville, Nev. See Vol. XI.
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- Nevada Greenwater M. Co. Greenwater, Cal. See Vol. VIII.
- Nevada Greenwater M., M. & S. Co. Greenwater, Cal.
- Nevada Metals Extrac. Co. Nev. See Florence Goldfield M. Co.
- Nevada Nickel & C. Co. Succeeded by Nev. C. Platinum and Nickel Co.
- Nevada Northern C. M. & M. Co. Winnemucca, Nev. See Vol. X.
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- Nevada-Pacific C. Co. A bad egg. Luning, Nev. See Vol. IX.
- Nevada Tungsten Mines Co. Nev. Out of business. See Vol. XII.
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- New Atlas Mng. Co. Whitehorse, Y. T.
- New Baltic Ex. Succeeded, 1909, by New Baltic C. Co. Houghton, Mich. See Vol. IX.
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- New Central C. M. Co. Battle, Wyo.
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- New Departure M. Co. Dillon, Mont. See Vol. VIII.
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- New England-Ariz. C. Co. Merged, 1907, in Verde River C. Co. Cherry, Ariz.
- New England-Ariz. C. G. M. Co. Paradise and Dudleyville, Ariz.
- New Eng.-Colo. C. Mines Co. Copperfield, Colo.
- New Eng. C. Co. Succeeded, 1904, by N. Eng. & Clifton C. Co. Clifton, Ariz.
- New Eng. C. Co. Copper Harbor, Mich.
- New England G. & C. Mng. Co. Utah. Mortgages foreclosed by International Trust Co., Boston, Dec., 1915. See Vol. XII.
- New Eng.-Utah M. Co. Bingham Canyon, Utah. See Vol. X.

- New Era M. Co.** Cananea, Mex. See Vol. X.
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- Noble M. & M. Co. Sheridan, Mont. See Vol. VIII.
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- North American Mines Co. Absorbed, 1908, by the Mary Verna M. Co. Frisco, Colo.
- North American M. Co. Succeeded, 1906, by North American C. Co. Lordsburg, N. M. See Vol. VI.
- North American M. Co. Succeeded, 1907, by North American C. Co. Burkemont, Ore. See Vol. VI.
- North American Prospecting & M. Ass'n. White Pine, Colo. See Vol. X.
- North Arkansas Zinc, L., C. S. & G. M. Co. Morrystown, Ariz. See Vol. VII.
- North Beck M. Co. Eureka, Utah. See Vol. IX.
- North Bisbee Dev. Co. Merged, 1909, in Bisbee Coalition M. Co. Bisbee, Ariz. See Vol. VIII.
- North Burro C. M. Co. Leopold, N. M. See Vol. VIII.
- North Butte Extension C. M. Co. Butte, Mont. See Vol. VIII.
- North Butte Extension M. Co. Butte, Mont. See Vol. X.
- North Butte Mountain C. Co. Butte, Mont. See Vol. VIII.
- North Butte Summit C. M. Co. Butte, Mont. See Vol. VIII.
- North Carolina Mng. Co. Webster, N. C.
- North Coast C. Co. Bella Coola, B. C. See Vol. X.
- North Coast C. Co. Mt. Vernon, Wash. See Vol. X.
- North Coast M. & M. Co. Wash. Property sold to British Col. M. Co. 1911.
- North Coast M. & Red'n. Co. Darrington, Wash. See Vol. VIII.
- North Colo. M. Co. Eureka, Utah. See Vol. IX.
- North Fork C. M. & M. Co. Mullan, Idaho. See Vol. VIII.
- North Gemini M. Co. Eureka, Utah.
- North Horn Silver & C. M. Co. Succeeded March 1909, by Frisco Cons. M. Co. Frisco, Utah.
- North Mowry Mines Co. Patagonia, Ariz. See Vol. VIII.
- North Park (U. S. A.) C. Syn., Ltd. Keystone, Wyo. See Vol. VIII.
- North Platte C. M. & Sm. Co. Douglas, Wyo. See Vol. VI.
- North Shore Copper & Sm. Co. Aberdeen, Ont.
- North Star M. Co. Ironwood, Mich. See Vol. VIII.
- North State G. & C. M. Co. Jamestown, N. C. See Vol. VIII.
- North Utah Mng. Co. Bingham, Utah. See See Mineral Lands Co. Vol. XI.
- North Verde C. Co. Jerome, Ariz. See Vol. VIII.
- North Wisconsin C. M. Co. Succeeded, 1899, by Chippewa C. M. Co., also dead. West Superior, Wis.
- Northeast Butte C. M. Co. Butte, Mont. See Vol. VIII.
- Northern Cal. Investment Co. Copley, Cal. See Vol. X.
- Northern Ontario Consol. Cop. Co., Ltd. Dean Lake, Ont.

- Northern Ont. Copper Co., Ltd. Succeeded, 1906, by Northern Ont. Cons. C. Co., Ltd. Dean Lake, Ont. See Vol. VI.
- Northern Texada Mines, Ltd. Van Anda, B. C. See Vol. IX.
- Northwest C. Co. Van Anda, B. C.
- Northwest M. Co. Kettle Falls, Wash. See Vol. III.
- Northwest Smelting & Ref. Co. Sumpter, Ore.
- Northwestern Cons. Lumber, Oil & C. Co. Baker City, Ore. See Vol. III.
- Northwestern C. M. Co. Dillon, Wyo. See Vol. VIII.
- Northwestern Metals Co. Helena, Mont. Sold out by sheriff, June, 1916.
- Northwestern Mng. Co. Idaho. Dead. Mine, acquired by Blue Jacket Mng. Co., R. H. Bayard, pres., Gailbin Bldg., Baltimore, Md.
- Northwestern Sm. & Ref. Co. Crofton, B. C. See Vol. IV.
- Norvell-Pickerell C. M. Co. Kingman, Ariz., and Encampment, Wyo. See Vol. X.
- Norway Mountain G. & C. M. Co. Rosslund, B. C.
- Norwegian Cons. M. Co. Calif. See Vol. XII.
- Notaway G. & C. M. Co. Silverton and Central City, Colo. See Vol. VI.
- Number 7 Mining Co., Ltd. Greenwood, B. C. See Vol. V.
- Oak Consol. Mng. & Milg. Co. Grants Pass, Oregon.
- Oaks M. & M. Co. Alta, Utah. See Vol. X.
- Oasis G. & C. M. Co. Oasis, Utah. See Vol. X.
- Oasis Mng. & Dev. Co. Erekson, Utah.
- Oaxaca Expl'n Co. Ocotlán, Oax., Mex. See Vol. VIII.
- Oaxaca Sm. & Ref. Co. Property sold, 1908, to bondholders. Oaxaca, Mex.
- O. B. Gray C. Co. Pennington, N. J. See Vol. VI.
- Ocala C. Co. Tyrone, N. M. See Vol. X.
- Occidental C. Co. Palomas, Chih., Mex. See Vol. VIII.
- Occidental M. Co. A bad egg. Keswick, Cal. See Vol. VIII.
- Ocotes, S. A.; Min. De Cobre, Los. Lands sold, 1906, to Teziutlán C. M. & Sm. Co. Ejutla, Oax., Mex. See Vol. VI.
- Octavia M. Co. Cambria, Wyo. See Vol. X.
- Odin M. Co. Park City, Utah. See Vol. X.
- Ogden-Buckhorn M. Co. Merged in Del Verde Tunnel Co., and discontinued. Ogden, Utah. See Vol. VIII.
- Ogden-Lucin Co. Lucin, Utah.
- Ogden Valley M. & Water Co. Eden Utah. See Vol. X.
- O'Hara Mountain G. & C. Co. Was a John J. O'Hara swindle. Goldfield, Nev. See Vol. VIII.
- Ohio Lead M. & Sm. Co. Wells, Nev. See Vol. XI.
- Ohio M. & M. Co. Montezuma, Colo.
- Ohio & Tennessee Mng. Co. Wickenburg, Ariz.
- O. K. Gold & C. M. Co. Florence, Ariz. See Vol. VIII.
- Oklahoma C. Co. Florence, Ariz. See Vols. X. and XI.
- Oklahoma M. Co. Yerington, Nev. See Vol. IX.
- Oklahoma M. & S. Co. Price, Ariz. See Vol. VI.
- Old Baldy, G. M. & Tunnel Co. Elizabethtown, N. M.
- Old Bullion M. Co. Merged, 1910, in Bullion Coalition Mines Co., Utah.
- Old Dominion Dev. Syn., Ltd. Kamloops, B. C. See Vol. VIII.
- Old Emma Mng. Co. Succeeded by Old Emma Mines Co. Alta, Utah. See Vol. VIII.
- Old Glory C. Co. Property sold, 1910, to Anaconda C. M. Co., Butte, Mont. Company dissolved, 1911. See Vol. VIII.
- Old Governors C. M. & S. Co. Roswell, N. M. See Vol. VIII.
- Old Hickory C. M. Co. Absorbed, 1901, by Copper Chief, later Sater, Ft. Pitt Copper Co., Clayton, N. M.

- Old Ironsides Mining Co. Merged, 1901, in Granby M., Sm. & P. Co., Ltd. Phoenix, B. C.
- Old Reliable C. Co. Property sold to Calumet & Copper Creek M. Co., Copper Creek, Ariz.
- Old Tiewaukee M. Co. Property passed, 1908, to Bingham-Butte Cons. M. Co. Bingham Canyon, Utah. See Vol. VIII.
- Old Town M. & M. Co. Succeeded by Old Town Cons. M. Co., also dead. Russell Gulch, Colo. See Vol. VI.
- Olentangy M. Co. Chesaw, Wash. See Vol. X.
- Olga C. Co. Luning, Nev. See Vol. X.
- Olive Camp M. Co. Tucson, Ariz. See Vol. VIII.
- Oliver M. Co. Merged, 1903, in San Juan Sm. & Ref. Co. Silverton, Colo.
- Olympia M. Co. of Wyo. Encampment, Wyo. See Vol. VIII.
- Omaha C. M. Co. Encampment, Wyo.
- Omaha G. & C. M. & Sm. Co. Bigtimber, Mont.
- Omega M. Co. Succeeded, 1906, by Omega C. Co., also dead. Vail, Ariz. See Vols. IX-X.
- Oneida G. & C. Co. Nogales, Ariz.
- Onn Copper Mng. Co. Coram, Calif. See Vol. XI.
- Onoko Mines Co. Central City, Colo. See Vol. VIII.
- Ontario & Coeur D'Alene M. Co. Mullan, Idaho. See Vol. VIII.
- Ontario & Colorado G. & C. M. Co. Central City, Colo. See Vol. VI.
- Ontario-Colorado M. Co. Central City, Colo. See Vol. X.
- Ontario C. Co. A bad egg. El Dorado, Ont. See Vol. VIII.
- Ontario Dev. Co. Goulais Bay, Ont. See Vol. X.
- Ontario G. & C. M. Co. Prescott, Ariz.
- Ontario Nickel Co., Ltd. Worthington, Ont. See Vol. X.
- Ontario Nickel & C. Co. Columbus, Mont.
- Opal Gold M. & M. Co. Chesaw, Wash.
- Ophir Cons. G. & C. M. Co. Florence, Ariz. See Vol. VI.
- Ophir Cons. Mines Co. Ames, Colo.
- Ophir C. M. Co. Lands sold, 1906, to Butte Central & Boston C. Corp. Butte, Mont.
- Ophir M. Co. A bad egg. Jerome, Ariz. See Vol. IX.
- Ophir M. Co. Apparently succeeded by Ophir C. M. Co. Butte Mont.
- Optimo G. & C. M. Co. Saltese, Mont.
- Oquirrh-Bingham C. Co. Bingham Canyon, Utah. See Vol. VI.
- Orange Blossom Extension M. & M. Co. Company dissolved 1910. Bagdad, Cal. See Vol. IX.
- Orange Blossom M. & M. Co. Forced into receivership and succeeded, 1910, by Bagdad M. & M. Co. Bagdad, Cal. See Vol. VIII.
- Ordенаura M. Co. Velardeña, Dur., Mex.
- Ore Knob C. Co. Jefferson, N. C. See Vol. X.
- Ore Knob M. Co. Jefferson, N. C. See Vol. V.
- Oregon & Arizona C. Co. Ariz. See Vol. XII.
- Oregon & Arizona M. Co. Old Glory, Ariz. See Vol. VIII.
- Oregon Homestead M. & Red. Co. Galice, Ore. See Vol. VIII.
- Oregon Ore Red. Works. A fake. Portland, Ore. See Vol. II.
- Oregon Short Line M. Co. Sold lands to Bristol Cons. Mines Co. Pioche, Nev.
- Oregon Sm. & Ref. Co. Reorganized as Northwest Sm. & Ref. Co. Sumpster, Ore. See Vol. VIII.
- Orford Copper Co. Bayonne, N. J. Absorbed by International Nickel Co., 1912.
- Orient Gold M. Co. Succeeded by Orient Gold Mines, Ltd. Bossburg, Wash. See Vol. X.

- Oriental M. & M. Co.** Succeeded, 1913, by Aladdin M. Co., Providence, Ariz.
- Original Cons. M. Co.** Butte, Mont. See Vol. VIII.
- Original Yerington C. Co.** Yerington, Nev. No trace of operations.
- Oriole M. & M. Co.** Succeeded by Oriole M. Co., 1910. Metaline, Wash.
- Orion M. Co.** Lordsburg, N. M. See Vol. VIII.
- Orion Oro Dev. Co.** Vicksburg, Ariz.
- Orizaba Cons. M. & S. Co.** Modena, Utah. See Vol. X.
- Oro Cons. M. Co.** Mineral Point dist., Yavapai Co., Ariz. See Vol. X.
- Oro Denoro Mines, Ltd.** Succeeded by Denoro Mines, Ltd. Rossland, B. C. See Vol. V.
- Oro Grande M. Co.** Globe, Ariz. See Vol. VIII.
- Oro Maximo M. Co.** Bacoachi, Son., Mex. See Vol. X.
- Oro Plata M. & Dev. Co.** Dillon, Mont. See Vol. VIII.
- Orogrande Sm. Co.** Orogrande, N. M. See Vol. IX.
- Orphan C. Co.** Ariz. Property sold under judgment in 1913 and since idle. See Vol. XI.
- Osceola G. & M. Co.** Property sold, 1902, to North American C. Co. Rudefeha, Wyo.
- Osceola Junior M. Co.** Dillon, Wyo. See Vol. X.
- Otate Copper Co.** Llano, Son., Mex.
- Ottumwa C. Co.** Holmes, Wyo.
- Ouras; Cia. Min. Cas.** Tepezalá, Mex. See Vol. IV.
- Ouray Chief M. Co.** Ouray, Colo.
- Ouray Cons. M. Co.** Ouray, Colo. See Vol. X.
- Overland G. M. Co.** Cableville, Ore.
- Overlock Copper Co.** Moctezuma, Son., Mex. Owned by Arizona & New Mexico Trading Co., c/o E. R. McBurnie, Douglas, Ariz.
- Oversight M. & M. Co.** Probably dead. Republic, Wash. See Vol. XI.
- Owl Head M. Co.** Succeeded, 1910, by Owl C. Co. Red Rock, Ariz. See Vol. VIII.
- Oxford C. M. Co.** Pierce, Idaho. Company dormant or defunct. See Vol. XI.
- Pacific Coast C. Co.** Reorganized as Pacific Coast M., M. & Dev. Co., also dead. Ketchikan, Alaska.
- Pacific Coast of Mexico Expl'n. Co.** Mex. No trace of operations secured.
- Pacific Coast Ore Sampling Works.** Oakland, Calif.
- Pacific Coast Sm. & Ref. Works.** Bay Point, Cal.
- Pacific Cons. M. Co.** Reno, Nev. See Vol. VIII.
- Pacific Cons. M. & S. Co.** Property sold, 1913, to Ely Cons. Copper Co., Nev.
- Pacific Copper Expl'n. Co.** Prescott, Ariz. See Vol. X.
- Pacific Dev. Co.** Riddle, Ore. See Vol. IX.
- Pacific Gold & Copper Co.** No trace of operations.
- Pacific G. & C. M. Co.** Ocotlán, Oax., Mex. See Vol. VIII.
- Pacific Metals Co.** Operated on Glacier Creek, Goose Bay, B. C. 1910-11.
- Pacific Mining Co.** Operated in Ontonagan Co., Mich., in the 60's.
- Pacific Mng. & Metals Co.** Globe, Ariz. See Vol. VI.
- Pacific M., M. & Sm. Co.** Oregon. No trace of operations.
- Pahagmarry Copper Co.** Delaware Water Gap.
- Palace G. & C. Co.** Was a swindle. Wickenburg, Ariz. See Vol. VIII.
- Pallant & Stoffel.** Charcas, S. L. P., Mex. See Vol. VIII.
- Palm Dev. Co.** Acton, Cal. See Vol. VI.
- Palmer Mountain C. M. & M. Co.** Loomis, Wash. See Vol. VIII.

- Palmer Mountain G. M. & Tun. Co. Reorganized, 1905, as Palmer Mtn. Tunnel & Power Co., a swindle, succeeded by Palmer Mtn. Tun. Co., reorganized, 1912, as Tillicum Dev. Co. Loomis, Wash.
- Palo Verde C. M. Co. Vail Ariz. See Vol. VIII.
- Palo Verde M. Co. Yucca, Ariz. See Vol. X.
- Paloma M. Co. Ayutla, Jal., Mex. See Vol. VI.
- P. A. Mining Co. Succeeded, 1911, by Keystone-Arizona C. Co., also dead. Skull Valley, Ariz.
- Panama C. M. Co. Curlew, Wash. See Vol. X.
- Pan-American Dev. Co. Aguacaliente de Baca, Sin., Mex. See Vol. VIII.
- Pan-American Expl'n. Co. Manzanillo, Col., Mex. See Vol. VIII.
- Pan-American Federal Sm. & Ref. Co. Had options on the old Billings Smelter, Socorro, N. M. See Vol. X.
- Pan-American Mines Co. Etzatlán, Jal., Mex. See Vol. V.
- Panamint Greenwater G. & C. M. Co. Was a Denver swindle. Greenwater, Calif. See Vol. VIII.
- Panamint M. Co. No trace of operations.
- Panamint Mtn. Mines Syn. Operated, 1910, in the Wild Rose district, Inyo Co., Cal.
- Pandora Syndicate. Knights Island, Alaska. See Vol. XII.
- Panhandle M. & Sm. Co. Coolin, Idaho. See Vol. X.
- Panhandle Sm. Co., Ltd. Ponderay, Idaho. See Vol. VIII.
- Pánuco C. Co., Ltd. Lands sold, 1905, to Continental Copper Co, Pánuco de Monclova, Coah., Mex. See Vol. V.
- Paola Mining Co. Central City, Colo.
- Papago Copper Co. Tucson, Ariz. See Vol. VIII.
- Papago Mining Co. Aztec, Ariz.
- Paradise Dev. Co. Succeeded, 1907, by Paradise M. Co. Paradise, Ariz. See Vol. VI.
- Paradox C.-G. Mining Co. Absorbed, 1903, by San Juan Sm. & Ref. Co. Silverton, Colo.
- Paragon Dev. Co. Operated near Redding, Cal., 1901.
- Park City Queen M. Co. Utah. No trace of operations.
- Park City Majestic M. Co. Park City, Utah. See Vol. IV.
- Park City M. Co. Keller, Wash. See Vol. X.
- Park Copper Co. Elkhorn, Mont. See Vol. X.
- Park C. M. Co. Dillon, Mont.
- Parker-Brown M. Co. Nev. No trace of operations.
- Parker G. & C. M. Co. Parker, Ariz. See Vol. X.
- Parks Copper Mines Co. Ely, Nev.
- Parks Mining Co. Polaris, Mont.
- Parral Sm. Co. Parral, Chih., Mex. See Vol. VIII.
- Parrot M. & M. Co. Leadville, Colo. See Vol. VIII.
- Per Value Cons. C. & C. Co. Turret, Colo. See Vol. VIII.
- Paso G. & C. Producing Co. Brighton, Utah.
- Passaic Mining Co. Operated, 1847, near Belleville, N. J.
- Pass City C. Co. Ahumada, Chih., Mex. See Vol. VIII.
- Patagonia Mining Co. Succeeded by Hardshell Flux M. and Dev. Co. Owned the R. R. R. mine at Patagonia, Ariz.
- Path M. & M. Co. Central City, Colo.
- Pathfinder Cons. Mines, Ltd. Grand Forks, B. C. See Vol. VIII.
- Pathfinder G. & C. Co. Atlanta, Idaho. See Vol. VIII.
- Paudorne Copper M. Co. Houston, Va. See Vol. X.
- Pawnee M. Co. San Simon, Ariz. See Vol. XI.
- Pay Car Mines Co. Bouse, Ariz. Property held by United Mines Co. of Arizona.

- Pay Copper Co.** Greenwater, Cal. See Vol. VIII.
- Paymaster Cons. Mines Co.** Succeeded, 1909, by Victoria Dev. Co. Tucson, Ariz. See Vol. VIII.
- Paymaster Copper Mining Co.** Encampment, Wyo. No trace of operations.
- Paymaster Mining Co.** Wash. No trace of operations.
- Paymaster M. & S. Co.** Operated in Coconino Co., Ariz., 1906.
- Peach Bottom Copper Co.** Elk Creek, N. C. See Vol. III.
- Peacock Copper Co.** Lavie, Cal. See Vol. V.
- Peacock Copper M. & M. Co.** Idaho. New Jersey charter forfeited, 1905.
- Peak Copper Co.** Bessemer, Mich. See Vol. III.
- Pearl Cons. M. Co.** Property, in Ferry Co., Wash., sold 1910.
- Pearl Copper M. Co.** Pearl, Colo.
- Pearl C. M. & S. Co.** Pearl, Colo. See Vol. VIII.
- Pearl Sm. Co.** Pearl, Colo. See Vol. VI.
- Peck Mining Co.** Lands passed to Great Peck M. Co. Providence, Ariz.
- Peerless C. Extraction Co.** Florence, Ariz. See Vol. X.
- Peerless G. & C. M. Co.** Silver Cliff, Colo. See Vol. X.
- Peerless San Juan M. Co.** Silverton, Colo.
- Pellon Copper King Mines.** Ariz. No trace of operations.
- Pend D'Oreille G. & C. M. Co.** Davenport, Wash.
- Peninsula C. M. Co.** Property sold, 1895, to Franklin M. Co., Houghton, Mich.
- Peninsula M. Co.** Organized about 1846, but never operated. Houghton, Mich.
- Peninsula M. & S. Co.** Lost lands, 1904. Santa Catarina, Baja Cal. Mex. See Vol. V.
- Penn-Arizona C. Co.** Skull Valley, Ariz. Vol. X.
- Penn Chemical Works.** Reorganized, 1910, as Penn Mining Co. Campo Seco, Cal. See Vol. VIII.
- Penn Mining Co.** Sold lands to Lake and Cherokee Copper Co.'s. Lake Mine, Ontonagon Co., Mich. See Vol. II.
- Penn Mining Co.** N. M. Succeeded, 1912, by Mulberry M. Co.
- Penn-Mont M. & M. Co.** Elliston, Mont. See Vol. X.
- Pennsylvania & Arizona Cons. C. Co.** Hot Springs, Ariz. See Vol. VIII.
- Pennsylvania & Cananea C. Co.** Merged, 1909, in Duluth & Sonora M. Co. Cananea, Son., Mex. See Vol. VIII.
- Pennsylvania, Cananea & Globe M. Co.** Globe, Ariz. See Vol. VIII.
- Pennsylvania C. Co.** San Pedro, N. M. See Vol. VI.
- Pennsylvania C. M. Co.** Delaware charter repealed, 1903. Was a bad egg, promoted by Paul Morris & Co. Pottstown, Pa. See Vol. VI.
- Pennsylvania M. Co. of Mich.** Operated in Keweenaw county, 1861-71.
- Pennsylvania Mining Co.** Merged in New England Lead-Zinc Mines Co. of N. M. Los Cerillos, N. M. See Vol. X.
- Pennsylvania M. & M. Co.** Succeeded by Royal M. Co., Idaho.
- Pennsylvania & Montana M. Co.** Succeeded by Western Reserve M. Co. Basin, Mont. See Vol. X.
- Percival Mining Co.** Succeeded, 1898, by Percival C. M. Co., also dead. Gordon, Wis.
- Percy-Chester Cons. M. Co.** Succeeded by Percy-Chester Mines., also dead. Red Cliff, Colo. See Vols. VIII and X.
- Perico Epl'n Co.** Mex. No trace of operations.
- Perkiomen Cons. M. Co.** Shannonville, Pa.
- Pernian & Trans-Pecos C. Co.** Texas charter forfeited, 1905, for taxes.
- Perseverance M. Co.** Owned White Pine group. Warm Springs, Mont.
- Peruvian M. & M. Co.** Alta, Utah. See Vol. VIII.
- Petanque M. Co.** No trace of operations.

- Petherick M. Co.** Property sold, 1877, and now part of Ashbed M. Co.'s property, Mich.
- Petoskey M. Co.** Williams, Ariz. See Vol. X.
- Petro M. Co.** Lands sold, 1905, to Utah-Apex M. Co. Bingham Canyon, Utah.
- Pewabic M. Co.** Wound up, 1905, and lands passed to Quincy M. Co. Hancock, Mich. See Vol. II.
- Piau Gold M. & Ref. Co.** Merged, 1907, in Verde River Copper Co. Jerome, Ariz.
- Phi Delta Theta C. M. Co.** Dillon, Carbon Co., Wyo.
- Philadelphia & Arizona M. Co.** Chloride, Mohave Co., Ariz. See Vol. VIII.
- Philadelphia & Boston M. Co.** Operated in Keweenaw Co., Mich., years ago.
- Philadelphia C. & G. M., M. & Sm. Co.** Organized, 1910, as La Regina M. Co. San Martin Hidalgo, Jalisco, Mex. See Vol. VIII.
- Philadelphia C. Mines Co.** Sold property, 1911, for \$164,000 to United States Copper Co. N. M.
- Philadelphia M. & M. Co.** Succeeded, 1906, by Hillsboro Cons. Mines Co. Hillsboro, N. M.
- Phoenix Amal. C. Mines, Ltd.** Phoenix, B. C. See Vol. VIII.
- Phoenix C. Co.** Succeeded by Phoenix Cons. C. Co., Mich.
- Phoenix & Eastern Sm. & Ref. Co.** Phoenix, Ariz. Regarded with suspicion. See Vol. X.
- Phoenix G. & C. M. Co.** Tenado, Nev. See Vol. X.
- Phoenix M., Sm. & Dev. Co., Ltd.** Phoenix, B. C. See Vol. XII.
- Phoenix M. Syn.** Berlin, Wash. See Vol. VIII.
- Pic C. & G. M. Co. of Lake Superior, Ltd.** Port Arthur, Ont.
- Picacho Blanco M. Co.** Property passed to Cababi M. Co. Morristown, Ariz. See Vol. VIII.
- Picayune Mining Co.** Payson, Utah. See Vol. X.
- Piedmont C. Co.** New Jersey charter forfeited, 1904, for non-payment of taxes.
- Piedmont C. M. & S. Co.** Elkton, Va. See Vol. VIII.
- Piedras Verdes M. Co.** Fuerte, Sin., Mex.
- Pierce M. Co.** Central City, Colo. See Vol. X.
- Picket Creek Dev. Co.** Merlin, Oregon. Vol. XI.
- Pilley's Island Pyrites Co.** Newfoundland. Mine shut down on account of depleted ore reserves, equipment rotting and company is presumably dead. See Vol. XI.
- Pilot Butte Copper M. Co.** Succeeded, 1910, by Pilot Butte M. Co. Butte, Mont. See Vol. VIII.
- Pilot Butte Mng. Co.** Butte, Mont.
- Pilot Knob C. M. Co.** Nev. No trace of operations.
- Pilot Range M. Co.** Luning, Nev. See Vol. VIII.
- Pioneer Smelting Co.** Reorganized as the Pioneer Mining & Smg. Co.
- Pima C. M. & S. Co.** Ariz. No trace of operations.
- Final Butte G. & C. Co.** Forbestown, Cal. See Vol. VIII.
- Final Copper Co.** Reorganized, 1905, as Arizona Banner C. Co. Globe, Ariz. See Vol. VI.
- Final Mining Co.** Ariz. New Jersey charter forfeited, 1904, for non-payment of taxes.
- Final Mtn. C. Co., Ltd.** Globe, Ariz.
- Final Mtn. M. Co.** Globe, Ariz. See Vol. X.
- Pine Mtn. C. Co.** Globe, Ariz. See Vol. X.
- Pinos Altos M. & M. Co.** N. M. Fully described in Vol. XII.
- Pintado Copper Co.** Pintada, N. M. See Vol. X.

- Pinto Copper Co. Santa Rita, N. M. See Vol. VIII.
- Pinto Creek C. Co. Title changed to Arizona & Hancock M. Co., which see.
- Pinto Creek M. & S. Co. Ariz. Succeeded, 1911, by Manitou Hill C. Co. See Vol. X.
- Pioche & Arizona C. & G. M. Co. Bouse, Ariz. See Vol. IX.
- Pioche Monitor M. Co. Pioche, Nev.
- Pioneer C. & S. M. Co. Oasis, Cal. See Vol. X.
- Pioneer Smelting Co. Ariz. Went into bankruptcy, 1913. Succeeded by Pioneer M. & S Mng. Co.
- Pioneer Walker Lake G. & C. M. Co. Yerington, Nev. See Vol. VIII.
- Piscataugua Mining Co. Mich. Lands sold, 1853, to Bohemian M. Co.
- Pit River G., S. & C. M. Co. Redding, Cal.
- Pitechin Copper Co. Me. No trace of operations.
- Pittsburg & Arizona Gold & Copper Co. Property sold, 1912, to satisfy judgment for \$52,533. Tombstone, Ariz.
- Pittsburg & Arizona M. Co. Johnson, Ariz. See Vol. VIII.
- Pittsburg & Boston Copper Co. Property sold to Tamarack M. Co. Phoenix, Mich. Described under title Cliff mine, Vol. II.
- Pittsburg & Boston Copper Harbor Co. Operated, 1846, in Keweenaw Co., Mich.
- Pittsburg & Chippewa Co. Operated near Lac La Belle, Mich.
- Pittsburg & Chiricahua Development Co. Paradise, Ariz.
- Pittsburg Copper Co. Clayton, N. M. See Vol. X.
- Pittsburg C. M. & Red. Co. Planet, Ariz. Was a swindle by Theo. Stegner, notorious character with a prison record. See Vol. VIII.
- Pittsburg & Duluth Dev. Co. Succeeded, 1904, by Pittsburg & Duluth M. Co. Bisbee, Ariz. See Vol. IV.
- Pittsburg & Duluth M. Co. Merged, 1907, in Superior & Pittsburg M. Co. Bisbee, Ariz. See Vol. VI.
- Pittsburg & Greenwater C. Co. A Dr. J. Grant Lyman swindle. Greenwater, Cal. See Vol. VIII.
- Pittsburg & Hecla Dev. Co. Bisbee, Ariz. See Vol. V.
- Pittsburg-Idaho M. Co. Succeeded by Pittsburg-Idaho M. & M. Co. Greer, Idaho. See Vol. VI.
- Pittsburg & Isle Royale M. Co. Operated, 1846-1858. Isle Royale, Mich.
- Pittsburg-Jerome C. & G. M. Co. Succeeded, 1904, by Pittsburg-Jerome C. Co. Jerome, Ariz.
- Pittsburg-Mayer M. Co. Reorganized, 1909, as Mayer Cons. M. Co. Mayer, Ariz. See Vol. X.
- Pittsburg Mining Co. Operated, 1852-1856, Ontonagon Co., Mich.
- Pittsburg M. & M. Co. White Bird, Idaho.
- Pittsburg & Montana Copper Co. Butte, Mont. See Vol. XI.
- Pittsburg-New York Copper Mng. Co. Marysville, Mont. See Vol. XI.
- Pittsburg, Philadelphia & Lake Superior C. M. Co. Mich. No trace of operations.
- Pittsburg & Portage Lake M. Co. Mich. No trace of operations.
- Pittsburg & Sonora Dev. Co. Cumpas, Son., Mex. See Vol. VIII.
- Pittsburg & Tennessee C. Co. Property owned by Tennessee C. Co. Copper Hill, Tenn.
- Pittsburg & Utah G., S., C. & L. M. Co. Ophir, Utah.
- Piute Copper Mines Co. No trace of operations.
- Piute G. & C. M. Co. Utah charter forfeited, 1910, for non-payment of taxes.
- Pizarro C. M. Co. Was a swindle. Silver City, N. M. See Vol. VIII.
- Placerville C. M. & Red. Co. Placerville, Colo. See Vol. X.


- Plainfield C. M. Co. N. Y. No trace of operations.
- Planet C. M. Co. Succeeded, 1909, by New Planet C. M. Co. Planet, Ariz.
See Vol. VIII.
- Plant & Callahan M. Co. Conconully, Wash.
- Plata Cobre M. & Trans. Co. Florence, Ariz. See Vol. VI.
- Plata C. M. Co. Pima, Ariz.
- Platte C. M. Co. Encampment, Wyo. See Vol. VIII.
- Pleasant View M. & M. Co. Kellogg, Wash.
- Plenty Copper Co. Pima, Ariz.
- Plutus Cons. M. & M. Co. Utah. No trace of operations.
- Poland-American G. M. & M. Co. Humboldt, Ariz. See Vol. X.
- Poland Extension G. M. & M. Co. Merged, 1904, in Poland-American G. M. & M. Co. Formerly at Poland, Ariz. See Vol. V.
- Polk County Copper Co. Copper Hill, Tenn. Property owned by the Tennessee C. Co.
- Polkinghorn Mining Co. Ingot, Calif.
- Pollyton Gold M. Co. Holmes, Wyo. See Vol. X.
- Pomeroy United C. Co. Tonopah, Nev.
- Ponderay Copper Co. Operated, 1908, Barker Mtn., Wash.
- Ponderosa C. Co. Bagdad, Cal. See Vol. VIII.
- Pontiac Copper Mines, Ltd. Changed title, 1906, to Keremeos-Pontiac Mines, Ltd. Olalla, B. C.
- Pontiac G. & C. M. Co. Tres Piedras, N. M.
- Pontiac M. Co. Property sold, 1895, to Quincy M. Co., Houghton, Mich.
- Pontiac Mining Co. Virgilina, Va. See Vol. XI.
- Porcupine Mtn. M. Co. Succeeded, 1901, by Porcupine Mtn. Copper Co., also dead. Ontonagon, Mich.
- Porcupine Pet Gold Mines, Ltd. Ontario. Bankrupt. See report Ont. Bureau of Mines, 1915, pp. 52, 57 and Vol. XII, the Mines and Copper Handbook.
- Portage Lake & Calumet Dev. Co. Reorganized, 1903, as Portage Lake & Bisbee M. Co. Bisbee, Ariz.
- Portage Lake & Copper River M. Co. Mich. No trace of operations.
- Portage Mining Co. Succeeded, 1860, by Grand Portage M. Co. Mich.
- Portage Mining Co. of N. Y. Operated in Houghton Co., Mich., about 1846.
- Portland Copper Co. Calumet, Mich. Merged in Calumet & Hecla M. Co. 1871.
- Portland Copper Co. Berlin, Wash. See Vol. X.
- Portland C. M. Co. Rambler, Wyo. See Vol. VIII.
- Portland G. & C. M. Co. Spirit Lake, Wash. See Vol. X.
- Portland-Imnaha C. M. Co. Imnaha, Ore. Disincorporated, 1902, with all debts paid.
- Portland Luning C. Co. Luning, Nev. See Vol. VIII.
- Portland (Rossland) Mine, Ltd. Merged, 1904, in Velvet-Portland Mine, Ltd. Rossland, B. C. See Vol. IV.
- Portlock Harbor C. M. Co. Wash. No trace of operations.
- Porvenir De Sonora Co. Reorganized, 1902, as Coast Line Copper Co. Calera, Son., Mex.
- Postal G., Platinum & C. M. Co. Rambler, Wyo. See Vol. V.
- Postal Savings M. & M. Co. Centennial, Wyo. See Vol. VIII.
- Potomac C. Co. N. Y. No trace of operations..
- Potomac Mining Co. Dumfries, Va.
- Potomac M. Co., Ltd. Silver City, Idaho.
- Potosina; Cia. Min. Charcas, S. L. P., Mex.
- Potreriillos; Cia. Min. Chafaral, Chile.

- Premier Copper M. Co. No trace of operations or lands.
- Premier M., M. & Leasing Co. Pinos Altos, N. M. See Vol. VIII.
- President C. & G. M. Co. Boulder, Mont. See Vol. X.
- Presidential Mining Co. Owned Hosey mine, Patagonia, Ariz. See Vol. VIII.
- Preston Peak Copper Co. Yreka, Cal. West Virginia charter forfeited 1902; lands sold, 1907, by sheriff. See Vol. V.
- Pride of Arizona C. Co. Prescott, Ariz.
- Pride M. Co. Montezuma, Colo. See Vol. IV.
- Pride of the West M. & M. Co. Patagonia, Ariz. See Vol. II.
- Priest Lake Mng. & Smg. Co. Coolin, Idaho.
- Prince Copper Co. Bisbee, Ariz.
- Prince M. & Dev. Co., Ltd. Revelstoke, B. C. See Vol. X.
- Prince of Wales C., G. & S. M. Co. Utah charter forfeited, 1910, for unpaid taxes.
- Prince William C. Co. Valdez, Alaska. See Vol. VIII.
- Prince William Sound Amal. C. Co. Ellamar, Alas. See Vol. VIII.
- Prince William Sound M. Co. Valdez, Alas. See Vol. VIII.
- Prince William Sound M. Dev. Co. West Virginia charter forfeited, 1902, for unpaid taxes.
- Princess Royal G. & C. M. Co. Port Essington, B. C. See Vol. VII.
- Princeton M. Co. Princeton, B. C. See Vol. X.
- Princeton Copper Mng. & Smg. Co. Ft. Huachuca, Ariz.
- Producer G. & C. M. & M. Co. Encampment, Wyo. See Vol. VIII.
- Producer M. Co. Idaho Springs, Colo. See Vol. X.
- Producer M. & S. Co. Lands reverted to former owner. Casa Grande, Ariz. See Vol. VI.
- Promontorio Cons. M. Co. Nogales, Son., Mex. See Vol. VIII.
- Promontorio M. & S. Co. Lampasos, Son., Mex.
- Promontory Signal M. Co. Promontory Point, Utah. See Vol. X.
- Pro Patria M. & M. Co. Succeeded, 1911, by Rico Mining Co., Rico, Colo.
- Prosper G. M. Co. Hillsboro, N. M.
- Protective M. Co. Succeeded, 1908, by Skagit Queen Cons. M. Co.
- Providence Copper Co. Paradise, Ariz. See Vol. XI.
- Providence C. M. Co. Belen, N. M. See Vol. X.
- Providence G. & C. Co. Kelso, Cal. See Vol. X.
- Providencia G., S. & C. Mining Co. Tucson, Ariz. See Vol. VI.
- Providence M. Co., Ltd. Greenwood, Boundary district, B. C. See Vol. X.
- Prudential M. Co. Crescent City, Cal. See Vol. X.
- Prudential M. & Dev. Co. Patagonia, Ariz. See Vol. X.
- Psyche M. Co. Greenhorn, Ore. See Vol. VI.
- Pueblo Copper M. & M. Co. Johnson, Utah. See Vol. VIII.
- Puertecito Copper Co. Cananea, Son., Mex. See Vol. III.
- Puget Sound C. Co. New Jersey charter forfeited, 1903, for non-payment of taxes.
- Puget Scund Inv. Co. Van Anda, Texada Id., B. C. See Vol. III.
- Pugwash Cons. M. & S. Co. Pugwash, Nova Scotia. See Vol. VI.
- Pugwash River C. Co. Pugwash, Nova Scotia. See Vol. IV.
- Puritan Copper & Gold M. Co. Tres Piedras, N. M. See Vol. II.
- Puritan G. & C. Co. Bingham Canyon, Utah. See Vol. X.
- Pyne Smelting Co. West Alameda, Cal. See Vol. VIII.
- Pyramid Copper Co. La Sal, Utah. See Vol. VIII.
- Pyramid Copper Syn., Ltd. Dissolved, 1905. Golden, B. C. See Vol. V.
- Pyramid G. & C. M. Co. Prescott, Ariz. See Vols. V. and VI.
- Pyramid Peak M. Co. Lands sold 1905 by sheriff. Lordsburg, N. M. See Vol. VI.

- Pyrite King C. M. Co.** Operated, 1904, in the Black Hills, S. D.
- Q. S. Gold M. & S. Co.** Property sold, under foreclosure, 1909. Reorganized as Q. S. Mng. Co. Conconully, Wash. See Vol. VIII.
- Quatsino C. Co.** B. C. Succeeded, 1916, by Coast C. Co.
- Quebec Copper Co., Ltd.** Deadwood, B. C.
- Queen of Arizona C. Co.** Merged, 1902, in Great Belcher of Ariz. Co. Providence, Ariz. See Vol. III.
- Queen Bee M. & M. Co.** Succeeded, 1902, by Wyoming Queen M. Co. Jelms, Albany Co., Wyo.
- Queen Gold & Copper M. & S. Co.** Wonder, Ore. See Vol. VIII.
- Queen Princess C. Co.** Merged, 1909, in Copperfield Cons. M. Co. Copperfield, Colo. See Vol. VIII.
- Queen Regent C. & G. Co.** Succeeded by Queen Regent Merger Mines Co. See Vol. VIII.
- Quincy & Arizona Dev. Co.** Bisbee, Ariz. See Vol. IV.
- Quincy M. Co.** Property sold, 1902, to Daly West M. Co. Park City, Utah.
- Rainbow Mining Co.** Crown King, Ariz. See Vol. VIII.
- Rainbow Mining & Copper Co.** Eureka, Cal.
- Rainbow M. & M. Co.** Riddle, Ore. See Vol. X.
- Rambler Copper M. Co.** Lands sold, 1903, to Lion C. M. Co. Stoddard, Ariz. See Vol. IV.
- Rambler Copper M. Co.** Succeeded, 1902, by Rambler M. & S. Co. Holmes, Wyo.
- Rambler Mining Co.** Rambler, Wyo. See Vol. VII.
- Rambler M. & S. Co.** Succeeded, 1908, by Rambler C. & Platinum Co. Holmes, Wyo. See Vol. VII.
- Rankin Copper Mining Co.** Rawlins, Wyo.
- Rattler Mining Co.** Globe, Ariz. See Vol. VIII.
- Raven Mining Co.** Reorganized as Raven Copper Co. which was dissolved March, 1911. Butte, Mont. See Vol. VIII.
- Ray-Arizona Copper Co.** Ray, Ariz. See Vol. X.
- Ray Coalition Copper Co.** Supposed to have held lands near Ray, Ariz. See Vol. X.
- Ray C. Mines, Ltd.** Lands sold, 1907, to Ray Cons. C. Co. Ray, Ariz. See Vol. VI.
- Ray Extension Copper Co.** Ray, Ariz. See Vol. X.
- Ray Northern Copper Co.** Ray, Ariz. See Vol. X.
- Raymond C. & Silver M. Co.** Clancey, Mont. See Vol. X.
- Raynor Copper M. Co.** Lewis, Cal. See Vol. VI.
- Raypinco Mining Co.** Succeeded, 1910, by Calzona M. Co. Cal.
- Real Del Monte Union y Bilbao; Neg. Min.** Ojocaliente, Zacatecas, Mex.
- Realito Gold, Silver & Copper Co.** Alamos, Son., Mex.
- Realty Syn.** Succeeded by California Improvement Co. Mills College, Cal. See Vol. V.
- Red Bird M. Co.** Austin, Mont. See Vol. X.
- Red Cloud M. Co.** Salton, Cal. See Vol. VIII.
- Red Cloud M. Co.** Cananea, Son., Mex. See Vol. VIII.
- Red Fox Mining Co.** McGuigan, B. C.
- Red Gulch Gold-Copper M. & M. Co.** Merged, 1909, in Copperfield Cons. M. Co. Copperfield, Colo. See Vol. VIII.
- Red Hill M. & S. Co.** Victor, Cal. See Vol. VIII.
- Red Horse Copper Co.** Springston, Idaho. See Vol. X.
- Red Jacket & Bisbee Dev. Co.** Bisbee, Ariz. See Vol. IV.

- Red Metal M. Co.** Property sold, 1909, to Turkey Creek M. & Dev. Co. Paradise, Ariz.
- Red Metal M. Co.** Luning, Nev. See Vol. VIII.
- Red Metal Cop. Mng. Co.** Dissolved, 1913. See Butte Coalition.
- Red Mountain Copper-Gold M. Co.** Cisco, Cal. See Vol. IX.
- Red River Copper Co.** Red River, N. M. Owned Anaconda mine.
- Red Rock Copper Co.** Red Rock, Ariz. See Vol. X.
- Red Wing Extens. M. Co.** Title changed, March, 1906, to Massasoit M. Co. Bingham Canyon, Utah. See Vol. VI.
- Red Wing M. & M. Co.** Succeeded, 1900, by New Red Wing M. Co. Bingham Canyon, Utah.
- Redding Gold & Copper M. Co.** Redding, Cal. See Vol. X.
- Redemption C. M. & M. Co.** Ariz. Mine, near Chloride, Ariz., sold 1917. See Vol. XII.
- Redlich Tungsten Co.** Nev. Property reverted to owners. See Vol. XII.
- Redwood Copper Mng. Co.** Chewelah, Wash.
- Reforma Mining Co.** Fuerte, Sinaloa, Mex.
- Refugio Syn., Ltd.** Wound up and property abandoned. Cananea, Son., Mex. See Vol. X.
- Reina; Cia. Min. la.** Sold lands, 1907, to Mexican Mines Syn., Ltd. Cusi-huiriacich, Chih., Mex. See Vol. VII.
- Reina de Cobre, S. A.; Cia. Min.** Ejutla, Oax., Mexico. See Vol. X.
- Reina de Cobre de Sonora; Cia. Min.** Caborca, and Santa Ana, Son., Mex. See Vol. VIII.
- Reliance Gold & Copper M. Co.** Turkey, Ariz. See Vol. VIII.
- Reliance Gold M. Co.** Groom Creek, Ariz. See Vol. VI.
- Reliance M. & M. Co.** Lands passed to Gem Cons. M. Co. Tenabo, Nev. See Vol. VIII.
- Reliance M. & M. Co.** Hunterstown, Pa.
- Rendall Ore Red. Co.** Lands sold to Ajo C. Co., 1909. Ajo, Ariz. See Vol. VIII.
- Republic Cons. M. & M. Co.** Idaho Springs, Colo. See Vol. VI.
- Republic Smelting Corporation.** California. See Vol. XII.
- Rescue Copper Co.** Merged, 1907, in Cornelia C. Co. Ajo, Ariz. See Vol. VII.
- Reservation M. & S. Co.** Lands sold, 1907, to Dominion C. Co., Ltd. Danville, Wash.
- Resolute Copper Co.** Lands sold, 1905, to Keeweenaw C. Co. Central Mine, Mich. See Vol. II.
- Restauradora M. & M. Co.** Huautla, Morelos, Mex. See Vol. X.
- Revenue M. & M. Co.** Encampment, Wyo. See Vol. VI.
- Reward Copper M. Co.** Vekol, Ariz. See Vol. X.
- Reward Gold-Copper M. Co.** Princeton Boundary district, B. C. See Vol. VIII.
- Rex Cobre M. Co.** Safford, Ariz. See Vol. VIII.
- Rex Gold Mines & Investment Co.** Leadville, Colo. See Vol. XI.
- Rey Del Oro Mining Co.** Mexico. Property owned by Intern'l Invest. Syn., L. A. Investment Bldg., Los Angeles, Cal.
- Reyes; Cia. Min.** Los Zitácuaro, Mich. Mex.
- Richard III Dev. Co., Ltd.** Succeeded, 1904, by Richard III M. Co. Mt. Sicker, Vancouver Id., B. C. See Vol. VI.
- Richards C. Co.** Ariz. Mines sold, 1917. See Vol. XII.
- Richfield Cons. M. Co.** Bingham Canyon, Utah. See Vol. IX.
- Richfield M. Co.** Succeeded, 1908, by Richfield C. Co. Querobabi, Son., Mex. See Vol. VI.
- Richmond Group Gold Mines Co.** Hillsboro, N. M. See Vol. VI.

- Richmond M. Co. Merged, 1905, in Richmond-Eureka M. Co. Eureka, Nev.
- Rickard Ely C. Co. Property sold, 1909, for \$84,000, to Thos. F. Cole. Ely, Nev. See Vol. VIII.
- Rigby M. & Red Co. Succeeded, 1910, by Mayer M. & M. Co. Mayer, Ariz. See Vol. VIII.
- Rillito Mining Co. Tucson, Ariz.
- Rincon Mines Co. Succeeded, 1908, by Weaver Mountain M. Co. Congress Junction, Ariz. See Vol. VIII.
- Rincon Mining Co. Benson, Ariz. See Vol. VIII.
- Ringling Rocks Copper M. Co. Pottstown, Pa. See Vol. X.
- Rio Arriba Cons. Mines Co. Tres Piedras, N. M. See Vol. III.
- Rio Bacanuchi M. Co. Bacanochi, Son., Mex. See Vol. VIII.
- Rio Dolores Copper Co. Castleton, Utah. See Vol. XI.
- Rio Dolores M. Co. Colo. Out of business. See Vol. XII.
- Rio Hondo C. Co. Property sold, 1900, to San Cristobal C. Co. Arroyo Seco, N. M.
- Rio Tinto Copper M. Co. Encampment, Wyo. See Vol. VI.
- Rio Tinto Dev. Co. Denver, Colo. Stock-jobbery. See Vol. VIII.
- Rio Tinto G. & C. Co. Prescott, Ariz. See Vol. VI.
- Rio Tinto Mexicana, Cia. Min. Succeeded, 1908, by Rio Tinto C. Co. Terrazas, Chih., Mex. See Vol. VIII.
- Rio Tinto Mines & Sm. Co. Terrazas, Chih., Mex. See Vol. VIII.
- Rio Tonto C. Co. Succeeded by Rio Tonto M. & M. C. Wickenburg, Ariz. See Vol. VIII.
- Rio Vista G. & C. M. Co. Was a bad egg, officers having been prominent state officials of California. Fair Play, Cal. See Vol. VIII.
- Rising Sun Copper M. & S. Co. Mt. Washington, Md.
- Rito Alto Copper Co. Hillside, Colo. See Vol. VIII.
- Riverside Copper Co. Morrystown, Ariz. See Vol. VI.
- Riverside Copper M. Co., Ltd. Kootenai Co., Idaho.
- Riverton Mining & Milling Co. Shoshoni, Wyo.
- Roaring Fork M. & M. Co. Rambler, Wyo.
- Rob Roy Mining Co. Wallace, Ida. See Vol. XI.
- Robinson Mining Co. Ely, Nev. See Vol. X.
- Robles Grande G. & C. M. Co. Goldfield, Nev. See Vol. VI.
- Roca Negra; Neg. Min. la. Mine sold, 1903, to American-Mexico M. & Dev Co. Velardeña, Dur., Mex. See Vol. IV.
- Rochester Shoshone M. & M. Co. Shoshoni, Wyo. See Vol. VIII.
- Rociada Gold & Copper Co. Rociada, N. M.
- Rock Creek Copper M. Co., Ltd. Mullan, Idaho.
- Rock Lake, M. Co., Ltd. Liquidated, 1905. Property sold to Algoma C. & Sm. Co. Bruce Mines, Algoma, Ont. See Vol. IV.
- Rock Spring Exploration Co. Rock Springs, Wyo.
- Rocky Mountain C. Co. Encampment, Wyo. See Vol. VI.
- Rocky Mountain Smelting Co. Florence, Colo.
- Rodman M. & M. Co. Guilford College, N. C.
- Rogers-Arizona Mng. Co. Rogers Spgs., Ariz. See Vol. XI.
- Rogers Copper & Iron Co. Ducktown, Tenn. See Vol. VI.
- Rogers Mining Co. Pearl, Colo. See Vol. VI.
- Rogers Springs M. Co. Merged in Rogers Springs M. & S. Co., 1911. Cave Creek, Ariz. See Vol. X.
- Rogue River M. & S. Co. Grants Pass, Ore. See Vol. VI.
- Ronquillo Copper Co. Cananea, Son., Mex. See Vol. X.
- Roosevelt Gold & Copper M. Co. Ft. Thomas, Ariz. See Vol. X.
- Roosevelt Gold, Silver & Copper M. Co. Butte, Mont. See Vol. VIII.

- Roosevelt M. & M. Co. Stagg, Cal. See Vol. X.
- Rosa Amarilla C. Co. Lands sold at forced sale, 1910, to M. J. Slattery. Pueblo Nuevo, Jal., Mex. See Vol. VIII.
- Roselle Mining Co. Centreville, Cassiar district, B. C. See Vol. V.
- Rose Springs Mng. Co. Battle Mtn., Nev.
- Rossland-Great Western Mines, Ltd. Reorganized, 1902, as Rossland-Kootenay M. Co., Ltd. Rossland, B. C.
- Rouse-Gardner Mining Co. Central City, Colo. See Vol. VI.
- Routt County, G. & C. M. Co. Steamboat Springs, Colo. See Vol. VIII.
- Rowan Gold & Copper M. Co. Gold Hill, N. C. See Vol. VI.
- Royal Cons. Mines of El Cobre, Ltd. Succeeded, 1902, by El Cobre Mines, Santiago de Cuba.
- Royal Copper M. Co. Title changed, 1902, to Cactus Sm. & Copper Co., also dead. Frisco, Utah. See Vol. II.
- Royal Crown M. Co. Ocotlan, Oax., Mex. See Vol. VIII.
- Royal Metals M. & Leasing Co. Ely, Nev.
- Royal M. & Invest. Co. Silverton, Colo. See Vol. X.
- Royal Morelos C. Co. Succeeded, 1908, by Occidental C. Co. Palomas, Chih., Mex. See Vol. VIII.
- Royal Mtn. Mng. Co. Montana. Absorbed by the Cactus C. Co.
- Royal Victoria M. Co. Grand Forks, B. C. See Vol. VIII.
- Ruby Copper & Gold M. Co. Encampment, Wyo. See Vol. VI.
- Ruby Gold & Copper Co. Ortiz, Son., Mex. See Vol. VI.
- Russell-Ball Copper Co. Valdez, Alaska. See Vol. X.
- Russell United C. Co. Property sold, 1904, to Arizona Cons. M. Co. Johnson, Ariz.
- Ruthburg Cons. C. Co. Weiser, Idaho. See Vol. II.
- Rye Copper Co. Payson, Ariz. See Vol. X.
- Sacaton Springs M. Co. Cima, Cal. Vol. VIII.
- Saginaw Dev. Co. Merged, 1906, in American-Saginaw Dev. Co. Bisbee, Ariz. See Vol. V.
- Saginaw M. Co. Operated, 1876, near Rock Harbor, Isle Royale.
- Saginaw Mining Co. Maple Falls, Wash.
- Saginaw M. Co. of Arizona. No trace of operations secured.
- Saginaw Valley C. M. Co. Lost lands, 1905. Encampment, Wyo. See Vol. V.
- Sahuaripa Expl'n. Co. Sahuaripa, Son., Mex. See Vol. X.
- St. Clair C. Co. Operated, 1863-1872, near Eagle River, Mich.
- St. Croix Cons. C. Mines. Operated in Douglas Co., Wis., 1899.
- St. George Copper M. Co. Iapah, Utah. See Vol. X.
- St. Joe M. Co. Property sold by sheriff, 1908, for \$25,000, and company reorganized, 1908, as Bingham & Orleans, M. Co. See Vol. VI.
- St. Joe M. & M. Co. Apparently succeeded, 1909, by Fremont C. Co. Riverside, Wyo. See Vol. VIII.
- St. Julian Gold M. Co. Chico, Mont. See Vol. X.
- St. Lawrence C. Co. New Jersey charter forfeited, 1909, for non-payment of taxes.
- St. Louis Copper Co. Ajo, Ariz. See Vol. X.
- St. Louis Copper M. Co. Duquesne, Ariz. See Vol. X.
- St. Louis Copper M. & Dev. Co. No trace of property or operations.
- St. Louis United C. M. Co. Jarilla, N. M. See Vol. VI.
- St. Margaret Copper Co. No trace of operations secured.
- St. Margaret Copper M. Co. Operated, 1865, in East Canada.
- St. Marie Copper Co. Was a swindle, perpetrated by J. Reilly and W. W. Wilson, two notorious confidence men. Leadville, Colo. 

- St. Mary's Copper Co. Hancock, Mich. See Vol. X.
 St. Michael's M., M. & Ref. Co. Tres Piedras, N. M. See Vol. X.
 St. Paul & Butte M. Co. Was in business, 1896. Butte, Mont.
 Salem M. Co. Operated in the vicinity of the Phoenix mine, Mich., 1865.
 Salero Mines Co. Patagonia, Ariz. See Vol. VIII.
 Salida C. Co. Salida, Chaffee Co., Colo. See Vol. XII.
 Salida Gold & Copper M. Co. Salida, Colo. See Vol. V.
 Salido Gold-Copper Co. Alamos, Son., Mex. See Vol. X.
 Salt Lake & Ely C. Co. Ely, Nev. See Vol. VIII.
 Salt Lake M. & M. Co. Callao, Utah. See Vol. X.
 Saltese Consol. Copper Mng. & Mllg. Co. Reorganized as the Saltese Mng. & Milling Co.
 Sahuda Copper M. Co. Donalds, S. C. See Vol. X.
 Samalayuca M. Co. Operated near Chihuahua, Mex., about 1907.
 San Antonio; Cia. Min. De. La Cruz, Tam., Mex. See Vol. VI.
 San Antonio-Arizona M. Co. Patagonia, Ariz. See Vol. X.
 San Antonio M. & Expl'n Co. Tapalpa, Jal., Mex. See Vol. X.
 San Baltazar C. Co. Tlacolula, Oax., Mex. See Vol. VIII.
 San Bernardino C. Co. West Virginia charter forfeited, 1902. Cal.
 San Bernardino G., C. & Lime Co. San Bernardino, Cal. See Vol. VIII.
 San Bernardino M. Co. Cananea, Son., Mex. See Vol. VIII.
 San Bernardino M. & M. Co. Douglas, Ariz. See Vol. VII.
 San Bruno C. M. Co. New York. Dissolved, 1883. No trace of operations.
 San Calletano M. & S. Co. Calabasas, Ariz. See Vol. VIII.
 San Carlos C. Co. Lands sold to Saddle Mountain M. Co. Christmas, Ariz.
 San Carlos C. Co. Linares, Nuevo León, Mex. See Vol. X.
 San Carlos Dev. Co. Globe, Ariz. See Vol. VIII.
 San Carlos M. Co. Ures, Son., Mex. See Vol. X.
 San Cristobal Copper Co. Arroyo Seco, N. M. See Vol. XI.
 San Diego; Cia. Min. Parras de la Fuente, Coah., Mex.
 San Diego M. Co. Near Kingman, Ariz.
 San Domingo G. & C. Co. Merged, 1903, in Picacho Blanco M. Co. Morristown, Ariz.
 San Felipe M. Co. Mexico. No trace of operations secured.
 San Fernando; Cia. Min. De. Zimatlán, Oax., Mex.
 San Fernando C. M. Co. Operated, 1854, near Cienfuegos, Cuba.
 San Fernando Copper M. & S. Co. Ensenada, Baja Cal., Mex. See Vol. VIII.
 San Fernando M. Co. New Jersey charter forfeited, 1908, for non-payment of taxes, Ariz.
 San Fernando y Santa Rosa; Soc. Anom. Indust. de Minas De Cobre. Santa Clara, Cuba. See Vol. VIII.
 San Francisco y Anexas; Neg. Min. Asientos, Aguascal., Mex.
 San Francisco C. Co. Campo Seco, Cal.
 San Francisco C. Co. Spenceville, Cal.
 San Francisco Del Oro Mines, Ltd. Was reorganized, 1908, as San Francisco del Oro M. Co., Ltd. Parral, Chih., Mex. See Vol. VIII.
 San Francisco M. Co. Felipe, Son., Mex. See Vol. X.
 San Javier Copper Co. San Javier, Son., Mex. See Vol. X.
 San José Cons. M. Co. Nacozari, Son., Mex. See Vol. VIII.
 San José M. Co. Succeeded, 1902, by El Cobre Mines, El Cobre, Santiago de Cuba.
 San Juan Mining Co. Central City, Colo. See Vol. X.
 San Juan S. & Ref. Co. Property sold by sheriff, 1909, partly to Ross M. & M. Co. and partly to Henrietta M. & M. Co. Silverton, Colo. See Vol. VIII.

- San Luis; Cia. Min. Tepezalá, Aguascal, Mex.
 San Luis Potosi; Cia. Min. De. Mapimi, Dur., Mex.
 San Marcos M. Co. Etzatlán, Jal., Mex. See Vol. IX.
 San Marcus-Salome Dev. Co. Salome, Ariz. See Vol. X.
 San Marino M. & M. Co. Nespelem; Wash. See Vol. X.
 San Pedro Cons. M. & M. Co. Operated, 1882, in Pinal Co., Ariz.
 San Pedro C. Co. San Pedro, N. M. Idle since 1899.
 San Pedro Dev. Co. Dissolved. Property sold, 1911. Ariz.
 San Poil Mng. Co. Wash.
 San Rafael Copper M. Co. Property passed to Rio Tinto C. Co. Terrazas, Chih., Mex. See Vol. VIII.
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 San Rafael M. Co. Succeeded by Mercer-San Rafael M. Co. Tapalpa, Jal., Mex. See Vol. VI.
 San Remo Copper Co. Gleeson, Ariz. See Vol. V.
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 Santa Rita C. Co. Property sold, 1898, for \$1,000,000. Company practically reorganized as Santa Rita M. Co. Santa Rita, N. M.
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- Schuyler Copper Co. Property, the Jones mine, in Caernarvon township,
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- Scott Mines Co. Bouse, Ariz. See Vol. X.
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- Seattle M. Co. Idaho. Property passed, 1912, to Ray-Jefferson M. Co.
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- Selma Cons. M. Co. Reconstructed, 1909 as Selma Mines Co.
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- Seminole Copper M. Co. Property sold, 1904, by sheriff, to Carl Henrich,
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- Silver & Copper Co. of Ontonagon Rapids.** Mich. Operated, 1846.
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- Silver Mtn. M. Co.** Succeeded by Silver Mtn. Mine & Mill Co. Empire, Clear Creek Co., Colo. See Vol. IV.
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- Siskowit Mining Co.** Mich. Dissolved, 1909, by order of Circuit Court.
- Six Eagles M. Co.** Reorganized, 1907, as Little Chopaca M. Co. Loomis, Wash. See Vol. VIII.
- Skagit Queen Mining Co.** Succeeded, 1908, by Skagit Queen Cons. Mining Co., also dead. Property passed, 1911, to British M. Co. Marblemount, Wash. See Vol. X.
- Skookum C. Co.** Bankrupt, Nov., 1910; liabilities \$34,000. Cle Elum, Wash. See Vol. X.
- Skull Valley Mining & Milling Co.** Skull Valley, Ariz. See Vol. XI.
- Skylark Copper M. & M. Co.** Merged, 1908, in the Utah United Copper Co. Milford, Utah. See Vol. VII.
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- Slater C. Mines Co.** Eminence, Shannon Co., Mo.
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- Snowshoe C. M. Co.** Canyon Ferry, Mont. See Vol. X.
- Snowshoe G. & C. Mines, Ltd.** British Columbia. Property sold to **Granby Cons. Mng. Sm. & Power Co., Ltd.**, and company dissolved. See Vol. XI.
- Snowslide M. & M. Co.** Mullan, Idaho.
- Snowstorm Extension M. Co., Ltd.** Succeeded, October, 1909, by **Snowstorm Extension C. M. Co.** Mullan, Idaho. See Vol. VIII.
- Snowstorm Mountain C. M. Co.** Mullan, Idaho.
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- Sonoma County G. S. & C. M. Co.** Cloverdale, Cal.
- Sonoma Mines of Mexico, Ltd.** Dissolved Feb. 26, 1909. Avino, Dur., Mex. See Vol. VIII.
- Sonora; Cia. Min. De La. Cumpas, Son., Mex.**
- Sonora Bonanza M. Co.** Reorganized, 1907, as **Superior-Bonanza M. Co.** Imuris, Son., Mex. See Vol. VI.
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- South Bisbee Copper M. & Townsite Improvement Co.** Wound up, 1904, Lands sold to **Lake Superior & Pittsburg M. Co.** Bisbee, Ariz. See Vol. II.
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- South Columbus Cons. M. Co.** Merged, Sept. 15, 1910, in **South Hecla M. Co.** Alta, Utah.
- South Columbus M. Co.** Reconstructed 1906, as **South Columbus Cons. M. Co.** See Vol. VIII.
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- Southern Cross M. Co.** Lands sold, 1912, to **Aanconda C. M. Co.** Butte, Mont.
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South West Sm. & Ref. Co. Property sold by receiver, June 6, 1909; reorganized as Orogrande Sm. Co. Orogrande, N. M. See Vol. VIII.
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- Spokane Copper Co. Cle Elum, Kittitas Co., Wash.
 Spokane Dev. Co. Property passed, 1910, to Revias Creek M. & Power Co.
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 Standard Cons. Mines Co. Oregon. Property sold, 1907, to Comer Mines Co.
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 Star Cons. Co. Merged, 1907, in Black Jack Cons. M. Co. Park City, Utah.
 Star Copper M. Co. Succeeded Star C. Co. 1887, reorganization of the Star M. Co. Property sold, 1906, to Keweenaw C. Co. Copper Harbor, Mich. See Vol. VIII.
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 State Line Mining Co. Encampment, Wyo. See Vol. VIII.
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 Stephenson-Bennett Cons. Co. Reorganized as Bennett-Stephenson M. & M. Co. Organ, N. M.
 Steptoe Lead & C. Co. McGill, Nev. See Vol. X.
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 Sterling Copper Co. Clifton, Ariz. See Vol. III.
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 Steubenville & Jalisco M. Co. Hostotipaquillo, Jalisco, Mex.
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 Stockton Hill M. Co. Arizona. Absorbed by Needles M. & S. Co.
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- Stonington M. Co. Mich. Lost lands, 1897. See Vol. II.
- Stafford C. M. Co. Vermont. Dissolved, 1872.
- Stafford M. Co. Succeeded by Vermont Copper Co.
- Stratton G. & C. M. & M. Co. Split, 1909, into Stratton G. & C. M. Co. and Hecla-Granite M. Co. Turret, Chaffee Co., Colo. See Vol. VIII.
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- Strong Copper Claims Co. Lands sold, 1901, to Waldo S. & M. Co. Waldo, Ore. See Vol. III.
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- Success M. Co. Conconully, Wash.
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- Sugar Loaf M. Co. Custer, S. D. See Vol. VI.
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- Sulphide Copper Co. Crested Butte, Colo. See Vol. XI.
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- Sultana-Arizona C. Co. Reorganized, May 1910, as Kelvin-Sultana C. Co. Kelvin, Ariz. See Vol. VIII.
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- Summit G. Mng. Co. Mont. Succeeded, 1916, by Polaris Mng. Co. See Vol. XII.
- Summit M. Co. Mich. Reorganized, 1859, as Madison M. Co.
- Summit M. & M. Co. Keller, Wash.
- Sumner M. Co. Mich. Reorganized as Hancock C. M. Co.
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- Sunlight M. Co. Merged in Great Belchef of Arizona Co. Providence, Yavapai Co., Ariz.
- Sunlight M. & M. Co. Eureka, Colo. See Vol. X.
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- Sunol C. M. Co. Operated, 1863, in Alameda Co., Cal.
- Sunrise Gold & C. Co. Vontrigger, Cal.
- Sunset Copper Co. Mayer, Ariz. See Vol. VIII.
- Sunset C. Co., Ltd. Princeton, B. C.
- Sunset C. M. Co. Property near Index, Wash., sold, by receiver, 1909, to F. L. Bell and W. W. Black, for \$40,000. See Vol. IV, and V. to VIII.
- Sunset M. & S. Co. Cerillos, N. M.
- Sunset National Mining Co. Homestake, Mont. See Vol. XI.
- Superior-Alta M. Co. Merged with Flagstaff C. M. Co. and Columbus Cons. M. Co. as Wasatch Mines Co. Alta, Utah.
- Superior & Boston Copper Mng. Co. Superior, Wis.
- Superior C. Co. Tucson, Ariz. See Vol. VI.
- Superior C. Co. Inc. Ariz. No trace of operations.
- Superior C. Co. Mich. Dissolved, 1902. Operated, 1846, near Copper Harbor.
- Superior C. & Gold M. Co. Utah. No trace of operations.
- Superior G. & C. Co. of Michipicoton, Ltd. Wolf, Thunder Bay dist., Ont.
- Superior M. Co. Mich. Lands sold, 1899, to Michigan C. M. Co.
- Superior M. Co. Property sold to 85 Mining Co. Lordsburg, N. M. See Vol. VIII.

- Superior M. Co.** Cerillos, N. M.
Superior M. Co. Bingham Canyon, Utah. See Vol. X.
Superior-Montana C. M. Co. Superior, Missoula Co., Mont. See Vol. VIII.
Superior & Montana M. Co. Merged, September, 1908, in South Columbus Cons. A. M. Co. Alta, Utah. See Vol. VIII.
Superior & Pittsburg C. Co. Ariz. Sold Dec. 31, 1915, to Calumet & Ariz. Mng. Co., which see. Dissolved, 1916.
Sure Thing G.-C. M. & Sm. Co. Succeeded, 1905, by Clipper M. Co. North Bend, Wash. See Vol. V.
Surprise C. & G. M. Co. Utah. Charter forfeited, 1910, for unpaid taxes.
Surprise Eagle M. Co. Boulder, Mont. See Vol. VIII.
Susquehanna Nevada C. Co. Ariz. No trace of operations.
Sutton Cons. Mng. Co. Former properties at Lordsburg, N. M., sold. See Vol. XI.
Swan Creek C. M. Co. Maine. No trace of operations.
Swansea Mining Co. Lands sold, 1905, to Ronquillo C. Co. Cananea, Son., Mex.
Swarthmore C. Co. Merged, 1907, in Swarthmore Cons. M. Co. Eldora, Boulder Co., Colo.
Swastika C. Co. Jerome, Ariz. See Vol. VIII.
Sweden Copper Co. Merged, 1903, in Mt. St. Helens Cons. M. Co. Spirit Lake, Wash. See Vol. III.
Swisshelm Dev. Co. Reorganized, 1911, as Swisshelm Mountain M. Co. Ariz.
Swiss Girl M. Co. Lands sold, 1901, to Baumann C. Co. Dewey, Ariz.
Sycamore Mining, Smelting & Devel. Co. Jerome, Ariz. See Vol. XI.
Sylvania G. & C. M. & M. Co. At Centennial, Wyo.
Syndicate M. Co., Ltd. Saltse, Mont. See Vol. X.
Syndicate M., M. & Sm. Co. Co. Landore, Idaho. See Vol. X.
Syndicated Deep Mines, Inc. Succeeded by Pearl Cons. M. Co., also dead. Republic Co., Wash. See Vol. VIII.
- Takoma Copper Co.** No trace of operations.
Talisman M. Co. Merged October, 1908, in Cedar Talisman Cons. Mines Co. Milford, Utah. See Vol. VIII.
Tallapoosa C. Mines. Succeeded, 1905, by Georgia & Tenn. C. Co. Temple, Ga.
Tamarack-Osceola C. Mfg. Co. Mich. Liquidated. Assets sold, 1912, to John A. Roebhing's Sons Co. for \$100,000.
Tamalipas: Compañia Min. De Cobres En. San Carlos, Tamalipas, Mex. See Vol. X.
Tantamount M. Co. Park City, Utah. See Vol. IX.
Tasmania Copper Mining & Mllg. Co. Winfield, Colo. See Vol. XI.
Tassoo Mng. & Sm. Co., Ltd. B. C.
Tatlayoco Lake C. Co. Tatlayoco Lake, Lilloet, B. C.
Taylor Copper Mines Co., Ltd. Sault Ste. Marie, Ont.
Taylor's Copper, Ltd. Moab, Grand Co., Utah. See Vol. X.
Tecolote C. Co. Succeeded by Las Vegas C. Co. Las Vegas, N. M.
Tecopa Cons. Mng. Co. Cal. See Vol. XII for description of property.
Tecumseh C. Co. Property sold, 1910, to La alle C. Co., for \$1,648,700. Calumet, Mich. See Vol. VIII.
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- Telkwa Mines, Ltd. Aldermere, B. C. See Vol. VIII.
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 Ten Lakes M. Co. Edgewood, Cal.
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 Tennessee-Sonora C. Co. Fronteras, Sonora, Mex.
 Tesora Silver M. Co. Silver City, Utah. See Vol. VIII.
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 Texada Cons. M. Co. Van Anda, Texada Island, B. C.
 Texada C. M. Co. Van Anda, Texada Island, B. C. See Vol. V.
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 Thompson Mining Co. Merged, 1909, in Thompson-Quincy Cons. M. Co.
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 Co. Jarilla, N. M. See Vol. V.
 Three Jays C. Co. Alberni, Vancouver Island, B. C.
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 Thunder Creek Mng. Co. Wash. Succeeded by Thunder Creek Trans.
 & Sm. Co., reorganized as Puget Sound, Chelan & Spokane Ry. Co.
 Tilt Cove Copper Co., Ltd. Newfoundland. Liquidated, 1918. Fully de-
 scribed Vol. XI, the Copper Handbook.
 Timber Peak M. Co. Socorro, N. M.
 Times Mining Co. Ariz. An Oatman company. Property sold for \$9,000
 to Grapevine Springs Water Co., in July, 1917. Described Vol. XII.
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 Tip Top C. Co. A swindle. Lands sold, 1908, to Burro Mtn. C. Co., for
 \$15,000, giving dividend of one mill on the dollar. Silver City, N. M.
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 Titanic C. Co. Williams, Ariz. See Vol. VIII.
 Tobacco Root Range M. Co. Mammoth, Mont.
 Todd C. Co. Ehrenburg, Yuma Co., Ariz.
 Togo Mng. & Smg. Co. Wash. Reorganized as Cons. Copper Co.
 Toltec Metallurgical Co. Reorganized, 1909, as Vanegas Metallurgical Co.
 Matehuala, S. L. P., Mex. See Vol. VIII.
 Toltec M. & Sm. Co. Ayutla, Oax., Mex.
 Tom Hal M. Co. A bad egg. Pateros, Wash. See Vol. VIII.
 Tom Moore Cons. M. Co. Succeeded by Tom Moore Gold M. Co., also
 dead. Eureka, Colo. See Vol. IV.
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Topeka G.-C. M. Co. Albany, Wyo.
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Trenton M. & Dev. Co. Property sold, 1910, to Anaconda C. M. Co., for 120,000 shares Anaconda stock. Company dissolved, and Anaconda stock distributed pro rata among its shareholders. See Vols. VIII.-X.
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Troy-Manhattan C. Co. Troy, Pinal Co., Ariz. Now Troy Arizona Copper Co.
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- Tularosa M. & M. Co. Succeeded, 1905, by Tularosa C. Co., which see.
- Tully C. M. Co. Pearl, Colo. See Vol. VIII.
- Tum-Tum G. & C. M. Co. Spirit Lake, Wash. See Vol. X.
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- Turk M. & M. Co. Turk, Wash. See Vol. X.
- Turkey Creek M. & Dev. Co. Merged, 1909, in Bernoudy-Turkey Creek Co. Paradise, Ariz. See Vol. IX.
- Turnbull Dev. Co. Globe, Ariz. See Vol. VIII.
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- Turquoise C. Co. Orogrande, N. M. See Vol. VIII.
- Turquoise C. M. Co. Gleeson, Ariz. See Vol. X.
- Tuscarora M. Co. Succeeded by Tuscarora M. & M. Co. Arizona.
- Tuscarora Mng. & Mlg. Co. California. See Vol. XII.
- Twentieth Century Alaska C. Co. Valdez, Alaska, and Index, Wash. See Vol. X.
- Twentieth Century G. M. Co., Ltd. A swindle of Anthony Blum; paid dividends while peddling stock. Gleeson, Ariz., and Kashaboiwe, Ont. See Vol. VI.
- Twentieth Century Knights Island C. Co. Northeast Cove, Dryer Bay, Alas. See Vol. X.
- Twin Butte C. M. Co. Flint, Mont. See Vol. X.
- Twin City Dev. Co. Turret, Colo. See Vol. VI.
- Twin Kings M. Co. Cuprite, Nev. See Vol. X.
- Twin Lakes Dev. Co. Winona, Mich. See Vol. X.
- Twin Lakes M. & M. Co. Twin Lakes, Colo. See Vol. XII.
- Twisp G.-C. M. Co. Twisp, Wash. See Vol. VIII.
- Tyrone C., Co. Tyrone, N. M. Now owned by the Phelps, Dodge Corp'n.
- Tyrone Dev. Co. Succeeded, 1907, by Chemung Copper Co. Tyrone, N. M. See Vol. VI.
- Uintah Copper Summit Co. Vernal, Uintah Co., Utah. See Vol. VI.
- Uintah Mining, Mill'g & Development Co. Bingham, Utah. See Vol. XI.
- Uintah Treasure Hill Coalition Mines Co. Succeeded Uintah Treasure Hill Mng. Co., 1907; sold property, 1910, to Silver King Coalition Mines Co., for \$100,000. Company wound up, Sept. 20, 1911. Park City, Utah. See Vol. VIII.
- Ulida Cons. C. Co. Lone Pine, Cal. See Vol. X.
- Unawep Copper M. & M. Co. Grand Junction, Colo. See Vol. VIII.
- Uncle Sam C. Co. Gilbert, Ariz. See Vol. VI.
- Union Blue M. Co. Buckskin, Nev. See Vol. X.
- Union C. M. Co. Property sold, 1909 to Calaveras C. Co. Copperopolis, Cal. See Vol. VIII.
- Union C. M. Co. Succeeded, 1907, by Union Copper Mines Co. Gold Hill, N. C. See Vol. VI.
- Union Copper Mines Co. North Carolina. Company dissolved. Formerly owned the Union Copper Mine.
- Union C. M. Co. Encampment, Wyo. See Vol. VI.
- Union C. Smelter Co. A Wm. F. Wernse fraud. Pima, Ariz.
- Union Dev. Co. Johannesburg, Cal. See Vol. IX.
- Union Cia. Min. La. Silao, Gto., Mex. See Vol. X.
- Union Ore Extr'n. & Red. Co. Reorganized, 1905, as National Radium & C. Co. Denver, Colo. See Vol. V.
- Union Sm. Co. Chloride, Ariz. See Vol. VIII.
- United Bingham G. & C. M. Co. Bingham Canyon, Utah.
- United Copper Co. A swindle. Calena, Kittitas Co., Wash. See Vol. VIII.

- United Copper Exploitation & M. Co.** A stock-jobbing scheme of A. L. Emberson's. Ely, Nev. See Vol. X.
- United C.-G. M. & Extra'n. Co.** Morristown, Ariz. See Vol. III.
- United C. M. Co.** Tucson, Ariz. See Vol. V.
- United C. Securities Co.** N. Y. Fully described Vol. XI. Also see **United C. Co.** Assets apparently consisted solely of a \$30,000,000 "damage" suit brought early 1913, against the Amalgamated C. Co., and its subsidiaries, which was dismissed in U. S. District Court, N. Y., Dec., 1914.
- United Ely Mines Co.** Ely, Nev. See Vol. X.
- United Empire Co.** Succeeded, 1906, by **United Empire Co., Ltd.** Princeton, B. C. See Vol. VI.
- United Expl'n. Co.** Battle, Wyo. See Vol. X.
- United G. & C. Co.** Hereford, Ariz. See Vol. VIII.
- United G. & C. Co.** Lordsburg, N. M. See Vol. V.
- United G. & C. M. Co.** A swindle. Turret, Colo. See Vol. V.
- United Greenwater C. M. Co.** Merged, 1906, in **Greenwater & Death Valley M. & S. Co.** Greenwater, Cal.
- United Metals Co.** Coppermount, Prince of Wales Id., Alaska. See Vol. X.
- United Mexican M. & S. Co.** Operated, 1904, Jalisco, Mex.
- United Miners' G., C. & Oil M. & Red. Co.** Ariz. No trace of operations.
- United Mines Co.** Globe, Ariz. See Vol. X.
- United Mines M. Co.** San Bdo. Co., Cal.
- United M. Co.** A bad egg. Leadville, Colo. See Vol. VIII.
- United M. & Dev. Co. of America.** Succeeded, 1905, by **United Mining Co.** See Vol. VI. Valley, Calaveras Co., Cal.
- United Rico Mines Co.** Succeeded, Oct. 25, 1911, by **Rico Mines Co.** Colo.
- United States & British Columbia Co.** Corbin, Mont. See Vol. X.
- United States C. Co.** Mullan, Idaho. See Vol. X.
- United States C. Co.** Wyo. No trace of operations.
- United States Copper Mines, Inc.** Ariz. Lost lands, 1909. See Vol. VIII.
- United States C. Sm. & M. Co.** Daulton, Madera Co., Cal.
- United States Expl'n Co.** Maine. Bankrupt. Was holding company.
- United States G. & C. Corp.** A bad egg, promoted by John McKinley and Jos. H. Reall. Humboldt House, Nev. See Vol. VIII.
- United States & Mexico Cons. M. Co.** A bad egg. Cananea, Son., Mex. See Vol. VIII.
- United States M. Co.** Operated, 1852, Ontonagon, Co., Mich.
- United States M. Co.** Utah. Dissolved. See U. S. Sm. and U. S. S. R. & M. Co.'s, and Vol. XI, Copper Handbook, for full direction.
- United States M. & S. Co.** Hermosillo, Son., Mex. See Vol. V.
- United Verde Junior C. Co.** Lost charter, 1902 and lands, 1906. Jerome, Ariz. See Vol. III.
- United Verde Syn., Ltd.** Howe Sound, B. C. See Vol. VIII.
- United Zinc Co.** Joplin, Mo. See Vol. XII.
- Unity C. & G. M. Co.** Charter forfeited 1902. Tres Piedras, N. M. See Vol. VI.
- Unity C. M. Co.** Encampment, Wyo. See Vol. VIII.
- Unity Mines Corp.** Alta, Utah. See Vol. VIII.
- Universal C. M. Corp., Ltd.** Dissolved, 1909. Arrio de Rosales, Mich., Mex. See Vol. VIII.
- Urea Mining Co.** Velardeña, Dur., Mex.
- Urique Dev. Co.** Urique, Chih., Mex. See Vol. VIII.
- Utah Amal. C. Co.** Reorganized, 1908, as **Utah G. & C. Mines Co.** State-line, Utah. See Vol. VIII.
- Utah Apex & Highland Bay Cons. M. Co.** Utah. No trace of operations.

- Utah-Bingham M. Co. See Vol. X. Succeeded April, 1912, by New Utah-Bingham M. Co. (which see).
- Utah & Boston C. Co. Utah. Property sold for debt, 1902.
- Utah Buckhorn M. Co. Utah. Succeeded, 1908, by Del Verde Tunnel Co.
- Utah Cons. Gold Mines, Ltd. Utah. Reorganized, 1903, as Utah Cons. M. Co.
- Utah Copper Co. Lone Pine, Cal. See Vol. X.
- Utah C. & G. M. Co. Utah. No trace of operations.
- Utah Dev. Co. Succeeded, 1908, by North Utah M. Co. Bingham Canyon, Utah. See Vol. VI.
- Utah Esmeralda C. M. Co. Fitting, Humboldt Co., Nev. See Vol. VIII.
- Utah Extension C. M. Co. Merged, 1908, in North Utah M. Co. of Bingham. Bingham Canyon, Utah.
- Utah Glory M. Co. Operated, 1909, in Big Cottonwood Canyon, Utah.
- Utah G. & C. Mines Co. Lost lands, 1913. Newhouse, Utah. See Vol. X.
- Utah Indian Peak M. Co. Lund, Iron Co., Utah. See Vol. X.
- Utah & Michigan M. & M. Co. Frisco, Utah. See Vol. X.
- Utah Midland C. M. Co. Basin, Grand Co., Utah. -See Vol. VIII.
- Utah Mines Coalition Co. Absorbed, March, 1912, by Michigan Utah M. Co. Alta, Utah.
- Utah Mining Co. Temosachic, Chih., Mex. See Vol. X.
- Utah & Montana C. M. Co. Phillipsburg, Mont. See Vol. X.
- Utah Mutual Tunnel & Silver M. Co. Bingham, Utah.
- Utah-Nevada C. Co. Elgin, Grand Co., Utah. See Vol. VIII.
- Utah-Nevada G. & C. M. Co. Promontory, Utah. See Vol. X.
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- Utah Smelting Co. Succeeded, 1908, by Independent Sm. Co. Bonneville, Box Elder Co., Utah.
- Utah Southern G. & C. M. Co. Milford, Utah. See Vol. VI.
- Utica & Bisbee Dev. Co. Bisbee, Ariz. See Vol. X.
- Val Verde C. Co. Succeeded by Southwestern C. Co., New Mexico.
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- Valdez-Boston C. Co. Valdez, Prince Wm. Sound, Alaska. See Vol. X.
- Valdez Gold Co. Alaska. Formerly known as the Cameron-Johnson Gold M. Co., which see.
- Valencia C. M. Co. Sherwood, Trinity Co., Cal. See Vol. VI.
- Valenciana M. Co. Forfeited N. J. charter, 1909.
- Valenciana Mng. Co. Matehuala, S. L. P., Mex.
- Valentine C. & G. M. Co. Bingham Canyon, Utah. See Vol. VI.
- Valensuela Copper Co. Bouse, Ariz. See Vol. XI.
- Valenzuela C. M. Co. Ariz. R. I. P. Mine near Benson, Ariz. See Vol. XI.
- Valley C. Co., of Michigan. Corporate existence expired, 1904.
- Valley M. & M. Co. West Cliff, Colo. See Vol. VI.
- Valley View M. Co. Operated, 1910, in Skidoo dist., Cal.
- Valley View M. Co. Anaconda, Mont.
- Van Anda Mines & Sm. Syn. Van Anda, Texada Id., B. C. See Vol. V.
- Van Britt C. Co. Planet, Ariz. See Vol. X.
- Vancouver & Boundary C. Dev. M. Co. Penticton, B. C. See Vol. III.
- Vancouver C. Co., Ltd. Mt. Sicker, Vancouver Id., B. C. See Vol. VIII.
- Vancouver Island C. Co., Ltd. Sidney, Vancouver Id., B. C. See Vol. X.
- Vancouver Island Mng. & Dev. Co., Ltd. B. C. Presumably dead. See Vol. XI.
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 Virginia Belle G. & C. M. Co. Lost lands, 1906, to Arizona Belle M. Co. Vail, Ariz. See Vol. V.
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 Virginia Cliff C. Co. New York. No trace of operations.
 Virginia Cons. C. Co. Libertytown, Frederick Co., Md. See Vol. X.
 Virginia C. Co., Ltd. High Hill, Halifax Co., Va.
 Virginia C. Co. of W. Va. No trace of operations.
 Virginia C. M. & Sm. Co. Casa Grande, Ariz. See Vol. VI.
 Virtue C. Co. Baker City, Ore. See Vol. VIII.
 Vivandiere Cons. M. & S. Co. Turret, Colo. See Vol. VIII.
 Volcanic Copper M. & Sm. Co. Cal. No trace of operations.
 Volcanic, M., Sm. & Dev. Co. Grand Forks, B. C. See Vol. IV.
 Vortex M. Co. Osburn, Idaho. See Vol. VIII.
 Vulcan Cons. C. Co. Succeeded by Nevada Vulcan M. Co. Sodaville, Nev. See Vol. IV.
 Vulcan C. Co. Jerome, Ariz. See Vol. X.
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 Vulcan C. M. Co. Encampment, Wyo. See Vol. X.
 Vulcan C. M. & S. Co. Reorganized, 1901, as Vulcan Cons. C. Co. Soda-ville, Nev.
 Vulcan-Ely C. Co. Ely, Nev. See Vol. VIII.
 Vulcan M. Co. Mich. Lands sold, 1905, to Keweenaw Copper Co.
 Vulcan M. Co. Operated, 1848, on War Dept. lease No. 98, in Ontonagon Co., Mich.
 Vulture Peak C. Co. Wickenburg, Ariz. See Vol. X.
- Wabash M. Co. Letcher, Fresno Co., Cal. See Vol. VIII.
 Wabaska Copper Mines Co. See Minnesota Nev. C. Co.
 Wagner Azurite Co. Succeeded by Ideal Cop. Co., 1914. See Vol. XII.
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 Wahnita C. M. Co. Name changed to Erie Cons. M. & Red. Co. Match-wood, Mich. See Vol. II.
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 Waldorf Cons. Mng. Co. Colo. Succeeded by Imperial Cons. Mng. Co., which see.
 Waldorf M. & M. Co. Reorganized, 1908, as Waldorf Cons. M. Co. George-town, Colo.
 Waldorf Cons. Mng. Co. Succeeded by Imperial Cons. Mng. Co.
 Wales C. M. Co. Merged, 1904, in Hadley Cons. Copper Co. Hadley, Prince of Wales Id., Alaska. See Vol. IV.
 Walker Lake C.-G. Co. Dutch Creek, Nev. See Vol. VIII.
 Walker Lake C. M. & S. Co. A bad egg. Hawthorne, Nev. See Vol. VIII.
 Walker Lake Exp'n & Dev. Co. Hawthorne, Nev. See Vol. X.
 Walker Lake Hiawatha M. Co. Hawthorne, Nev.
 Walker Lake Indian Reservation M. Co. Dutch Creek, Nev. See Vol. VIII.
 Wall Street C. & G. M. Co. Boulder, Mont.
 Wallace & Missoula M. Co., Ltd. Wallace, Idaho. See Vol. X.
 Wallace River C. M. Co. Maine. No trace of operations.

- Wallapai C. Co. Wickenburg, Ariz. See Vol. VIII.
- Waltham Mine, Ltd. Russell Gulch, Colo. See Vol. VIII.
- Wanamaker M. Co. Mullan, Idaho. See Vol. IX.
- Wardwell & Osborne C. Mines Co. Ariz. Property held by Mammon C. Co. See Vol. XII.
- War Eagle Cons. M. & Dev. Co., Ltd. Merged in Cons. M. & S. Co. of Canada, Ltd. Rosslund, B. C. See Vol. VIII.
- War Eagle C.-G. M. Co. Lands sold, 1906, to Phoenix Amal. C. Mines, Ltd. Phoenix, B. C.
- Warren Dev. Co. Name changed, 1905, to Warren Dist. Dev. Co., also dead. Bisbee, Ariz. See Vols. V and X.
- Warren Realty & Dev. Co. Ariz. Property sold, 1917, to Phelps, Dodge Corp'n. See Vol. XII.
- Warrior Dev. Co. Ariz. See Vol. XII.
- Warrior Dev. Co. Miami, Arizona. See Vol. XI.
- Warrior M. Co. Dissolved. Fort Garland, Costilla Co., Colo. See Vol. VIII.
- Warwhoop M. Co. Idaho. Probably dead. See Vol. XI, Copper Handbook. Formerly at Larson, Idaho.
- Wasatch Cons. M. Co. Milford, Utah. See Vol. V.
- Wasatch C. Co. Brigham, Utah. See Vol. X.
- Wasatch C. Co. Pinto, Wash. Co., Utah. See Vol. X.
- Wasatch King Mng. Co. Milford, Utah. Sold for taxes, 1915. See Vol. XI.
- Wasatch M. & M. Co. Merged, 1908, in Utah United C. Co. Milford, Utah.
- Washington-Arizona M. Co. Poland, Ariz. See Vol. X.
- Washington Cons. C. Co. Succeeded, March, 1909, by Penn-Wash. Cons. Mines Co. Conconully, Wash. See Vol. X.
- Washington C. Mlg. Co. A fraud of L. E. Pike & Co. Eatonville, Wash. See Vol. VIII.
- Washington-Nevada M. & M. Co. Property sold, 1910, to Syncline G.-S.-C. Mng. Co. Lida, Nev. See Vol. X.
- Washington Sm. & Ref. Co. Wash. No trace of operations.
- Washington Sonora G. & C. Co. Magdalena, Son., Mex. See Vol. VIII.
- Washington Tunnel & C. Co. Conconully, Wash. See Vol. VIII.
- Washoe Copper Co. Butte, Mont. Sold to Anaconda Copper Co. See Vol. VIII. and XI.
- Waterbury M. Co. Mich. Lands passed to Eagle Harbor M. Co.
- Waterloo C. M. Co. Mass. Dissolved, 1872. No trace of operations.
- Wachusett M. Co. Orogande, N. M. See Vol. X.
- Waukegan & Washington M. & S. Co. Lands sold for debt, 1908, to S. H. Kennedy. Bossburg, Wash.
- Wayne County C. M. Co. Utah. Charter forfeited, 1910, for unpaid tax.
- Weaver Mountain M. Co. Congress, Ariz. See Vol. X.
- Weber County M. & M. Co. Succeeded, 1908, by Del Verde Tunnel Co. Ogden, Utah. See Vol. VIII.
- Webster M. Co. Marysvale, Utah. See Vol. VIII.
- Wellington C. M. Co. Cutter, N. M. See Vol. X.
- Weldon Gold & Copper Co. See Wayne Dev. Co. & Vol. X.
- Wendigo C. Co., Ltd. Absorbed by Isle Royale Land Corp., Ltd. Washington Harbor, Mich. See Vol. II.
- Wendigon Sm. & C. M. Co., Ltd. Ont. No trace of operations.
- West Bingham C. Co. A bad egg. Bingham Canyon, Utah. See Vol. X.
- West Butte M. Co. Butte, Mont. See Vol. X.
- West Canada M. Co. Bruce Mines, Ont.

- West Cananea C. Co. Formerly at Cananea, Son., Mex. See Vols. VIII and X.
- West Coast C. Co. Wash. No trace of operations.
- West Coast M. Co. Latouche Id., Alaska.
- West Coast Smelting & Ref. Co. Tecolote, Son., Mex. See Vol. XI.
- West Columbus C. Co. Alta, Utah. See Vol. VIII.
- West Fork G.-C. M. Co. Grangeville, Ida. See Vol. X. A fraud.
- West Hill Mng. Co. Wash. Forfeited bond on San Poil mine, Republic dist., Washn.
- West Le Roi M. Co., Ltd. Lands sold, 1900, to Le Roi No. 2, Ltd. Company wound up, compulsorily, November, 1901. Rossland, B. C.
- West Minnesota Mng. Co. Ontonagon, Mich.
- West Mountain M. Co., of Ariz. Lands lost. Bingham Canyon, Utah. See Vol. V.
- West Quincy M. Co. Merged, 1910, in Quincy-Thompson Cons. M. Co. Park City, Utah. See Vol. VIII.
- West Side M. Co. Berlin, Wash. See Vol. II.
- West Slope M. & M. Co. La Sal, Utah. See Vol. III.
- West Virginia & Montana M. Co. Helena, Mont. See Vol. VIII.
- West Virginia-Wyoming Copper Mng. Co. Wyo. Succeeded by Portland Cons. Copper Co., which see.
- West Yerington C. M. Co. Yerington, Nev. See Vol. VIII.
- Western Cons. M. Co. Hermosillo, Son., Mex. See Vol. VIII.
- Western C. Co. Globe, Ariz. See Vol. VIII.
- Western C. Co. Cooke, Mont. A bad egg. See Vol. X.
- Western C. Co., Ltd. Newfoundland. Idle. Probably bankrupt. Owned the York Harbor mine, at York Harbor. Described Vol. X.
- Western Dev. Co. N. Y. Bankrupt. Was the successor of Otto Heinze & Co., which firm became bankrupt in 1907.
- Western Expl'n Co. Winthrop, Shasta Co., Cal., See Vol. VI.
- Western Expl'n Co. Ely, Nev.
- Western Leasing & Dev. Co. Bouse, Ariz.
- Western Mines Dev. Co. Swansea, Ariz. See Vol. X.
- Western M. Co. Lake City, Colo. See Vol. VIII.
- Western M. Co. Apex, Beaverhead Co., Mont. See Vol. VIII.
- Western M. & Dev. Co. Planet, Ariz. See Vol. VIII.
- Western M. & Dev. Co. Pearl, Colo. See Vol. X.
- Western M. & Steel Corp. San Luis Obispo, Cal.
- Western Montana M. Co. Saltese, Mont. See Vol. X.
- Western Nevada C. Co. Nev. Property formerly held by this company is now a part of the Nevada Douglas C. Co.'s property. See Vol. X.
- Western Nevada C. Co. New York. No trace of operations.
- Western Pacific Gold & Copper Mining & Mfg. Co. See Vol. XI.
- Western Queen Mines Co. Turkey, Ariz. See Vol. X.
- Western Slope C. M. & S. C. Colo. Property taken over by bondholders, 1916. Fully described, Vol. XII.
- Western Tungsten Mines Co. Nederland, Colo. See Vol. XII.
- Westmoreland C. Co. Dorchester, New Brunswick. See Vol. V.
- Whalen Cons. C. M. & S. Co. A. Wm. Whalen swindle. Palisade, Nev. See Vol. IV.
- What Cheer Mng. Co. Riverside, Calif. See Vol. XI.
- Whipple Mountain Gold & Copper Co. Needles, Calif. See Vol. XI.
- Whipsaw C. Co. Prescott, Ariz.
- White Bear Cons. G. Mines, Ltd. Reorganized, 1908, as Cons. White Bear M. Co., Ltd. Rossland, B. C. See Vol. VII.
- White Chief M. & M. Co. Chinipas, Chih., Mex. See Vol. VIII.

- White Cloud C. M. Co.** Nev. No trace of operations.
White Eagle C. M. Co. Lands sold for debt. Burnet, Tex. See Vol. III.
White Giant M. & S. Co. Jerome, Ariz. See Vol. VIII.
White Horse C. Co. White Horse, Yukon, Canada.
Whitehorse Mining Co. Prescott, Ariz. See Vol. XI. Was a fraud.
White Knob C. Co., Ltd. Reorganization, 1900, of White Knob M. Co., Ltd. Succeeded, 1907, by White Knob C. & Dev. Co., Ltd. Mackay, Ida. See Vol. X.
White Mountain C. Co. A swindle of Rogers Norton Co., N. Y. Independence, Cal. See Vol. X.
White Pine C. Co. Merged, 1904, in Nevada Cons. C. Co. Ely, Nev. See Vol. V.
White Quail C. Co. Merged, 1907, in Doyle Cons. Mines Co. Hesperus, Colo.
White Rock C. M. Co. Lewis, Cal. See Vol. VI
Whitetail Copper Mng. Co. Paradise, Ariz. See Vols. X and XI.
White Tanks M. Corp. Wickenburg, Ariz. See Vol. VIII.
Whitewater M. Co. Tyrone, N. M.
Whitewater-Mohawk M. Co. Palm Springs, Cal.
Whitney Red. Co. Gold Hill, N. C. See Vol. X.
Wickenburg Red. Co. Wickenburg, Ariz. See Vol. X.
Wickenburg Sm. & Ref. Co. Wickenburg, Ariz. See Vol. X.
Wicklow Mining Co. Eureka, Utah. See Vol. XI.
Wildcat Leasing Co. Ely, Nev.
Wild Rose M. Co. Skidoo, Cal. See Vol. X.
Willard Ely Copper Co. Ely, Nev. See Vol. XI.
Wilhelmi Silver & Copper Co. Velardeña, Dur., Mex. See Vol. XI.
Williey-Cananea C. Co. Property passed, 1910, to Arizona-Cananea Mines Corp. Cananea, Son., Mex. See Vol. IX.
Williams C. M. Co., Ltd. Ontario. No trace of operations.
Williams-Ely C. Co. Ely Nev. See Vol. X.
Willow Creek C. & G. M. Co. Thermopolis, Wyo. No trace of operations. See Vol. X.
Wilson Bay M. Co. Latouche Id., Alas.
Wilton M. & M. Co. Huron, Ariz. See Vol. VIII.
Window Mountain C. M. Co. Deming, N. M. See Vol. VIII.
Windsor Mine. Absorbed 1863, by Norwich M. Co., Mich.
Winnipeg Mines, Ltd. Phoenix, B. C. See Vol. V.
Winnipeg Mining Co. Republic, Wash. See Vol. XI.
Winona M. Co. Mich. Succeeded, 1898, by Winona, C. Co.
Winona-Rex C. M. Co. Encampment, Wyo. See Vol. VIII.
Winthrop M. Co. Lands passed to Frontenac M. Co., Mich.
Wisconsin & Arizona M. Co. Prescott, Ariz. See Vol. VIII.
Wisconsin C. Co. Kellogg, Idaho. See Vol. IX.
Wisconsin C. M. Co. Operated, 1863, Douglas Co., Wis.
Wisconsin M. & M. Co. Elk City, Idaho. See Vol. X.
Wisconsin M., M. & Dev. Co. Blacktail, Bonner Co., Idaho. See Vol. X.
Wisconsin-Wyoming C. M. Co. Encampment, Wyo. See Vol. VI.
Wissahickon G.-C. Co. Delaware. No trace of operations.
Wizard C. M. Co. Chewelah, Wash. See Vol. X.
Wolcott C. M. Co. Wolcott, Lamoille Co., Vt. See Vol. X.
Wolf Peak G. & C. M. Co. Paradise, Utah. No trace of operations.
Wolfram C. Co. Parker, Ariz. See Vol. X.
Wolverine & Arizona Dev. Co. Reorganized, 1904, as Wolverine & Arizona M. Co. Bisbee, Ariz. See Vol. IV.
Wolverine C. M. Co., Ltd. Mullan, Idaho. See Vol. VIII.

- Wolverine M. Co.** Succeeded by Wolverine C. M. Co., Houghton Co., Mich.
Wolverine M. Co. Wound up, by receiver, 1908. Park City, Utah. See Vol. VI.
Wolverine-M. & Leasing Co. Pearl, Colo. See Vol. X.
Wolverine & Western Dev. Co. Roseburg, Ore. See Vol. VI.
Wood River G. & C. Co. Delaware. No trace of operations.
Woolley M. Co. Kelvin, Ariz. See Vol. X.
World's Fair M. Co. Patagonia, Ariz.
Wright & Lawrence M. Co. A swindle. Doyle, Cal. See Vol. VIII.
Wright-Russell C. M. Co. Battle, Wyo. See Vol. X.
W. S. Fletcher M. & S. Co. Succeeded, 1905, by Arizona-Mexican M. & S. Co. Kingman, Ariz., and Needles, Cal. See Vol. V.
Wyoming & Alabama M. Co. Tie Siding, Wyo. See Vol. X.
Wyoming & Colorado C. Co. Rock Springs, Wyo. See Vol. X.
Wyoming Cons. C. Co. Encampment, Wyo. See Vol. X.
Wyoming C. Co. Encampment, Wyo. See Vol. X.
Wyoming C. & M. Co. Rawhide Buttes, Wyo. See Vol. VIII.
Wyoming Gold & Copper Mining Co. Lusk, Wyo. See Vol. XI.
Wyoming Hills M. Co. Encampment, Wyo. See Vol. IX.
Wyoming M. Co. Operated, 1865, near Mosquito Lake, Keweenaw Co., Mich.
Wyoming M. Co. Kirwin, Wyo. See Vol. X.
Wyoming Queen M. Co. Jelm, Wyo. See Vol. X.
Wyona Iron & C. Co. Battle, Wyo. See Vol. VIII.

Yadkin Cons. M. Co. North Carolina. No trace of operations.
Yadkin M. & Improvement Co. Buck Shoal, N. C. See Vol. X.
Yaeger Canyon C. Co. Ariz. See Vol. XI, Copper Handbook. Formerly at Jerome, Ariz.
Yale G.-C. M. Co. Rossland, B. C. See Vol. X.
Yale M. Co., Ltd. Lands sold to Hedley Gold M. Co. Hedley, B. C. See Vol. VIII.
Yampa Sm. Co. Utah. Smelter equipment sold in 1914. Fully described Vol. XI.
Yankee Cons. M., M. & Tunneling Co. Merged, 1908, in Continental Mines, Power & Reduction Co. Described Vol. X.
Yankee Doodle M. Co. Johnson, Ariz. Name changed, 1908, to Centurion Arizona M. Co. (which see).
Yaqui River Expl'n Co. San Antonio de la Huerta, Son., Mex.
Yaqui River G. & C. Co. Nogales, Son., Mex. See Vol. X.
Yarwell Mtn. C. Co. Steamboat Springs, Colo. See Vol. X.
Yavapai C. Co. Prescott, Ariz. See Vol. VIII.
Yavapai Dev. Co. Mayer, Ariz. See Vol. X.
Yavapai Metals Mng. & Red. Co. Ariz. Property now owned by A. W. Nichols of Humboldt, Ariz. See Vol. XI.
Yellow Butte C. Co. Edgewood, Cal. See Vol. X.
Yellow Jacket C. Co. Merlin, Ore.
Yellow Jacket C. M. Co. Utah. No trace of operations.
Yellowstone C. M. Co. Mullan, Idaho. See Vol. X.
Yerington Associated C. Co. Yerington, Nev. See Vol. X.
Yerington-B. C. M. Co. Wabuska, Nev. See Vol. VIII.
Yerington C. Co. Nev. Succeeded, 1911, by New Yerington C. Co.
Yerington C. King M. Co. Yerington, Nev. See Vol. X.
Yerington Gold M. Co. Mason, Nev.
Yerington Knob Hill Syn. Yerington, Nev. See Vol. X.

- Yerington Mohawk C. Ass'n. Yerington, Nev. See Vol. VIII.
Yerington Nat'l C. Co. Yerington, Nev. See Vol. IX.
Yerington Nipper C. Co. Yerington, Nev. See Vol. X.
Yerington Queen C. Co. Yerington, Nev. See Vol. VIII.
Yerington Red Metal M. Co. Yerington, Nev. See Vol. VIII.
Yerington United C. Co. Yerington, Nev. See Vol. X.
Yerington-Utah M. Co. Yerington, Nev. See Vol. X.
York Harbour C. Co., Ltd. Wound up, 1902. York Harbour, Newfoundland. See Vol. III.
York Harbour Mine (Newfoundland), Ltd. Property, York Harbour mine, leased from Western C. Co., Ltd. See Vol. X.
York M. Co. Utah. Merged, 1902, in Utah Apex M. Co.
Yosemite C. Co. Bagby, Cal. See Vol. X.
Yosemite C. M. & Red. Co. Daulton, Cal. See Vol. VI.
Yreka C. Co. Yreka, Vancouver Id., B. C. - See Vol. VII.
Yuba Leasing & Dev. Co. Nev. See Vol. XII.
Yukon Pueblo Mines Co. Sold 1910, to Atlas M. Co. White Horse, Yukon. See Vol. VIII.
Yuma C. Co. Vicksburg, Ariz. See Vol. X.
Yuma C. & S. M. Co. Ariz. No trace of operations.
- Zacatecas & Durango M. & Sm. Co. Chalchihuites, Zac., Mex. See Vol. VII.
Zapoteca; Compania Minera. Property sold, 1909, to Mutual M. & Dev. Co. Ocotlán, Oax., Mex.
Zarthushtra C. Co. Ariz. No trace of operations.
Zelnora M. Co. Property passed to Bingham-New Haven C. & G. M. Co. Bingham, Utah. See Vol. X.
Zenith G. & C. M. Co. Encampment, Wyo. See Vol. VI.
Zimapan M. & Sm. Co. Zimapan, Mex. See Vol. VI.
Zonia C. M. Co. Kirkland, Ariz. See Vol. X.

CHAPTER V

STATISTICS OF THE METAL MINING INDUSTRY

Mineral production of the United States during 1916 was valued by the U. S. Geological Survey at \$3,470,000,000, an increase of 45% over that for 1915, which was a large gain over the 1914 yield. Metal production in 1916 was worth \$1,622,000,000, 63% higher than in 1915. Copper and pig iron contributed 78% of the increase. Non-metals were valued at \$1,833,000,000, a gain of 32%. Coal and oil supplied 76% of the increase.

Metal production in 1917—due to labor troubles, lower prices, and other causes—will most likely be considerably below that of 1916.

The remarkable prosperity of the metal mining industry for 1915, 1916, and 1917, is a direct result of the great European War. When this War began in 1914, the sudden lack of demand and cessation of exports of the metals, coupled with slack if not stagnant business conditions in the United States, led to lowered prices, and a painfully depressed state of the entire industry, but in 1915-'16-'17 the truly remarkable demand for copper, zinc, lead, and mercury, and tungsten, also many non-metallic minerals with runaway prices, quickly led to the reopening of many properties long idle and the crowding of output from producing mines.

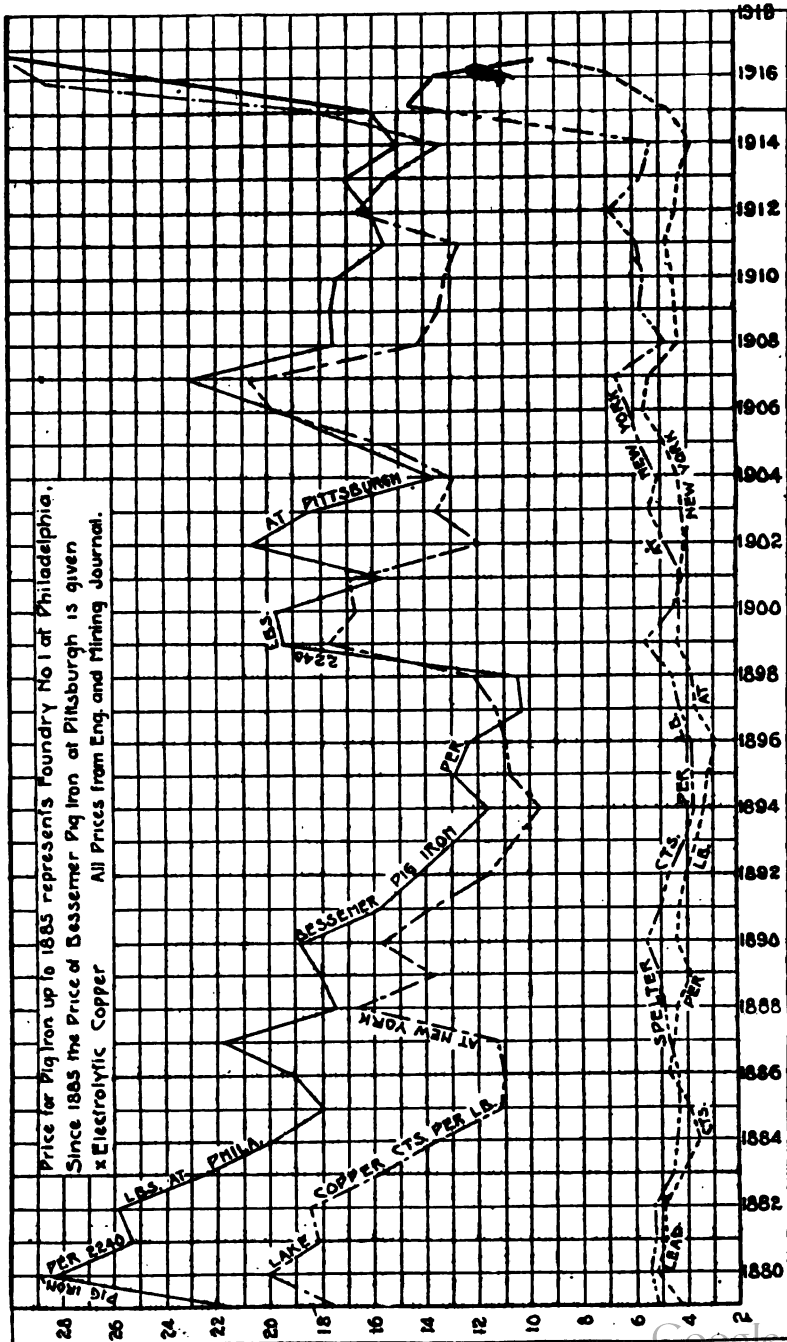
The following table, showing production for the years 1913-1916, does not disclose this activity, since in the figures for the calendar year the small output for the first half year, combined with the great output of the second half, makes the total nearly normal. The total from July to July would be quite different. The table is from the *Engineering & Mining Journal*, Mineral Industry, and U. S. Geological Survey.

PRODUCTION OF METALS IN THE UNITED STATES

Metal	1913	1914	1915	1916
Aluminum, pounds.....	64,900,000	90,000,000	99,000,000	(g)139,000,000
Copper (a), pounds.....	1,225,735,834	1,158,581,876	1,423,698,160	1,941,900,586
Ferromanganese, long tons...	229,834	185,118	239,824	415,534
Gold (b), dollars.....	88,884,400	94,531,800	101,035,700	92,316,400
Iron, long tons.....	30,966,301	23,332,244	29,916,213	39,434,797
Lead (c), short tons.....	433,476	538,735	535,922	583,498
Nickel (e), pounds.....	47,194,101	35,006,770	56,352,582	72,611,492
Quicksilver, flasks.....	19,681	16,568	21,033	(f)29,932
Silver (b), Troy ounces.....	66,801,500	72,455,100	74,961,075	72,883,800
Zinc (d), short tons.....	346,676	353,049	489,519	667,456

(a) Production from ore originating in the United States. (b) The statistics are final, reported jointly by the directors of the Mint and the U. S. Geological Survey. (c) Production of refined lead from ore and scrap originating in the United States; antimonial lead is included. (d) Total production of smelters, except those treating dross and junk exclusively; includes spelter derived from imported ore. (e) Imports: this nickel is refined in the United States for the production of metal, oxide and salts. (f) As reported by U. S. Geological Survey. (g) Estimated.

The most important individual producer is the American Smelting & Refining Co., often called the Smelter Trust. This company handles most of the custom ore sold in this country and Mexico, and also has many mines of its own. The metals recovered by its smelters in 1915 were sold for \$232,281,182, and \$330,297,952 in 1916. In 1915 and 1916 this single company



COURSE OF METAL PRICES SINCE 1879--ANNUAL AVERAGES

Prices in 1917 are for six months. Pig iron rose to \$55, but at end of Nov., 1917, was \$37.25 per ton; copper declined and was fixed by Government at 23½¢ per lb., spelter rose to 10.3¢ in March, but was 7.7¢ in Nov.; and lead rose to 11.17¢ in June, but

received nearly \$55,000,000 each for gold produced from the ores handled, equal to more than half the United States production; its smelter extracted over \$38,000,000 of silver in 1915 and \$41,000,000 in 1916 from the ores treated, including some from Mexico and Canada. The copper ore put through its smelters realized \$92,356,662 and \$185,919,397, or over 35% and 39% of the country's total production for the last two years. The lead production, equivalent to over one-half the value of the entire United States production, was sold for over \$27,000,000 and \$37,000,000. These figures explain why the company is so often called the Smelter Trust.

METAL PRICES

The price per unit of metal production (gold excepted, which is fixed by law at \$20.67+ per fine ounce) is based upon averages of daily market prices current at New York for silver, copper and lead, and at St. Louis for metallic zinc or spelter. The prices used by the U. S. Geological Survey for calculation of values for years 1850-1915, inclusive, are as follows:

PRICES OF SILVER, COPPER, LEAD AND ZINC

Year	Silver Fine oz.	Copper Pound	Lead Pound	Zinc Pound	Year	Silver Fine oz.	Copper Pound	Lead Pound	Zinc Pound
1850.....	\$1.32	\$0.22	\$0.05	\$.....	1884.....	\$1.11	\$0.13	\$0.037	\$0.044
1851.....	1.34	.166	.05	.....	1885.....	1.07	.108	.039	.043
1852.....	1.33	.22	.05	.....	1886.....	.99	.111	.046	.044
1853.....	1.35	.22	.06	0.055	1887.....	.98	.138	.045	.046
1854.....	1.35	.22	.06	.....	1888.....	.94	.168	.044	.049
1855.....	1.34	.27	.07	.....	1889.....	.94	.135	.039	.05
1856.....	1.34	.27	.066	.....	1890.....	1.05	.156	.045	.055
1857.....	1.35	.25	.06	.....	1891.....	.99	.128	.043	.05
1858.....	1.34	.23	.06	.....	1892.....	.87	.116	.04	.046
1859.....	1.36	.22	.055	.....	1893.....	.78	.108	.037	.04
1860.....	1.35	.23	.056	.....	1894.....	.63	.095	.033	.035
1861.....	1.33	.22	.05	.....	1895.....	.65	.107	.032	.036
1862.....	1.35	.22	.06	.....	1896.....	.58	.108	.03	.039
1863.....	1.345	.34	.06	.....	1897.....	.60	.12	.036	.041
1864.....	1.345	.47	.07	.139	1898.....	.59	.124	.038	.046
1865.....	1.337	.3925	.066	.....	1899.....	.60	.171	.045	.058
1866.....	1.339	.3425	.07	.....	1900.....	.62	.166	.044	.044
1867.....	1.33	.2537	.065	.....	1901.....	.60	.167	.043	.041
1868.....	1.326	.23	.065	.....	1902.....	.53	.122	.041	.048
1869.....	1.325	.2425	.06	.....	1903.....	.54	.137	.042	.054
1870.....	1.328	.2118	.06	.....	1904.....	.58	.128	.043	.051
1871.....	1.325	.2412	.06	.....	1905.....	.61	.156	.047	.059
1872.....	1.322	.3556	.064	.....	1906.....	.68	.193	.057	.061
1873.....	1.297	.2800	.06	.....	1907.....	.66	.20	.053	.059
1874.....	1.278	.2200	.06	.....	1908.....	.53	.132	.042	.047
1875.....	1.24	.227	.058	.07	1909.....	.52	.13	.043	.054
1876.....	1.16	.21	.061	.072	1910.....	.54	.127	.044	.054
1877.....	1.20	.19	.055	.06	1911.....	.53	.125	.045	.057
1878.....	1.15	.166	.036	.049	1912.....	.615	.165	.045	.069
1879.....	1.12	.186	.041	.052	1913.....	.604	.155	.044	.056
1880.....	1.15	.214	.05	.055	1914.....	.553	.133	.039	.051
1881.....	1.13	.182	.048	.052	1915.....	.507	.175	.047	.124
1882.....	1.14	.191	.049	.053	1916.....	.658	.272	.068	.134
1883.....	1.11	0.165	0.043	0.045	1917*.....	.808	.297	.096	.093

* 11 months.

These prices do not accord with the yearly averages reported by the American Metal Exchange, the differences being possibly those between an arithmetical and a geometrical average.

The 25 years (1889-1919) geometric averages for the three metals are as follows: Silver, 66 cts. per oz.; copper, 14 cts. per lb.; zinc; 5.3 cts. per lb.

These variations are shown graphically on the diagram on the opposite page where the generally close relation of the prices of pig iron and of copper is brought out. The price of pig iron is the recognized index of industrial activity, high prices prevailing during "good times" and the reverse in periods of depression. Spelter prices rise and fall with copper, while lead prices have been less responsive to general conditions.

In the following pages, the essential facts concerning the price, production, consumption, exports and imports of each metal are given in tables.

ALUMINUM

Aluminum Production and Prices of the United States, in Pounds

				Per Lb.
1883.....	83	1901.....	7,150,000	.....
1884.....	150	1902.....	7,300,000	.....
1885.....	283	1903.....	7,500,000	.....
1886.....	3,000	1904.....	(a) 8,600,000	.....
1887.....	18,000	1905.....	(a) 11,347,000	.....
1888.....	19,000	1906.....	(a) 14,910,000	.....
1889.....	47,468	1907.....	(a) 17,211,000	.....
1890.....	61,281	1908.....	(a) 11,152,000	.....
1891.....	150,000	1909.....	(a) 34,210,000	23.18c
1892.....	259,885	1910.....	(a) 47,734,000	22.97
1893.....	333,829	1911.....	(a) 46,125,000	20.34
1894.....	550,000	1912.....	(a) 65,607,000	22.52
1895.....	920,000	1913.....	(b) 72,379,000	23.63
1896.....	1,300,000	1914.....	(b) 79,129,000	18.595
1897.....	4,000,000	1915.....	99,000,000	31.90
1898.....	5,200,000	1916.....	139,000,000	34.00
1899.....	6,500,000			
1900.....	7,150,000	Total.....	694,866,779	

(a) Consumption. (b) American Metal Market figures. In July, 1916, virgin ingots, 98%–99% pure, sold at 61 to 62 cents per pound, remelted at 58 cents, and alloy at 47–49 cents. In October, 1917, the respective prices were 37 to 39 cents, 35 to 37 cents, and 27 to 29 cents. Aluminum dust, used in recovery of silver, etc., was 75 to 85 cents per pound. This is also used in the explosive 'ammonal.'

EXPORTS OF ALUMINUM OF UNITED STATES PRODUCTION

1908.....	\$ 330,092	1913.....	\$966,094
1909.....	567,375	1914.....	1,546,510
1910.....	949,215	1915.....	3,682,117
1911.....	1,158,603	1916.....	15,419,134
1912.....	1,347,621	1917 (July-August).....	3,775,325

Imports during 1916 were 8,200,528 lbs., against 18,765,172 in 1915, 15,964,042 in 1914, and 26,958,354 in 1913. In 8 months of 1917, 55,238 lb.

WORLD'S PRODUCTION OF ALUMINUM

In metric tons of 2,204.6 lb.

	1906	1907	1908	1909	1910	1911	1912	1913	1914	1915	1916
United States and Canada.....	6,000	8,000	6,000	13,200	16,100	18,000	19,500	22,500	35,800	44,900	63,000
Germany, Austria, Switzerland.....	3,500	4,000	4,000	5,000	8,000	8,000	12,000	12,000	.....	.....	20,000
France.....	4,000	6,000	6,000	6,000	9,500	10,000	13,000	18,000	.....	.....	20,000
England.....	1,000	1,800	2,000	2,800	5,000	6,000	7,500	7,500	.....	.....	4,000
Italy.....	.....	.....	600	800	800	800	800	800	.....	.....	1,000
Norway.....	.....	.....	.....	600	900	900	1,500	1,500	.....	.....	16,000
Total.....	14,500	19,800	18,600	31,200	43,800	45,000	62,600	68,200	74,800	77,000	132,500
Price in cents per pound.....				22.18	22.97	20.34	22.52	23.63	18.595	31.90	24.00

ALUMINUM PRODUCERS

Aluminum Co. of America, U. S. and Canada; Northern Aluminum Co. of Canada; British Aluminum Co. (England and Norway); L'Aluminium Francaise; Aluminium Industrie Aktien Gesellschaft (Austria and Switzerland); Hoyang Falden Norsk Aluminium (Norway); and Societa dell'alluminio (Italy).

ANTIMONY

ANTIMONY PRODUCTION OF THE UNITED STATES, IN SHORT TONS,

Year	Contained in anti- monial lead of domestic origin		Antimony produced from domestic ore		Recovered from old alloys, scrap, dross, etc.		Average price per pound
	Quantity	Value	Quantity	Value	Quantity	Value	
1903.....	2,558	\$445,092	570	\$103,341	.....	.....	.....
1904.....	2,571	443,598	(a)486	61,926	.....	.....	.....
1905.....	2,747	568,354	493	117,433	.....	.....	.....
1906.....	1,362	544,800	(b)404	58,149	.....	.....	20.00c
1907.....	1,561	508,886	(b)351	77,300	.....	.....	6.30
1908.....	2,246	359,360	(c)	(c)	.....	.....	8.00
1909.....	1,617	252,252	(c)	(c)	1,556	\$242,736	7.80
1910.....	1,598	263,431	.....	.....	2,779	457,979	8.24
1911.....	1,543	264,780	.....	.....	2,369	406,520	8.58
1912.....	1,224	209,059	.....	.....	2,506	428,025	8.54
1913.....	2,204	375,562	.....	.....	2,705	460,932	8.52
1914.....	2,530	(d)529,740	.....	.....	2,645	(d)555,450	10.50
1915.....	3,425	1,735,105	2,100	1,063,860	3,100	1,571,460	25.33
1916.....	.....	.....	.....	.....	.....	.....	.....

(a) Estimated from the average content of the ore. (b) Figured as 60% of domestic ores only. (c) None produced from domestic ore. Figures not collected for foreign ores. (d) Includes actual marketed value of a few tons of antimony made as a by-product in the electrolytic refining of copper.

Figures by the U. S. Geological Survey. In 1910 a total of 9 tons, in 1911 a total of 10 tons, in 1912 a total of 13 tons, in 1913, 45 tons; in 1914, 1 ton, was recovered as antimony, the remainder as alloy.

ANTIMONY IMPORTS OF THE UNITED STATES, IN POUNDS

Year	Metal		Crude and Ore		Oxide and Salts		Total
	Quantity	Value	Quantity	Value	Quantity	Value	Value
1904....	4,268,045	\$248,726	2,488,518	\$50,414	981,026	\$70,668	\$369,808
1905....	4,941,247	431,228	1,970,788	53,026	1,010,228	80,130	564,384
1906....	10,305,734	1,391,289	1,972,658	125,841	764,070	99,251	1,616,279
1907....	9,600,901	1,407,861	2,771,387	180,903	682,192	98,038	1,686,802
1908....	8,069,915	771,206	3,287,218	106,930	623,125	65,898	944,034
1909....	9,557,956	620,117	3,453,542	94,249	955,360	60,353	744,719
1910....	7,955,945	492,570	1,346,962	47,185	326,136	14,201	553,956
1911....	8,486,137	470,552	1,641,467	60,459	1,003,647	54,426	585,437
1912....	13,936,873	806,473	1,562,066	51,444	1,759,908	81,077	940,994
1913....	12,479,727	798,581	4,021,486	137,780	1,968,475	117,169	1,053,530
1914....	13,110,426	736,420	2,606,349	75,345	2,744,406	315,001	1,126,766
1915....	17,484,000	.....	3,374,012	.....	.....	.....	.....
1916....	19,749,830	.....	9,485,423	.....	.....	.....	.....
1917*....	21,285,252	2,554,637	9,636,523	871,035	.....	.....	.....

* 8 months.

(American Metal Market and Mineral Industry figures.)

ANTIMONY PRICES, IN CENTS PER POUND

	1913			1914			1915		1916
	Cook- son's	U. S.	Ordinaries	Cook- son's	U. S.	Ordinaries	Cook- son's	Ordinaries	Ordinaries*
January....	9.94	9.53	8.97	7.388	7.110	6.125	17.90	15.85	42.45
February....	9.47	9.09	8.25	7.250	7.057	6.100	21.25	18.21	44.31
March.....	9.28	8.85	8.18	7.815	7.073	6.053	28.75	22.18	44.75
April.....	9.13	8.50	7.98	7.363	7.048	6.006	31.88	24.88	42.06
May.....	8.88	8.37	7.79	7.365	7.020	5.845	....	35.30	31.60
June.....	8.79	8.27	7.64	7.250	7.000	5.825	....	37.69	20.05
July.....	8.54	8.08	7.55	7.210	6.940	5.638	....	38.13	14.70
August....	8.38	7.91	7.39	17.250	15.800	13.800	....	33.00	11.53
September..	8.37	7.93	7.37	11.830	.....	9.940	....	28.63	11.81
October....	7.60	7.27	6.49	14.680	.....	12.060	....	31.45	12.70
November..	7.62	7.30	6.45	17.750	.....	14.450	....	38.88	13.84
December... 7.50	7.25	6.13	16.130	.....	13.310	....	....	39.25	14.50
Year.....	8.73	8.22	7.52	10.732	.....	8.763	....	30.28	25.37

Figures from Eng. and Min. Jour.

* Really Chinese and Japanese brands. Cookson's quotations ceased in May, 1915. In October, 1917, prices were nominal at 14.50 cents per pound.

WORLD'S PRODUCTION OF ANTIMONY IN 1911, 1912, 1913, 1914, AND 1915, IN SHORT TONS

	1911	1912	1913	1914	1915
	Quantity	Quantity	Quantity	Quantity	Quantity
Algeria (ore).....	.....	5,139	.....	1,100	9,022
Argentina.....	34	Not stated	.....	.....	.....
Australia:					
New South Wales (ore and metal) ..	186	71	.....	.....	.....
Queensland (metal).....	11	.....	.....	.....	.....
Victoria (ore).....	1,230	2,722	.....	.....	.....
Austria (ore).....	298	4,983	.....	.....	.....

WORLD'S PRODUCTION OF ANTIMONY IN 1911, 1912, 1913, 1914, AND
1915, IN SHORT TONS (*Continued*)

	1911	1912	1913	1914	1915
	Quantity	Quantity	Quantity	Quantity	Quantity
Bolivia (ore).....	344	100	.....	.....	17,900
Canada: Nova Scotia (ore).....	192	.....	.....	.....	.....
China, exports:					
Metal.....	7,702	14,914	13,032	19,645	23,357
Ore.....	7,509	2,265	.....	.....	.....
France (ore).....	32,267	12,147	.....	.....	.....
Hungary:					
Crude and metal.....	933	947	1,038	.....	.....
Ore.....	88	72	.....	.....	.....
Italy (ore).....	2,691	2,070	76	138	481
Japan:					
Crude.....	1	14	21	3,852	8,320
Refined.....	106	69	.....	.....	.....
Mexico:					
Ore.....	133	17	.....	.....	.....
Metal.....	4,554	3,849	.....	.....	.....
Portugal (ore).....	.....	110	.....	.....	.....
Serbia (ore).....	186	327	.....	.....	.....
Spain (ore).....	110	551	.....	.....	.....

Production in 1913 was approximately 22,000 tons (long tons) of regulus, crude and refined, made up as follows: China, 12,820 tons; France 6,000; Mexico, 2,315, and Hungary, 860 tons.

During 1916 the *Metal Bulletin* of London stated that Algeria produced 28,473 tons of ore, and smelters were erected near Marseilles, France. The Bolivian output increased considerably. China exported 24,727 tons of metal and 12,968 tons of ore, valued at \$9,340,567 and \$1,092,762, respectively. In China, the Wah Chang Mining & Smelting Co., is the important factor, also in the world's output.

The antimony deposits of the U. S. may be classed as those containing antimony only, and those whose antimonial content is a valuable by-product. Though many deposits of stibnite are known, they cannot be worked with normal prices, because in ordinary years the Chinese and Japanese smelters can supply it cheaper than we can produce it, and because the market is limited and easily glutted, resulting in still lower prices. The domestic production has therefore come almost entirely from the electrolytic refining of antimonial lead and copper metal.

The entire world's consumption up to 1914 was less than $\frac{1}{3}$ that of tin or 3% of that of zinc or copper. Antimonial ores to be valuable must be free from arsenic, zinc, and lead.

The average price for the 30 years preceding 1914 is 7.5 cts. per pound.

The Market for Antimony. The principal uses of antimony, the demand for which continues to increase, are in making type metal, babbitt and other anti-friction bearing metals, battery plates, siphon tops, cable sheathing, white metals for the foundation of silver-plated ware, and other plated ware, such as clock-cases, table-ware, coffin trimmings, and toys. In 1915-16 a great demand was created by the use of antimony in making shrapnel bullets, but this fell off somewhat due to the use of high explosive shells.

Its compounds are used in enamels, rubber vulcanizing, pigments, glass making, and safety matches.

The following persons are buyers of antimony ores:

Atkins, Kroll & Co., San Francisco, Cal.; Elsasser Merchants Finance Co., 625 Security Bldg., Los Angeles, Cal.; Frazer & Co., 50 Church St., New York City; C. W. Hill Chemical Co., 320 S. San Pedro St., Los Angeles, Cal.; Edw. Hill's Son & Co., Inc., 65 Wall St., New York City; Hoyt Metal Co., St. Louis, Mo.; M. D. Mackay, 130 Pearl St., New York City; Magnolia Metal Co., 113-15 Bank St., New York City; Pennsylvania Smelting Co., Pittsburgh, Pa.; Philipp Brothers, 43 Broadway, New York City; Herbert Solinger, Beer-Sondheimer Co., 61 Broadway, New York; C. Solomon, Jr. (Chapman Smelting Co.), 409 Battery St., San Francisco, Cal.; David Taylor, Consolidated Ores Co., Boston Bldg., Salt Lake City, Utah; Wm. Wraith, mgr., International Smelting Co., Salt Lake City, Utah; Wah Chang Mining & Smelting Co., New York.

In 1915 antimony mines in all parts of the U. S. were reopened, notably those of Pine creek, in the Coeur d'Alene, Idaho. Several small furnaces were built, due to the increased price of the metal. The largest production was made from deposits near Wild Rose spring, on the northwest slope of Telescope peak, in the Panamint range, Death Valley, Cal. Alaska furnished 800 tons of stibnite ore from the Fairbanks district and from Seward peninsula. Reported that shippers received from \$1.25 to \$1.75 per unit of stibnite.

The slump in prices early in 1916 resulted in many domestic producers closing most of them being in districts where transportation is expensive, while there was lack of buyers. This condition grew worse until stagnation set in, with a temporary increase, and remained so at Dec., 1917.

Antimony is sold as star metal, and the market not only demands a product assaying 99%, but also that each slab should have the fern-like crystallized surface known as the star, although this does not indicate that it is chemically pure.

ANTIMONY MINES

Antimony Corp.....	Mexico	Idaho Antimony Mining Co.....	Idaho
Antimony Silver Mining Co.....	Idaho	Merchants Finance Co. (Western	
Benton Mining Co.....	Idaho	Metals Co.).....	Calif.
Coeur D'Alene Antimony Co.....	Idaho	Pomana Antimony Mine.....	Nevada
Homelode Mining Development		Stanley Mining Co. (no recent pro-	
Co.....	So. Dakota	duction).....	Idaho
Howell Mining Co.....	Utah	Star Antimony Co.....	Idaho
		Wah-Chang Mining & Smelting Co..	China

ARSENIC**U. S. PRODUCTION OF WHITE ARSENIC, As₂O₃, IN SHORT TONS**

Year	Quantity	Value	Year	Quantity	Value
1901.....	300	\$18,000	1909.....	1,214	\$52,946
1902.....	1,353	81,180	1910.....	1,497	52,305
1903.....	611	36,691	1911.....	3,132	73,408
1904.....	36	2,185	1912.....	3,142	190,757
1905.....	754	35,210	1913.....	2,513	159,236
1906.....	737	63,460	1914.....	4,670	313,147
1907.....	1,751	163,000	1915.....	5,498	302,116
1908.....	.....	.....	1916.....	5,986	555,186

PRICES AND IMPORTS OF ARSENIC COMPOUNDS, 1904-1916

Fiscal Year	Quantity short tons	Value	Price per pound,	Paris Green and London Purple Quantity, pounds	Value
			cents		\$
1904.....	3,400	\$243,380	3.58	28,498	\$ 985
1905.....	3,838	256,540	3.34	44,931	1,118
1906.....	3,987	350,045	4.39	311,293	21,347
1907.....	5,164	574,998	5.52	133,422	21,919
1908.....	4,964	430,400	4.34	195,000	30,764
1909.....	4,036	303,728	3.76	183,765	20,370
1910.....	5,139	314,306	3.06	181,363	14,648
1911.....	4,096	247,323	3.01	126,191	4,972
1912.....	6,156	428,741	3.48	162,272	6,950
1913.....	4,701	410,446	4.37	99,692	4,431
1914.....	3,628	273,713	3.77	15,476	2,235
1915.....	1,786	154,517	4.30	.....	.....
1916.....	1,090	124,844	5.70	.....	.....
1917*.....	1,878	170,530	6.11	.....	.....

* 8 months.

WORLD'S PRODUCTION OF ARSENIC, BY COUNTRIES, IN SHORT TONS

	1913	1914	1915	1916
Great Britain, white arsenic.....	1,716	2,007	2,536	2,575
Canada, white arsenic.....	1,538	1,576	2,174	1,983
France (arsenopyrite).....	70,613	.....	.....	.....
Germany, oxide and sulphide.....	5,008	.....	.....	.....
Japan, white arsenic.....	.....	.....	15	.....
Portugal, ore.....	925	960	.....	.....
United States, white arsenic.....	2,158	4,238	4,990	5,430

The occurrence of arsenic in metal-bearing ores is so common as to be practically universal. This is shown at the smelters treating lead, copper, and zinc ores, which emit over 20,000 tons of arsenious trioxide yearly into the atmosphere in the form of smelter smoke or fume. A small amount is saved at the Anaconda, Mont., smelter, and at the Ontario smelters treating Cobalt ores, and also in Mexico by the Mapimi smelter of the American Metal Co. Allison Butts, in The Mineral Industry for 1916, states that the amount lost yearly from the Anaconda smelter is greater than the American production.

With such an enormous wastage, it is foolish to attempt to work arsenical ores for the arsenic alone. The chief use of the metal is in glass-making and for insecticides in agriculture; the glass industry uses about half of the amount produced in this country.

ARSENIC PRODUCERS

American Smelting & Refining Co.	Nipissing Mining Co., Ltd.....	Ontario
Canadian Smelting & Refining Co.	Puget Sound Reduction Co.....	Wash.
Deloro Mining & Reduction Co.....	U. S. Smelting, Refining & Mining	
Metals Chemical Co.....	Co.....	Utah

BISMUTH

Occurrence. Bismuth ores are comparatively rare, though the metal occurs in many of the lead ores of the Rocky Mountain regions. The U. S.

production comes entirely from electrolytic lead refineries at Grasselli, Ind., Omaha, Neb., and a few other plants. The Wilson Cons. Mining Co. produced oxidized bismuth ore in the Clifton district, Tooele Co., Utah, in 1914. The world's supply comes mainly from Bolivian mines owned by Aramayo Francke Mines, Ltd., at Chorolque and Tasna. This firm produced 511 tons crude metal in the year ended May 31, 1915, compared with 437 tons the previous year. Another producer is the Seoul Mining Co., Korea, whose concentrates in 1915 contained bismuth worth \$30,000, say 5 tons of metal.

Occasionally lots of gold-silver or lead ore containing from 10 to 20% bismuth have been marketed in the West, but buyers gave nothing for the bismuth contained.

Prices. The price for bismuth in the U. S., ordinarily about 65 cents a pound, was \$2.75 per lb. at the beginning of 1915; toward the end of the year it sold to \$4 per lb. This declined to \$3.25 later on. In London the price was from 10s to 11s. (\$2.40 to \$2.64) per lb. in 1916.

The price and market for bismuth ores and metal were both artificial, prior to the war being fixed by a combination of English and German firms, who absolutely controlled the market and shut out competition by most drastic and iniquitous methods. Were American production constant, domestic producers could have secured the American market. At present the A. S. & R. Co., and U. S. S. R. & M. Co., are the main producers and dealers.

The Anaconda smelter dust carries over 1% bismuth, equal to a daily production of 1,580 lbs., and this plant will probably be a factor in the market.

Uses. Metallic bismuth is employed in making low-fusing alloys or cliché metals which are used in automatic fire sprinklers, fuses for electric wiring, and solders. Some of the salts have a smooth, unctuous feel, and are used in face and toilet powders, and in medicinal preparations. It is also employed to a small extent in making optical glasses.

U. S. IMPORTS OF METALLIC BISMUTH IN POUNDS

Year	Quantity	Value	Year	Quantity	Value
1904.....	185,905	\$339,058	1910.....	198,174	\$332,668
1905.....	148,589	318,007	1911.....	172,093	311,771
1906.....	254,733	318,452	1912.....	182,840	316,440
1907.....	259,881	325,015	1913.....	117,747	213,257
1908.....	164,793	257,397	1914.....	90,505	165,208
1909.....	183,413	286,516	1915.....	34,237	72,587
			1916.....	64,821	155,925

BISMUTH PRODUCERS

American Sm. & Ref. Co.	Wilson Cons. Mining Co.....	Utah
U. S. Metals & Refining Co.....	N. J. Seoul Mining Co.....	Korea
Anaconda Copper Mining Co.....	Montana San Gregorio Mine.....	Peru

Australia produced 37 tons in 1916, 30 tons coming from New South Wales deposits.

CADMIUM

The world's supply of cadmium comes from the zinc smelters of Upper Silesia, Germany, with small amounts from U. S. zinc furnaces.

CADMIUM PRODUCED IN GERMANY (U. S. G. S.)

Year	Quantity		Average Price per		Year	Quantity		Average Price per	
	Pounds	Value	Pound.			Pounds	Value	Pound	
1882	7,762				1898	32,954	\$29,666		\$0.90
1883	5,333				1899	21,693	15,544		.72
1884	6,118				1900	29,835	19,524		.65
1885	7,222				1901	28,977	19,754		.68
1886	10,944	\$8,710	\$0.80		1902	27,833	15,132		.54
1887	16,140	11,542	.72		1903	36,519	19,242		.53
1888	10,573	5,439	.51		1904	55,655	32,882		.59
1889	11,327	4,621	.41		1905	54,163	35,240		.65
1890	9,167	3,477	.38		1906	47,368	36,083		.76
1891	6,281	2,423	.39		1907	72,639	60,757		.84
1892	7,055	2,713	.38		1908	72,741	48,590		.67
1893	11,651	5,198	.45		1909	81,982	46,777		.57
1894	15,095	8,393	.56		1910	90,516	39,309		.43
1895	15,095	9,052	.60		1911	93,861	53,372		.57
1896	23,514	19,453	.83		1912	94,262	63,507		.67
1897	34,231	42,037	1.23		1913	84,865	58,453		...

The 1914 yield was at the rate of 77,000 lbs. per annum. No more figures will be available until after the War.

U. S. CADMIUM IMPORTS IN POUNDS

Year	Quantity	Value	Year	Quantity	Value
1903	8,679	\$4,565	1910	4,060	\$2,295
1904	7,655	4,524	1911	5,367	3,870
1905	8,138	5,298	1912	5,250	3,764
1906	13,808	10,522	1913	1,656	1,232
1907	1,953	1,633	1914	441	368
1908	3,567	2,390	1915	264	278
1909	8,862	4,559	1916	5	6

American production from 1911 to 1915, inclusive, in metal and as sulphide, was as follows: 28,012; 59,504; 67,650; 109,076; and 99,675 lbs., valued at \$19,240, \$46,275, \$53,974, \$101,446, and \$120,500, respectively. Present price is around \$1.50 per lb.

CADMIUM PRODUCERS

American Sm. & Ref. Co., U. S. Smelt. Co., and Grasselli Chemical Co.

CHROMIUM

The chromium produced in the U. S. all comes from chromite or chrome ore.

U. S. CHROMITE PRODUCTION* (Long Tons)

Year	Quantity		Price		Year	Quantity		Price	
		Value	per Ton				Value	per Ton	
1880	2,288	\$27,808	\$12.15		1885	2,700	\$40,000	\$14.81	
1881	2,000	39,000	15.00		1886	2,000	30,000	15.00	
1882	2,500	50,000	20.00		1887	3,000	40,000	13.33	
1883	3,000	60,000	20.00		1888	1,500	20,000	13.33	
1884	2,000	35,000	17.50		1889	2,000	30,000	15.00	

U. S. CHROMITE PRODUCTION* (Long Tons) (Continued)

Year	Quantity	Value	Price	Year	Quantity	Value	Price
		per Ton				per Ton	
1890	3,599	\$53,985	\$15.00	1903	150	\$2,250	\$15.00
1891	1,372	20,580	15.00	1904	123	1,845	15.00
1892	1,500	25,000	16.67	1905	22	375	17.05
1893	1,450	21,750	15.00	1906	107	1,800	16.82
1894	3,680	53,231	14.46	1907	290	5,640	19.45
1895	1,740	16,795	9.65	1908	359	7,230	20.14
1896	786	6,667	8.48	1909	598	8,300	13.88
1897				1910	205	2,729	13.31
1898				1911	120	1,629	13.58
1899				1912	201	2,753	13.70
1900	140	1,400	10.00	1913	255	2,854	11.19
1901	368	5,790	15.73	1914	591	8,715	14.75
1902	315	4,567	14.50	1915	3,281	36,744	11.20
				1916	40,000	640,000	16.00

* U. S. Geol. Survey.

Chromic-iron ore is sold on the basis of 40% chromic oxide and 8% silica, bringing in 1916 from 30 to 50c per unit, or \$12 to \$20 per ton, f. o. b. California, plus \$11 freight to Eastern points. In 1917, prices steadily advanced, and in October stood at 60 to 75 cts. for 40% ore and over, equal to \$24 and \$30 per ton. Production is almost entirely from California. The output during 1916 was 13 times greater than in 1915.

Occurrence. The chief producing areas are the belts of serpentine in the Sierra Nevada and Coast ranges, the foothill regions being the important producers. Most of the orebodies are small and lenticular in shape, containing only from 1 to 200 tons ore. Others are very irregular. An interesting occurrence is the disseminated ore such as near Red Bluff. This has to be concentrated. Oregon shipped 3,000 tons in 1916. Some of its ores require concentrating.

Preliminary Report No. 3, Sept., 1917, entitled 'Manganese and Chromium,' issued by the California State Mining Bureau, San Francisco, gives the names of all the chrome mines in that State, which produce most of the ore in this country.

Use. Chromic iron ore is used in the manufacture of ferrochrome and steel for high-speed tools, armor plate and projectiles, bichromates of soda and potash, chromic acid, chrome alum and chrome tannage, and refractory brick.

WORLD'S PRODUCTION OF CHROMIC IRON ORE, IN LONG TONS.

U. S. G. S.

Country:	1910	1911	1912	1913	1914	1915	1916
United States	205	120	201	255	591	3,281	40,000
Bosnia and Herzegovina	315	246	197	305	533		
Canada	267	140			123	11,196	24,522
Greece	9,311	4,542	6,209	6,342	7,059	10,420	
India	1,737	3,804	2,890	5,670	5,986	3,828	
Japan	2,091	1,500	1,591		2,108	2,979	
New Caledonia	39,368	34,447	41,325	62,352	82,806		
Rhodesia	39,287	46,753	61,840	62,265	49,009	61,590	
Russia	14,157	1,238	20,934				

New Caledonia, Rhodesia and the United States are the principal producers, but Canada is gaining fast, especially in Quebec.

CHROME ORE AND CHROMIUM IMPORTED IN U. S.

	Salts		Chromic Acid		Chrome Ore		Total Value
	Pounds	Value	Pounds	Value	Long Tons	Value	
1908.....	216,081	\$15,453	3,805	\$ 708	27,876	\$345,960	\$362,121
1909.....	537,017	28,837	7,559	1,412	39,624	460,758	491,007
1910.....	406,790	19,569	9,850	1,635	38,579	415,768	436,972
1911.....	22,408	2,159	6,789	1,349	37,540	407,958	411,466
1912.....	32,913	3,085	8,728	1,376	53,929	499,818	504,279
1913.....	18,629	1,819	5,562	1,100	65,180	622,821	625,740
1914.....	31,858	2,375	9,164	1,597	80,736	695,645	699,617
1915.....	32,942	2,902	3,571	755	*76,455	780,061	783,718
1916.....	459	75			115,886	1,548,477	1,548,552
1917†.....					49,315	828,320	828,320

* From New Caledonia and Quebec.

† 8 months.

Of the 1916 imports, Rhodesia supplied 61,850 tons, New Caledonia 30,950 tons, Canada 10,930 tons, Greece 7,900 tons, and Australia 2,968 tons.

COBALT

COBALT ORE, OXIDE, AND ZAFFER IMPORTED INTO THE U. S., IN POUNDS

Year	Quantity	Value	Year	Quantity	Value
1906.....	41,084	\$83,167	1912.....	791,242	\$83,080
1907.....	48,013	74,849	1913.....	209,396	95,735
1908.....	210,098	17,677	1914.....	334,556	274,538
1909.....	12,132	11,096	1915.....	154,672	143,828
1910.....	14,935	6,352	1916.....	206,639	192,009
1911.....	602,454	59,151	1917*.....	130,069	195,039

* 8 months.

No record is kept of the imports of metallic cobalt. The price of the metal seems to have varied little during the last three years, ranging from \$1.50 to \$2 a pound. In 1916 the range was from \$1.25 to \$1.50 per lb.; while in October, 1917, the metal was quoted at \$2.70 per lb.

No cobalt was produced from domestic ores in the last 4 years. The cobalt used in making high-priced steels and stellite is generally reduced from the imported oxide. (Stellite is an alloy, 75% cobalt and 25 % chromium, said to be especially valuable for making high-speed steels and non-tarnishable cutlery.) Experimental work in 1916 has shown that cobalt may be substituted for nickel in plating. Canadian production, mainly from Cobalt, Ont., is as follows:

	Metallic Cobalt	Cobalt Oxide	Total Metal
1914, pounds.....	242,572	899,027	871,891
1915, ".....	211,610	379,219	477,063
1916, ".....	215,215	670,760	841,859
1917,* ".....	295,866	276,769	.....

From Preliminary Reports, Mineral Resources of Canada.

* 9 months.

COBALT PRODUCERS

Beaver Mt. Mining Co. (Idle).....	Alaska	Independence Mining Co. (Small quantities).....	Wyoming
Canadian Smelting & Refining Co.....	Ontario	Metals Chemical Co.....	Ontario
Cobalt Comet Mines Co.....	Ontario	Mine La Motte Co.....	Missouri
Coniagas Mines Ltd.....	Ontario	Nipissing Mining Co., Ltd.....	Ontario
Coniagas Red. Co., Ltd.....	Ontario	Peterson Lake S. C. M. Co.....	Ontario
Deloro Mining & Red. Co.....	Ontario	Pittsburgh & Lorrain Synd.....	Ontario

GOLD

GOLD PRODUCTION OF THE UNITED STATES IN OUNCES

Year	Quantity	Value	Year	Quantity	Value
1880	1,741,500	\$36,000,000	1900	3,820,987	79,171,000
1881	1,678,612	34,700,000	1901	3,805,500	78,666,700
1882	1,572,187	32,500,000	1902	3,870,000	80,000,000
1883	1,451,250	30,000,000	1903	3,560,000	73,591,700
1884	1,489,950	30,800,000	1904	3,892,480	80,464,700
1885	1,538,373	31,801,000	1905	4,265,742	88,180,700
1886	1,686,788	34,869,000	1906	4,565,333	94,373,800
1887	1,603,049	33,136,000	1907	4,374,827	90,435,700
1888	1,604,478	33,167,500	1908	4,574,340	94,560,000
1889	1,594,775	32,967,000	1909	4,821,701	99,673,400
1890	1,588,877	32,845,000	1910	4,657,018	96,269,100
1891	1,604,840	33,175,000	1911	4,687,053	96,890,000
1892	1,597,098	33,015,000	1912	4,520,717	93,451,500
1893	1,739,323	35,955,000	1913	4,299,783	88,884,400
1894	1,910,813	39,500,000	1914	4,572,976	94,531,800
1895	2,254,760	46,610,000	1915	4,887,604	101,035,700
1896	2,568,132	53,088,000	1916	4,465,807	92,316,400
1897	2,774,935	57,363,000	1917	4,085,500	84,456,800
1898	3,118,398	64,463,000			
1899	3,437,210	\$71,053,400			
			Total	116,291,626	\$2,323,961,100

GOLD PRODUCTION OF THE UNITED STATES, IN OUNCES, 1915 AND 1916

	1916		1915	
		\$		\$
Alabama	339	7,000	247	5,100
Alaska	785,721	16,242,300	808,346	16,710,000
Arizona	211,805	4,378,400	220,392	4,555,900
California	1,069,586	22,110,300	1,090,731	22,547,400
Colorado	919,565	19,009,100	1,089,928	22,530,800
Georgia	977	20,200	1,684	34,800
Idaho	47,006	971,700	56,628	1,170,600
Montana	221,335	4,575,400	240,825	4,978,300
Nevada	407,714	8,428,200	574,874	11,883,700
New Mexico	67,870	1,403,000	70,632	1,460,100
North Carolina	1,437	29,700	8,258	170,700
Oregon	91,990	1,901,600	90,321	1,867,100
Philippine Islands	74,962	1,549,600	63,898	1,320,900
Porto Rico	29	600	34	700
South Carolina	15	300	174	3,600
South Dakota	363,403	7,512,200	358,145	7,403,500
Tennessee	290	6,000	329	6,800
Texas	24	500	87	1,800
Utah	173,831	3,593,400	189,045	3,907,900
Virginia	63	1,300	24	500
Washington	23,791	491,800	22,330	461,600
Wyoming	4,054	83,800	672	13,900
Total	4,465,807	\$92,316,400	4,887,604	\$101,035,700

Gold imports during 8 months ended Aug. 31, 1917, totaled \$524,160,907, against \$290,325,528 in that period of 1916. Exports amounted to \$317,636,118.

compared with \$87,581,321. Canada (for England) supplied \$494,980,735 of the imports, while Japan took \$141,968,201 of the exports.

WORLD'S PRODUCTION OF GOLD (U. S. G. S.)

1860....	\$134,083,000	1875... \$	97,500,000	1890... \$	118,848,700	1905... \$	380,288,700
1861....	122,989,000	1876... \$	103,700,000	1891... \$	130,650,000	1906... \$	402,503,000
1862....	122,989,000	1877... \$	113,947,200	1892... \$	146,651,500	1907... \$	412,966,600
1863....	122,989,000	1878... \$	119,092,800	1893... \$	157,494,800	1908... \$	442,476,900
1864....	122,989,000	1879... \$	108,778,800	1894... \$	181,175,600	1909... \$	454,059,100
1865....	122,989,000	1880... \$	106,436,800	1895... \$	198,763,600	1910... \$	455,239,100
1866....	129,614,000	1881... \$	103,023,100	1896... \$	202,251,600	1911... \$	461,939,700
1867....	129,614,000	1882... \$	101,996,600	1897... \$	236,083,700	1912... \$	466,136,100
1868....	129,614,000	1883... \$	95,392,000	1898... \$	286,879,700	1913... \$	454,942,211
1869....	129,614,000	1884... \$	101,729,600	1899... \$	306,724,100	1914... \$	453,000,000
1870....	129,614,000	1885... \$	108,435,600	1900... \$	254,576,300	1915... \$	478,500,000
1871....	115,577,000	1886... \$	106,163,900	1901... \$	260,992,900	1916... \$	470,400,000
1872....	115,577,000	1887... \$	105,774,900	1902... \$	290,737,600		
1873....	96,200,000	1888... \$	110,196,900	1903... \$	327,702,700		
1874....	90,760,000	1889... \$	123,489,200	1904... \$	347,377,200		
						Tot. \$	12,206,220,811

WORLD'S PRODUCTION OF GOLD, BY COUNTRIES

Country	1911	1912	1913	1914	1915	1916
North America:						
United States.....	\$96,890,000	\$93,451,500	\$88,894,480	\$94,531,800	\$101,035,700	\$92,316,400
Canada.....	9,762,100	12,048,800	16,216,121	15,925,044	18,977,901	19,162,025
Mexico.....	24,880,100	24,500,000	18,250,000	18,000,000	14,950,000	14,150,000
Cuba.....	20,000		24,600			
Africa:	191,538,400	211,850,600	205,875,000	201,000,000	215,385,531	220,862,290
Australasia:	60,184,200	54,609,400	53,038,090	49,386,180	45,193,921	38,213,328
Europe:						
Russia and Finland.....	32,151,600	22,199,000	24,578,575	26,750,000	35,150,000	34,750,000
Austria-Hungary.....	2,185,100	2,042,200	2,180,414	1,600,000		
Germany.....	78,100	78,100	60,000			
Sweden.....	2,000	20,300	36,630			
Italy.....	44,800	11,000	30,572		1,675,000	1,580,000
Spain and Portugal.....	2,400	2,300	2,500			
Turkey.....	500	500	500			
France.....	1,812,100	1,812,100	1,946,600	1,000,000	1,025,000	950,000
Great Britain.....	29,600	27,800	17,360			
Serbia.....	261,100	251,100	250,000	100,000		
South America:						
Argentina.....	289,000	107,300	100,000			
Bolivia and Chile.....	362,500	176,000	800,000	500,000		
Colombia.....	3,167,800	2,971,700	3,000,000	3,000,000		
Ecuador.....	276,800	406,500	289,133			
Brazil.....	3,334,500	3,570,600	3,009,786	3,000,000		
Venezuela.....	364,800	623,500	444,800		13,750,000	13,975,600
Guiana—						
British.....	892,000	879,900	1,352,368	1,250,000		
Dutch.....	523,400	407,300	470,433	500,000		
French.....	2,229,100	3,050,600	3,050,600	3,000,600		
Peru.....	492,300	492,200	492,200	500,000		
Uruguay.....	70,600	111,000	111,000			
Central America:	3,360,400	3,030,400	3,000,000	3,500,000	3,575,000	3,605,000
Asia:						
Japan.....	4,118,600	4,467,000	4,470,723	4,476,500	7,880,000	7,980,000
China.....	3,314,600	3,658,900	3,658,900	3,800,000	3,675,000	3,750,000
Indo-China.....	74,700	74,700	76,000			
Chosen (Korea).....	2,889,400	2,852,800	3,281,333	3,760,000		
Siam.....	56,500	56,500	56,800			
India, British.....	11,064,100	11,055,700	11,152,463	11,388,870	11,484,169	11,184,062
East Indies, British.....	1,339,400	1,352,900	1,352,000			
East Indies, Dutch.....	3,387,100	3,387,100	3,387,100	4,750,000	4,825,000	4,960,000
Total.....	461,939,700	466,136,100	454,942,211	453,000,000	478,552,222	470,442,068

Figures from U. S. Geological Survey report, 1914; and *Eng. & Min. Jour.*, Sept. 8, 1917.

DERIVATION OF GOLD PRODUCTION OF THE UNITED STATES

Production by:	Percentage of total output			
	1912	1913	1914	1915
Placers.....	24.8	24.9	25.3	22.7
Gold and silver mills:				
By amalgamation.....	22.3	21.5	20.9	22.8
By cyanidation.....	30.9	31.2	31.4	30.4
By chlorination.....	.4	.3	.4	.5
Total Milling.....	53.6	53.0	52.5	53.7
Smelting.....	21.6	22.1	22.2	23.6
• Total.....	100.0	100.0	100.0	100.0

Gold output of the world for 1917 was considerably under that for 1916, as the Rand shows a decrease of over \$2,000,000 in 9 months, Australia, several millions, the true Russian figures are rarely obtainable and are generally considered inaccurate, and several states in America will show declines; on the other hand, Canada should show a fair increase and probably Mexico and Korea.

IRIDIUM—See Platinum.

IRIDOSMINE (osmiridium)—See Platinum.

IRON

This metal is included in The Mines Handbook for the first time. The United States produced as much pig iron as the remainder of the world combined in 1916; while in a normal year, say 1913, the domestic output is 40% of the total. From 1820 to 1865, production increased irregularly from 20,000 to 1,000,000 tons per annum; from 1866 to 1898 it gained from 1,205,663 to 11,773,934 tons per annum, after which were the following yields:

Year	Tons	Year	Tons
1890.....	13,620,703	1909.....	25,795,471
1900.....	13,789,242	1910.....	27,303,567
1901.....	15,878,354	1911.....	33,649,547
1902.....	17,821,307	1912.....	29,726,937
1903.....	18,009,252	1913.....	30,966,301
1904.....	16,497,033	1914.....	23,332,244
1905.....	22,992,380	1915.....	29,916,213
1906.....	25,307,191	1916.....	39,434,797
1907.....	25,781,361	1917*.....	35,412,440
1908.....	15,936,018		

* 11 months.

Pig iron production is generally considered a good barometer of a country's prosperity, as the above table will show.

Prices of Bessemer pig iron at Pittsburg ranged from \$18.96 to \$9.98 per ton from 1886 to 1897, then:

Year	Per ton	Year	Per ton
1886.....	\$10.31	1908.....	\$16.14
1899.....	18.89	1909.....	16.53
1900.....	18.84	1910.....	16.20
1901.....	15.73	1911.....	14.81
1902.....	20.07	1912.....	15.09
1903.....	18.64	1913.....	16.19
1904.....	13.66	1914.....	13.98
1905.....	15.48	1915.....	14.87
1906.....	18.48	1916.....	22.93
1907.....	21.74	1917*.....	44.85

* Nine months.

In 1917 prices from January to September were: \$35, \$35, \$36.70, \$41.36, \$44.12, \$53.50, \$55.56, \$54.26, and \$48.13 per ton.

On September 24, the Government fixed the price at \$33 per ton for all buyers, effective until January 1, 1918.

Steel production of the United States, including all grades, is as follows for 13 years.

Year	Tons	Year	Tons
1904.....	13,859,887	1911.....	23,676,106
1905.....	20,023,947	1912.....	31,251,303
1906.....	23,398,136	1913.....	31,300,874
1907.....	23,361,946	1914.....	23,513,030
1908.....	14,023,247	1915.....	32,151,036
1909.....	23,955,021	1916.....	42,773,690
1910.....	26,094,919		

The U. S. Steel Corporation produced 44% of the pig iron and 50% of the steel made in 1916.

Imports of pig iron vary considerably, and in the past 9 years averaged about 135,000 tons yearly; and exports in 8 years averaged 227,000 tons, the quantity for 1916 being nearly 3 times greater than in 1915, bringing up the average. In 8 months of 1917 imports totaled 55,109 tons, and exports 471,545 tons, including ferro-manganese, etc.

Iron production of the world was 4,401,415 tons in 1850; 26,994,904 tons in 1890; 40,181,865 tons in 1910; then:

Year	Tons	Year	Tons
1911.....	63,210,720	1914.....	62,844,609
1912.....	73,529,929	1915.....	64,515,928
1913.....	79,395,472	1916*.....	72,000,000

* Estimated.

The principal producing countries are as under:

Country	METRIC TONS						
	1910	1911	1912	1913	1914	1915	1916
Australia.....							*200,000
Austria.....	2,010,000	2,095,000	2,312,689	2,369,864	2,020,000	1,960,000	
Belgium.....	1,852,090	2,046,280	2,301,290	2,484,690	1,560,000		
Canada.....	726,471	832,376	920,636	1,024,424	710,481	828,920	1,060,787
France.....	4,032,459	4,426,469	4,871,992	5,311,316	5,028,000	4,760,000	
Germany.....	14,793,325	15,280,527	17,852,571	19,291,920	14,389,547	11,790,199	
Italy.....	218,600	302,931	379,987	486,778	385,114	377,510	454,928
Russia.....	3,042,046	3,521,000	4,197,638	4,548,376	4,261,008	3,696,560	
Spain.....	367,000	408,667	403,243	424,773	435,000	419,000	
Sweden.....	604,300	633,800	701,000	735,000	635,100	767,600	
United Kingdom.....	10,386,723	9,718,628	8,751,464	10,481,917	9,005,898	8,793,659	9,047,988
United States.....	27,436,637	27,027,940	30,292,568	31,482,406	23,721,115	30,414,817	40,092,043
Others.....	525,000	535,000	540,000	550,000	495,000	480,000	

* Present rate.

Iron-ore production of the United States from 1810 to the end of the 1917 season approximates 1,200,000,000 long tons. By 1886 the year's output was 10,000,000 tons, then a gradual increase to 19,433,716 in 1898, followed by considerable gains to 28,887,479 in 1901. From then the figures were as follows:

Year	Tons	Year	Tons
1902.....	35,554,135	1910.....	57,014,906
1903.....	35,019,308	1911.....	43,786,552
1904.....	27,644,330	1912.....	55,150,147
1905.....	42,526,133	1913.....	61,980,437
1906.....	47,749,728	1914.....	41,439,761
1907.....	51,720,619	1915.....	55,526,490
1908.....	35,983,336	1916*	75,500,000
1909.....	51,294,271	1917*	70,000,000

* Estimated.

The Lake Superior region (Michigan, Minnesota, and Wisconsin) contribute 80% of the American total output of iron ore, followed by Alabama with 10%. The U. S. Steel Corporation mines about 60% of the country's iron ore, through its subsidiary, the Oliver Iron Mining Co., whose operations, with other iron companies, are described elsewhere in this volume.

Prices of Mesabi ore were \$2.50 per ton for Bessemer and \$1.75 for non-Bessemer at Lake Erie docks, in 1894. Up to 1903 prices rose irregularly to \$4 and \$3.50 per ton, after which were the following:

Year	Bessemer	Non-Bessemer	Year	Bessemer	Non-Bessemer
1904.....	\$2.75	\$2.35	1911.....	\$4.25	\$3.50
1905.....	3.50	3.00	1912.....	3.50	2.85
1906.....	4.00	3.50	1913.....	4.15	3.40
1907.....	4.75	4.00	1914.....	3.50	2.85
1908.....	4.25	3.50	1915.....	3.45	2.80
1909.....	4.25	3.50	1916.....	4.20	3.55
1910.....	4.75	4.00	1917.....	5.70	5.05

In September, 1917, prices for the next season (1918) were fixed by the Government at \$5.05 per ton.

Imports of iron ore from 1912 to 1916 were as follows: 2,104,576; 2,594,770; 1,351,368; 1,341,281; and 1,325,736 tons, respectively. Normally, Cuba supplies 60%, and Sweden 15%.

Exports of iron ore from 1912 to 1916 were as follows: 1,195,742; 1,042,151; 551,618; 707,641; and 1,183,952 tons, respectively.

The above figures are from the U. S. Geological Survey.

LEAD STATISTICS

The lead production of the United States comes largely from three states, Missouri, Idaho and Utah, whose 1916 output was 218,253, 170,049, and 111,789 tons, respectively. Colorado produced only 33,046 tons.

The great bulk of Missouri's output comes from the south-eastern part of the State, where a half-dozen companies work on 3 to 4% disseminated ore. The characteristic of this district is that lead alone, without zinc, is produced. Idaho's production comes from the lead-silver-zinc ores of the Coeur d'Alene district, which in some years leads all others. Utah's production comes mainly from the silver-lead ores of Park City, Alta Cottonwood, and Bingham, and the mixed ores of the Tintic district.

Only 18,906 tons of lead from foreign ore, mainly Mexico, was refined in the United States last year, compared with 94,984 tons in 1911, and 43,029 tons in 1915. The production of lead from domestic ores in 1916 reached the total of 596,221 tons, a healthy increase from 389,211 tons in 1910. Next to the United States, the important lead-producing countries of the world are Spain and Australia.

The vital figures of the industry are given in the following tables:

U. S. LEAD PRODUCTION (SHORT TONS), PRICE AND VALUE

Year	Desilverized Lead	Soft Lead	Total Production	From domestic ores and bullion base	From foreign ores	From foreign bullion	Price at New York	Value
1720-1868		755,400	755,400	755,400				\$79,829,200
1869		17,500	17,500	17,500			\$0.065	2,275,000
1870		17,830	17,830	17,830			.063	2,246,580
1871	970	19,000	19,970	19,970			.061	2,436,340
1872	5,220	20,500	25,720	25,720			.063	3,240,720
1873	19,559	22,381	41,940	41,940			.063	5,284,440
1874	27,674	23,556	51,230	51,230			.060	6,147,600
1875	33,859	24,731	58,590	58,590			.059	6,913,620
1876	36,519	26,421	62,940	62,940			.061	7,678,680
1877	49,228	31,152	80,380	80,380			.055	8,841,800
1878	62,360	26,770	89,130	89,130			.036	6,417,360
1879	62,710	28,130	90,840	90,840			.041	7,448,880
1880	68,035	27,690	95,725	95,725			.050	9,572,500
1881	83,725	30,770	114,495	114,495			.048	10,991,520
1882	100,765	29,015	129,780	129,780			.049	12,718,440
1883	118,497	21,800	140,297	140,297			.043	12,065,452
1884	116,365	19,932	136,297	136,297			.037	10,085,978
1885	104,217	21,975	126,192	126,192			.040	10,095,360
1886	111,389	20,800	132,189	127,189	5,000		.046	12,161,388
1887	131,482	25,148	156,630	141,630	15,000		.045	14,096,700
1888	146,925	29,090	176,015	147,379	28,636		.044	15,489,320
1889	149,099	29,258	178,357	151,787	26,570		.039	13,911,846
1890	126,493	31,351	157,844	139,720	18,124		.045	14,205,960
1891	166,966	31,397	198,363	174,511	23,852		.043	17,059,218
1892	176,545	31,673	208,223	168,266	39,957		.041	17,074,286
1893	191,807	32,513	224,320	158,969	65,351		.037	16,599,680
1894	175,964	37,686	213,650	153,911	59,739		.033	14,100,900
1895	195,932	39,890	235,822	159,649	76,173		.032	15,092,608
1896	213,960	43,537	257,497	179,749	77,738	Lowest	.030	15,449,220
1897	238,616	43,553	282,169	198,498	83,671		.036	20,316,168
1898	259,369	42,779	302,148	202,203	99,945		.038	22,963,248
1899	257,481	40,566	298,047	202,121	95,926		.045	26,824,230
1900	319,752	48,021	367,773	260,918	106,855		.044	32,364,024
1901	313,134	57,898	371,032	258,610	112,422		.043	30,906,752
1902	293,842	74,050	367,892	267,286	100,606		.041	30,167,144
1903	285,495	83,444	368,939	280,615	88,324		.042	30,990,876
1904	304,283	89,169	393,452	297,602	95,850		.043	33,836,872
1905	302,852	85,455	388,307	307,514	80,793		.047	36,500,858
1906	313,886	90,860	404,746	336,200	28,803	39,743	.057	46,141,044
1907	313,588	99,801	413,389	352,381	24,041	36,967	.053	43,819,234
1908	295,552	101,012	396,564	311,668	11,509	73,389	.042	33,311,376

U. S. LEAD PRODUCTION (SHORT TONS), PRICE AND VALUE (Continued)

Year	Desilver- ized Lead	Soft Lead	Total Produc- tion	From domestic		From foreign ores	From foreign bullion	Price at New York	Value
				ores and base bullion	ores				
1909.....	329,751	117,158	446,909	352,839	21,754	72,316	\$0.043	\$38,434,174	
1910.....	328,954	141,318	470,272	375,402	18,065	76,805	.044	41,383,936	
1911.....	331,032	155,947	486,979	391,995	10,764	84,220	.045	43,828,110	
1912.....	339,646	141,248	480,894	392,517	11,572	76,805	.045	43,280,460	
1913.....	330,593	131,867	462,460	411,878	13,223	37,356	.044	40,696,480	
1914.....	383,903	158,219	542,122	512,794	7,639	21,689	.039	42,285,516	
1915.....	388,594	161,461	550,055	507,026	9,853	33,176	.047	51,705,000	
1916.....	406,119	165,015	571,134	558,200	7,157	11,598	.068	78,816,000	
Total.	9,012,797	3,545,742	12,558,439	10,535,281	2,028,979	.....	.....	\$1,138,104,183

MONTHLY AVERAGE PRICE OF LEAD

Month	New York			St. Louis			London		
	1914	1915	1916	1914	1915	1916	1914	1915	1916
January.....	4.111	3.729	5.94	4.011	3.548	5.80	19.665	18.606	30.871
February.....	4.048	3.827	6.23	3.937	3.718	6.17	19.606	19.122	31.937
March.....	3.970	4.053	6.83	3.850	3.997	7.46	19.651	21.883	34.383
April.....	3.810	4.221	7.50	3.688	4.142	7.67	18.225	21.094	34.406
May.....	3.900	4.274	7.50	3.808	4.182	7.28	18.503	20.347	32.971
June.....	3.900	5.932	7.02	3.810	5.836	6.77	19.411	25.170	30.700
July.....	3.891	5.659	6.54	3.738	5.531	6.20	19.051	24.611	27.446
August.....	3.875	4.656	6.25	3.715	4.520	6.19	*	21.946	29.129
September....	3.828	4.610	6.75	3.658	4.490	6.71	*	23.151	29.866
October.....	3.528	4.600	7.00	3.384	4.499	6.87	*	23.994	30.000
November....	3.683	5.155	7.00	3.585	5.078	6.96	18.500	26.278	30.000
December....	3.800	5.355	7.44	3.662	5.266	7.53	19.097	28.807	30.000
Year.....	3.862	4.628	6.83	3.737	4.567	6.80	.....	22.917	30.975

New York and St. Louis, cents per pound. London, pounds sterling per long ton.

* London Exchange closed.

LEAD PRICES IN NEW YORK

Yearly highest, lowest and average prices of pig lead in New York.

Year	High	Low	Average	Year	High	Low	Average
1886.....	4.95	4.00	4.63	1898.....	4.12½	3.55	3.78
1887.....	5.15	4.15	4.50	1899.....	4.77½	3.92½	4.47
1888.....	5.25	3.60	4.42	1900.....	4.75	3.75	4.41½
1889.....	4.10	3.62½	3.93	1901.....	4.37½	4.00	4.36
1890.....	5.25	3.77½	4.48	1902.....	4.15	4.00	4.10
1891.....	4.62½	4.05	4.35	1903.....	4.70	4.10	4.26
1892.....	4.22½	3.72½	4.09	1904.....	4.60	4.10	4.32
1893.....	4.15	3.22½	3.73	1905.....	6.25	4.45	4.70½
1894.....	3.65	3.02½	3.29	1906.....	6.35	5.35	5.66
1895.....	3.55	3.02½	3.23	1907.....	6.35	3.50	5.35
1896 Lowest.	3.25	2.67½	2.98	1908.....	4.60	3.65	4.23½
1897.....	4.40	3.00	3.58	1909.....	4.75	3.95	4.30

LEAD PRICES IN NEW YORK (Continued)

Yearly highest, lowest and average prices of pig lead in New York.

Year	High	Low	Average	Year	High	Low	Average
1910.....	4.75	4.37½	4.49	1914.....	4.15	3.50	3.87
1911.....	4.60	4.25	4.46	1915.....	7.62½	3.70	4.67½
1912.....	5.15	4.00	4.48½	1916.....	7.67	5.80	6.80
1913.....	4.85	4.00	4.40	1917.....	11.00	5.50	8.71
				Average price for 32 years..... 4.19			

SUMMARY OF LEAD STATISTICS IN SHORT TONS (U. S. G. S.)

	1915	1916	1917*
Total production of refined lead in the United States.....	550,055	571,134	306,062
Production of desilverized lead in the United States.....	388,594	406,119	152,231
Production of soft lead in the United States (including desilverized soft).....	205,462	165,015	153,831
Production of antimonial lead in the United States.....	23,224	24,033	9,781
Production of lead from domestic ores.....	507,026	596,221	.....
Production of secondary lead in the United States.....	78,900	11,097	7,578
Consumption of lead in the United States (disregarding stocks).....	426,751	471,232	.....
World production (approximate).....	†1,100,000	.....	.....
World consumption (approximate).....	.....	.....	.....
United States (domestic) percentage of world production.....	.....	.....	.....
United States percentage of world consumption.....	.....	.....	.....
World rank of United States in production of lead.....	First	First	First
World rank of United States in consumption of lead.....	First	First	First

* First half. † Estimated.

	1914	1915	Increase
Lead production of United States (short tons).....	542,122	550,055	7,933 or 1.3%
Lead stocks of United States (primary, short tons).....	449,052	426,751	22,301 " 5%
Value of lead production of United States.....	\$42,286,000	\$51,705,000	\$9,419,000 " 22%

The 1916 U. S. production of primary refined lead increased 21,079 tons, or 3.8%, and the value \$27,111,000, equal to 52.3%.

*PRIMARY LEAD PRODUCTION OF UNITED STATES, AND SOURCE OF ORE

(United States Geological Survey Figures, in Tons)

Domestic Ore:	1911	1912	1913	1914	1915	1916
Alaska.....	51	45	6	.....	358	659
Arizona.....	3,428	3,891	4,901	5,601	6,953	15,328
Arkansas.....	15	.....	.....	52	51	170
California.....	615	811	3,294	3,698	5,606	8,633
Colorado.....	30,442	37,039	42,840	41,198	32,352	33,046
Georgia.....	.....	.....	.....	.....	.....	9
Idaho.....	117,335	127,780	137,802	177,827	160,680	170,059
Illinois.....	308	513	619	427	910	670
Iowa.....	.....	.....	.....	34	.....	.....
Kansas.....	2,522	1,937	1,504	1,043	1,320	1,737

* Primary lead is that smelted from ore.

***PRIMARY LEAD PRODUCTION OF UNITED STATES, AND SOURCE OF ORE**
(Continued)

(United States Geological Survey Figures, in Tons)

	1911	1912	1913	1914	1915	1916
Domestic Ore:						
Kentucky.....		91	16	16	95	37
Missouri.....	182,203	162,610	152,430	194,275	195,634	218,253
Montana.....	2,484	2,517	3,258	4,386	4,853	4,961
Nevada.....	1,082	5,699	6,142	5,996	7,664	11,858
New Hampshire.....					3	46
New Mexico.....	1,371	2,511	1,821	741	2,157	3,290
North Carolina.....	35	34	10			
Oklahoma.....	1,925	2,500	3,214	3,916	4,346	10,969
Oregon.....	11	21	37	17	11	9
South Dakota.....	33	12	7	2	5	12
Pennsylvania.....					6	
South Carolina.....						8
Tennessee.....					8	
Texas.....	57	30	108	89	111	26
Utah.....	54,933	60,664	71,069	88,976	106,105	111,789
Virginia.....	400	85	878	143	457	740
Washington.....	612	53	9	2	11	†217
Wisconsin.....	3,966	3,301	2,639	1,819	2,632	3,121
Wyoming.....					6	
Undistributed.....	48	120	63	99	116	96
Zinc residues.....	1,987	3,131	3,765	4,125	4,567	5,478
Total from domestic ore.	405,863	415,395	436,430	534,482	537,012	596,221
Foreign Ore:						
Africa.....	582	1,774	5,976	2,942		328
Canada.....	122	29	16	2	1,174	1,231
Central America.....	28				1	7
Mexico.....	7,333	7,407	4,512	2,386	5,437	1,917
South America.....	2,677	2,332	2,617	1,821	2,829	2,366
Other foreign.....	22	30	102	488	140	236
Foreign Base Bullion:						
Canada.....						1,072
Mexico.....	84,220	76,805	37,359	21,689	33,176	11,598
South America.....					275	151
Total from foreign ore and base bullion.....	94,984	88,377	50,582	29,328	43,029	18,906
Grand total, derived from all sources.....	500,847	503,772	487,012	563,810	580,044	615,127

* Primary lead is that smelted from ore.

† Also 2,001 tons of lead smelted in Canada from Washington ores.

STOCKS OF REFINED LEAD AVAILABLE FOR CONSUMPTION IN THE U. S.

	(U. S. Geological Survey figures)					
Supply:	1911	1912	1913	1914	1915	1916
Stock in bonded warehouses						
Jan. 1.....	35,972	4,481	10,492	5,310	7,668	12,169
Imports—						
For consumption.....	13,281	14,146	11,980	7,386	9,680	12,771
For warehouse.....	76,871	69,414	45,165	20,952	41,816	22,559
Increase by liquidation....					2,250	5,642
Production from domestic ores.....	391,995	392,517	411,878	512,794	507,026	552,228
Total Supply.....	517,919	480,558	479,515	546,442	568,440	605,369
Withdrawn:						
Exports of foreign lead—						
From Warehouse.....	101,227	64,906	44,544	21,545	38,445	9,880
In manufactures, with benefit of drawback...	12,080	11,320	9,757	9,399	3,983	5,171
Exports of domestic lead..				58,722	87,092	100,565
Decrease by liquidation...	14,812	5,692	419	56		
Stock in bonded warehouses						
Dec. 31.....	4,481	10,492	5,310	7,668	12,169	12,369
Total withdrawn.....	132,600	92,410	60,030	97,390	141,689	127,985
Available for consumption...	385,319	388,148	419,485	449,052	426,751	477,384

Production of Secondary Lead in the United States

	1911	1912	1913	1914	1915	*1916
Pig Lead.....	27,389	30,266	33,104	29,337	36,300	11,097
Lead in alloy.....	26,895	36,902	39,730	31,725	35,000	28,168
Total recovered lead....	54,284	67,168	72,834	61,077	71,300	39,265

* Incomplete.

Lead Production of the World in Short Tons (U. S. G. S.)

Country	1909	1910	1911	1912	1913	1914	1915	1916
Australia.....	85,098	108,907	109,789	118,387	127,867			
Austria-Hungary...	15,432	19,290	21,605	23,589	26,565			
Belgium.....	44,423	44,864	48,832	56,438	55,997			
Canada.....	22,928	16,535	11,795	17,968	18,849	16,487	21,009	18,866
France.....	29,652	22,366	26,014	34,282	30,864			
Germany.....	184,745	174,604	181,218	194,666	199,627			
Great Britain.....	31,085	32,628	28,660	32,187	33,620	79,684	15,767	12,500
Greece.....	16,865	18,519	15,763	15,983	20,282	20,864	11,595	
Italy.....	24,361	15,983	18,408	23,699	28,920	20,464	21,812	
Japan.....	3,748	3,868	4,630	4,960	3,968	4,563	4,764	
Mexico.....	130,071	133,048	137,347	132,276	68,343			
Russia.....	882	1,223	1,102	1,102	1,102			
Spain.....	202,823	211,531	193,013	206,799	223,767		190,000	173,343
Sweden.....	220	441	1,213	1,433	1,653	1,396	1,918	
Turkey in Asia.....	13,338	13,999	13,668	13,779	15,322			
Other countries.....	6,393	17,306	22,597	13,448	6,834			
United States (domestic refined)...	352,839	375,402	391,995	392,517	411,878	512,794	507,026	596,221
Total.....	1,164,903	1,210,504	1,227,648	1,282,513	1,270,458			
United States percentage of world's production.....	30.3	31.0	32.0	30.6	32.4			

No complete figures of the world's production in 1914, 1915 and 1916, are available.

IMPORTS OF LEAD, IN ORE, BASE BULLION, AND REFINED, BY COUNTRIES, IN POUNDS

Country	1911	1912	1913	1914	1915	1916
United Kingdom.....	401,688	279,546	404,594	245,548	185,236	261,406
Germany.....	56,288	494,337	282,152	4,639,919	.....	.....
Other European countries.....	111,789	55,356	143,293	123,085	32,637	314,353
Total from Europe.....	569,161	829,139	810,019	4,898,552	217,773	575,759
British North America.....	270,947	819,497	238,569	384,007	2,303,170	12,606,216
Mexico.....	172,633,479	159,455,664	95,693,439	46,282,907	94,247,384	48,395,670
South America.....	4,778,221	3,207,936	8,768,327	2,417,744	5,430,567	6,325,758
Other countries.....	1,651,544	3,309,356	8,685,812	2,694,293	802,516	2,845,949
Total imports.....	179,903,353	167,121,592	114,293,966	56,676,803	102,991,410	70,659,352

1914 figures for Germany, include German South Africa, which formerly went under "Other countries."

IMPORTS OF LEAD, BY CLASSES, IN POUNDS

Year	Lead in ore (lead con- tent)	Base bullion		Pigs, bars, sheets and old	Total lead content*
		Gross Weight	Lead con- tent*		
1907.....	64,815,254	76,259,828	74,594,313	18,554,899	157,964,466
1908.....	64,708,204	153,921,829	150,560,176	5,518,621	220,787,001
1909.....	71,357,868	149,852,559	146,579,779	7,152,665	225,090,312
1910.....	94,751,054	118,061,415	115,483,542	6,970,170	217,204,766
1911.....	35,686,180	141,481,852	138,952,372	5,264,800	179,903,352
1912.....	19,577,499	152,420,624	146,999,168	544,925	167,121,592
1913.....	19,883,313	96,908,170	94,327,654	82,999	114,293,966
1914.....	23,649,637	33,444,503	32,730,320	296,846	56,676,803
1915.....	18,185,140	86,247,995	83,986,988	819,282	102,991,410
1916.....	35,086,100	24,943,660	24,262,435	11,310,817	76,659,352
1917†.....	34,072,024	55,983,507	54,289,365	4,228,763	88,361,389

* Lead content of bullion for 1907-1909 estimated on the basis of average lead content of imports of base bullion in 1910.

† 8 months.

EXPORTS OF LEAD FROM THE UNITED STATES IN TONS (U. S. G. S.)

Stocks—	1910	1911	1912	1913	1914	1915	1916
Stock in bond, Jan. 1....	17,405	35,972	4,481	10,492	5,310	7,668	12,169
Imports—							
For consumption.....	15,359	13,281	14,146	11,980	7,386	9,680	12,771
For export.....	93,249	76,671	69,414	45,165	20,952	41,816	22,559
Domestic production.....	375,402	391,995	392,517	411,878	512,794	507,026	552,228
Total supply.....	501,415	517,919	480,558	479,515	546,442	658,440	599,727
Exports, etc.—							
Exports of foreign lead... 69,786	101,227	64,906	44,544	21,545	38,618	9,880	
Exports under drawback.. 8,800	12,080	11,320	9,779	9,438	3,983	5,171	
Exports of domestic lead.....	.....	.....	.....	.....	58,722	87,306	100,565
Decrease by liquidation.. 7,661	14,812	5,692	419	56	.....	.....
Stocks in bond, Dec. 31.. 35,972	4,481	10,492	5,310	7,668	12,169	12,369	
Total withdrawn....	122,219	132,600	92,410	60,052	97,429	142,076	127,985
Available for consumption	379,196	385,319	388,148	419,463	449,013	426,364	477,384

Exports during 8 months ended Aug. 31, 1917, totaled 36,097 tons, of which 30,586 tons was from domestic ore. Canada received 76% of the total.

CONSUMPTION OF LEAD, BY COUNTRIES, IN SHORT TONS

Country	1907	1908	1909	1910	1911	1912	1913
Australia.....	5,952	8,501	5,401	7,937	10,631	11,133	10,582
Austria-Hungary.....	27,778	31,906	34,171	34,722	39,903	41,667	39,132
Belgium.....	36,596	28,880	48,060	35,274	47,399	49,493	47,289
Canada.....	15,553	15,102	23,589	19,621	23,259	33,069	25,243
France.....	89,397	114,749	112,765	98,988	109,789	115,411	118,607
Germany.....	206,130	237,215	234,680	230,370	256,726	255,844	246,364
Great Britain.....	214,287	252,595	223,436	229,719	218,588	216,381	210,980
Holland.....	5,732	5,961	6,504	7,165	7,496	6,944	10,472
Italy.....	38,390	40,296	34,612	31,085	40,013	36,376	35,935
Japan.....	15,983	10,582	12,676	13,188	20,333	24,030	30,393
Russia.....	27,668	49,349	42,328	63,792	47,289	50,265	64,815
Switzerland.....	5,842	6,514	5,842	6,504	5,612	7,053	6,393
Other European countries.....	3,417	4,416	4,409	4,470	3,858	4,850	6,944
Other countries.....	23,377	27,227	26,235	33,289	34,392	33,069	33,069
United States.....	367,903	324,176	367,504	397,763	358,628	394,159	414,281
Total world's consumption...	1,078,005	1,157,469	1,182,212	1,209,055	1,218,914	1,279,746	1,290,499
Percentage U. S. production..	34.0	28.0	30.3	31.0	32.0	30.6	32.4

United States consumption in 1914, 1915 and 1916 was 449,013; 426,751; and 477,384 tons, respectively.

Lead Smelters and Refineries in North America in 1917

UNITED STATES

Arizona:

Mowry—Consolidated Mines, Smelter & Transportation Co. (Idle.)

California:

Keeler—Four Metals Mining & Smelting Co. (Idle.)

Needles—Needles Mining & Smelting Co. (Subsidiary of U. S. Sm. Ref. & Mng. Co.) (Idle.)

Selby—Selby Smelting & Lead Co. Refinery also. American Smelters Securities Co., controlled by A. S. & R. Co.

Colorado:

Denver—Globe plant, American Smelting & Refining Co.

Durango—Durango plant, American Smelting & Refining Co.

Georgetown—Western Metals Co. Malm dry chlorination process.

Leadville—Arkansas Valley plant, American Smelting & Refining Co.

Pueblo—Pueblo plant, American Smelting & Refining Co.

Salida—The Ohio & Colorado Smelting & Refining Co.

Idaho:

Kellogg—Bunker Hill & Sullivan Mining & Concentrating Co.

Clayton—Red Bird Smelting Co.

Enaville—North Fork Smelting & Mining Co. (Idle.)

Ponderay—Idaho Smelting & Refining Co. (Idle.)

Sea Foam—Greyhound Mining & Milling Co. (Idle.)

Illinois:

Aurora—Aurora Metal Co. Secondary metals, but some ore also.

Chicago—Goldsmith Bros. Smelting & Refining Co. Secondary lead, but some ore.

Chicago—Great Western Smelting & Refining Co. Secondary lead, but some ore.

Chicago—National plant, American Smelting & Refining Co. Refinery only; smelter dismantled at end of 1914.

Collinsville—St. Louis Smelting & Refining Co. Refinery also. Nat'l Lead Co.

Federal—Federal Lead Co. Am. Smelters Sec. Co.

Granite City—Hoyt Metal Co. Smelts secondary lead, but also some ore.

Indiana:

East Chicago—International Lead Refining Co. Refinery only. Intern'l Sm. & Ref. Co.

East Chicago—U. S. Reduction Co. Smelts secondary lead and some ore.
Grasselli—United States Metals Refining Co. Refinery only. Betts electrolytic process.

Iowa:

Dubuque—J. W. Watters. Not operated for some years.

Kansas:

Galena—Galena Smelting & Manufacturing Co. Controlled by Eagle-Picher Lead Co.

Missouri:

Desloge—Desloge Consolidated Lead Co.

Granby—Granby Mining & Smelting Co.

Herculaneum—St. Joseph Lead Co.

Joplin—Eagle-Picher Lead Co.

Valle Mines—Valle Mining Co. Not operated for some years.

Webb City—Webb City Smelting & Manufacturing Co. Controlled by Eagle-Picher Lead Co.

Montana:

Cooke—Western Smelting & Power Co. (Idle.)

East Helena—East Helena plant, American Smelting & Refining Co.

Helena—Northwestern Metals Co. Dry chlorination process. (Idle 1915.)

Nebraska:

Omaha—Omaha & Grant Smelting Co. Refinery only. Betts electrolytic process. Am. Sm. & Ref. Co.

Nevada:

Nelson—Santa Barbara Searchlight Mining Co. (Idle.)

Spruce—Black Forest Mines & Smelting Co. (Idle.)

New Jersey:

Newark—Balbach Smelting & Refining Co. Refinery also.

Perth Amboy—Perth Amboy plant, American Smelting & Refining Co. Refinery also.

New Mexico:

Deming—National Mining & Smelting Co. (Idle.)

Pennsylvania:

Carnegie—Pennsylvania Smelting Co. Refinery also.

Texas:

El Paso—Kansas City Consolidated Smelting & Refining Co. (Am. Sm. Ref. Co.)

Utah:

Midvale—United States Smelting Co. (Subsid. U. S. Sm., Ref. & Mng. Co.)

Murray—Murray plant, American Smelting & Refining Co.

Silver City—Tintic Smelting Co. (Idle several years.)

Tooele—International Smelting Co.

Washington:

Keller—Keller & Indiana Consolidated Smelting Co. (Idle several years.)

Northport—Northport Smelting & Refining Co.

Wisconsin:

Dodgeville—Blue Mounds Mining & Smelting Co. (Idle.)

Waukesha—Northern Smelting Co. (Idle.)

CANADA

British Columbia:

Trail—Consolidated Mining & Smelting Co. of Canada, Ltd. Refinery also. Betts electrolytic process.

Ontario:

Kingston—North American Smelting Co., Ltd.

MEXICO

Aguascalientes:

Aguascalientes—American Smelting & Refining Co.

Chihuahua:

Chihuahua—American Smelting & Refining Co.

Uruachic—Uruachic Mining & Smelting Co., Ltd.

Coahuila:

Saltillo—Mazapil Copper Co., Ltd.

Torreon—Compañía Metalúrgica de Torreon.

Durango:

Asarco (Velardena)—American Smelters Securities Co.

Mapimi—Compañía Minera de Penoles. (Am. Metal Co.)

Guerrero:

Campo Morado—Reforma Mining & Milling Co. (Idle.)

Nuevo Leon:

Monterey—American Smelting & Refining Co.

Monterey—Compañía Minera, Fundidora y Afinidora, S. A. Refinery also.

San Luis Potosi: Plant wrecked by revolutionists, 1914.

Matchuala—American Smelters Securities Co. (National Metallurgical Co.)

San Luis Potosi—Compañía Metalúrgica Mexicana.

Sonora:

Guaymas—Pacific Smelting & Refining Co. (Mexican-American Smelting & Refining Co., Ltd.) (Idle and never operated.)

Ures—Yaqui Smelting & Refining Co., S. A. Refinery also. (Idle.)

Zacatecas:

Chalchihuites—National Smelting Co. (Idle.)

MANGANESE

Manganese ore, to be saleable, must contain 35% or more manganese, and for ferro-manganese or ferro, 40% or better, with less than 8% silica, and not over 0.2% phosphorus. As 90% of the manganese ore used in the United States goes into ferro, the demand is chiefly for high-grade ore. For dry batteries, the ore must contain a minimum of 50% manganese, present as the dioxide, and less than 1% iron or ½% copper, nickel or cobalt.

MANGANESE ORE SOLD IN THE UNITED STATES IN LONG TONS*

	1913			1914			1915		
	Tons	Value	Price	Tons	Value	Price	Tons	Value	Price
Arkansas.....							1,343	\$13,333	\$9.93
California.....							2,563	29,004	11.32
Georgia.....							3,168	33,927	10.71
Virginia.....	4,048	\$40,480	\$10.00	1,724	\$18,565	\$10.77	1,620	17,988	11.10
Other States†.....				911	8,812	9.67	1,015	19,057	18.78
	4,048	\$40,480	\$10.00	2,635	\$27,377	\$10.39	9,709	113,309	11.67

* Min. Res. U. S. Geol. Survey, 1915, p. 32.

† 1914: California and South Carolina; 1915: Alabama, Arizona, Colorado, Tennessee, Texas, and Utah.

Figures for 1916 are not available, but the total was about 27,000 tons, the price being upwards of \$20 per long ton at eastern points. In August, 1917, prices had advanced to over \$40 per ton for domestic ore.

MANGANESE ORE PRODUCTION OF THE UNITED STATES

Long tons		Long tons		Long tons	
1838-1879.....	43,860	1892.....	13,613	1905.....	4,118
1880.....	5,761	1893.....	7,718	1906.....	6,921
1881.....	4,895	1894.....	6,308	1907.....	5,604
1882.....	4,532	1895.....	9,547	1908.....	6,144
1883.....	6,155	1896.....	10,088	1909.....	1,544
1884.....	10,180	1897.....	11,108	1910.....	2,258
1885.....	23,258	1898.....	15,957	1911.....	2,457
1886.....	30,193	1899.....	9,935	1912.....	1,664
1887.....	34,524	1900.....	11,771	1913.....	4,048
1888.....	29,198	1901.....	11,995	1914.....	2,635
1889.....	24,197	1902.....	7,477	1915.....	9,709
1890.....	19,287	1903.....	2,825	1916.....	27,000
1891.....	22,452	1904.....	3,146		
				Total.....	454,082

IMPORTS OF MANGANESE ORE INTO THE U. S.

Country—	1913		1914		1915		1916	
	Quantity (long tons)	Value	Quantity (long tons)	Value	Quantity (long tons)	Value	Quantity (long tons)	Value
Brazil.....	70,200	\$445,680	113,924	\$736,769	268,786	\$2,218,143	471,837	
Russia.....	124,337	712,324	52,681	490,331				
British India.....	141,587	710,024	103,583	504,981	36,450	194,626	51,960	
Cuba.....					5,141	69,453		
France.....	1,114	12,578	5	1,580				
Netherlands.....			2,505	52,213	50	1,792		
Japan.....	3	78	40	1,320	2,810	106,434		
Germany.....	2,014	103,612	1,713	92,273	258	23,590		
United Kingdom..	227	12,082	8,321	136,206	49	4,730		
Canada.....	5	631	64	1,357	325	12,989		
Belgium.....			450	5,913				
Other countries...	5,603	32,671	8	1,177	116	1,529		

Total imports... 345,090 \$2,029,680 283,294 \$2,024,120 313,985 \$2,633,286 523,797

Imports during 8 months ended Aug. 31, 1917, amounted to 457,878 tons, valued at 7,397,764, equal to \$16.15 per ton. Most of this ore came from Brazil, where an export tax is proposed on the mineral.

MANGANIFEROUS ORES PRODUCED IN THE UNITED STATES, IN LONG TONS

Year	Arkan- sas	Colo- rado*	Colo- rado†	Lake Superior region	Vir- ginia	Other States	Total
1906.....	8,900	32,400	(‡)	\$1,000,000	.....	.....	1,041,300
1907.....	4,133	67,514	32,197	314,316	.....	(N. M.) 7,000	425,160
1908.....	4,066	15,973	35,581	467,140	274	.....	523,034
1909.....	3,325	12,905	52,119	775,035	305	.....	843,689
1910.....	5,030	.....	55,770	558,634	301	.....	619,735
1911.....	2,177	.....	41,753	477,920	507	.....	522,357
1912.....	1,332	.....	48,618	816,984	1,567	.....	868,501
1913.....	9,650	.....	49,753	612,743	.....	.....	672,146
1914.....	1,970	2,100	37,781	402,754	1,222	.....	445,827
1915.....	2,600	15,956	14,965	659,025	1,944	||106,800	801,290
1916.....	.....	.....	.....	.....	.....	.....	.....
	43,183	146,848	368,537	6,084,551	6,120	113,800	6,763,039

* Manganiferous silver ore used in the manufacture of spiegeleisen and ferromanganese. † Manganiferous silver ore used for flux. ‡ Not recorded. § Estimated. || Arizona, Georgia, and Nevada.

MANGANIFEROUS RESIDUUM PRODUCED FROM ZINC ROASTING IN THE UNITED STATES

Long tons		Long tons	
1889.....	43,648	1903.....	73,264
1890.....	48,560	1904.....	68,189
1891.....	38,228	1905.....	90,289
1892.....	31,859	1906.....	93,461
1893.....	37,512	1907.....	93,413
1894.....	26,981	1908.....	110,225
1895.....	43,249	1909.....	141,264
1896.....	44,953	1910.....	137,173
1897.....	33,924	1911.....	109,296
1898.....	48,502	1912.....	104,670
1899.....	65,010	1913.....	102,239
1900.....	87,110	1914.....	100,198
1901.....	52,311	1915.....	159,318
1902.....	65,246		
		Total.....	2,050,092

FERROMANGANESE AND SPIEGELEISEN PRODUCED IN THE UNITED STATES

Long tons		Long tons		Long tons	
1872.....	4,072	1880.....	17,503	1888.....	48,901
1873.....	3,930	1881.....	18,827	1889.....	76,628
1874.....	4,070	1882.....	19,610	1890.....	133,180
1875.....	6,993	1883.....	21,941	1891.....	127,766
1876.....	5,907	1884.....	30,262	1892.....	179,131
1877.....	7,897	1885.....	30,956	1893.....	81,118
1878.....	9,530	1886.....	42,841	1894.....	120,180
1879.....	12,438	1887.....	42,498	1895.....	171,724

FERROMANGANESE AND SPIEGELEISEN PRODUCED IN THE UNITED STATES (Continued)

	Long tons		Long tons		Long tons
1896.....	131,940	1904.....	219,446	1911.....	173,615
1897.....	173,095	1905.....	289,983	1912.....	227,939
1898.....	213,769	1906.....	300,500	1913.....	228,475
1899.....	219,768	1907.....	339,348	1914.....	177,356
1900.....	255,977	1908.....	152,018	1915.....	253,816
1901.....	291,461	1909.....	225,040	1916.....	415,534
1902.....	212,934	1910.....	226,216		
1903.....	192,661			Total.....	6,147,394

Ore Buyers:

The principal purchasers of manganese ores are as follows: N. A. Adler, Batesville, Ark.; Alleghany Ore & Iron Co., Iron Gate, Va.; American Carbon & Battery Co., E. St. Louis, Ill.; American Manganese Mfg. Co., Dunbar, Pa.; American Smelting & Refining Co., Murray, Utah; American Steel Foundries, Pittsburgh, Pa.; Burney & Smith, New York, N. Y.; Carnegie Steel Co., Pittsburgh, Pa.; Delaware River Steel Co., Chester, Pa.; Eureka Manganese Co., Birmingham, Ala.; Robert Gilchrist, Elizabethtown, N. J.; Harshaw, Fuller & Goodwin Co., Cleveland, Ohio; Hickman Williams & Co., St. Louis, Mo.; Illinois Glass Co., Alton, Ill.; Illinois Pacific Glass Co., San Francisco, Cal.; J. S. Lawson & Bro., Inc., 80 Maiden Lane, N. Y.; Manhattan Electrical Supply Co., New York, N. Y.; Napier Iron Works, Napier, Tenn.; National Alloys Co., Philadelphia, Pa.; National Paint & Manganese Co., Lynchburg, Va.; Noble Electric Steel Co., Heroult, Cal.; Pulaski Iron Co., Pulaski, Va.; Sloss Sheffield Steel & Iron Co., Birmingham, Ala.; U. S. Steel Corporation, Pittsburgh, Pa.; U. S. Steel Corporation, South Chicago, Ill.; U. S. Steel Corporation, Birmingham, Ala.

MANGANESE MINES

Arps Group.....	California	Crimora Manganese Corp..	Virginia
Bunker Hill Mines Co....	Arizona	Ladd	California
Clark Mine (Idle).....	Michigan	Ponupo Mining Co.....	Cuba
	U. S. Manganese Co.....		Virginia

Preliminary Report No. 3, Sept., 1917, entitled 'Manganese and Chromium,' issued by the California State Mining Bureau at San Francisco, gives the names of all the manganese mines in that State.

MOLYBDENUM

The amount of molybdenum produced in the U. S. has never exceeded a few tons a year and the annual consumption is unknown. Imports comprise but small quantities of molybdenite, the sulphide ore, and some wulfenite, molybdenum metal, and ferro-molybdenum.

The world's supply, mostly molybdenum, comes from New South Wales, Queensland, and Norway; but the demand created by the war resulted in deposits being opened in Bolivia, Peru, Ontario, Quebec, and the Western United States. What is probably the largest molybdenum producer is that of the Canadian Wood Molybdenite Co., in Quebec, which yielded 5,000 tons of 2.5% ore in 1916. In the past 3 years, the Primos Chemical Co., operated a molybdenite mine at Camp Boericke near Empire, Colo., and several other properties in the same State were worked on a small scale. A little was mined in Washington. In British Columbia a molybdenum mine, 13 miles from Anyox, was reported to have a 50-ton flotation plant, which was expected to start operating by Aug., 1916.

In U. S. Bureau of Mines, Bulletin 111, by F. W. Horton, the American deposits are fully described. Six Western States contain large low grade deposits that can be concentrated.

Uses: Molybdenum has rather limited uses and while it can be used instead of tungsten in high speed steels and in the manufacture of ordnance, such use is practically prohibited in the U. S. by the Halcomb patent. The metal is also used in electric resistance furnaces as supports for filaments in electric light bulbs, and Roentgen ray tubes and in alloys such as stellite. The salts have a limited use in chemical technology.

As noted above the use of molybdenum by American steel manufacturers has been greatly retarded if not prohibited by the Halcomb patent, issued in 1903, and held by the Crucible Steel Co. This controls the manufacture of the best grades of molybdenum-steel, using quantities of 6 to 15% molybdenum, less than 1.2% carbon and 2% silicon; the patent also controls the use of chromium in practicable amounts in conjunction with steels of the composition specified. France and Germany make large quantities of molybdenum steel. The results in those countries make it certain that when the Halcomb patent expires the use of molybdenum in America will be quickly extended and its production receive a sudden stimulus. The metal is more abundant than tungsten, and the exhaustion of the richer bodies of tungsten ore is likely to result in a maintenance of a price so that molybdenum will become a strong competitor.

An average price for molybdenite cannot be given. Production and demand have been small and irregular; most of the molybdenite being bought by individual bargaining. The price has ranged in general, from 15 to 30c per lb. for molybdenite, containing 92% MoS₂ until the past couple of years; during 1915-16 it sold as high as \$2 per lb. for 92% molybdenite; such prices are of course ephemeral. During 1917, prices have been steady at from \$1.50 to \$2 per lb.

In 1915 Canada produced 28,600 lbs., of molybdenite, valued at \$28,460, and in 1916, 79.5 tons worth \$159,000. In 1916 New South Wales yielded 54 tons; Queensland, 97 tons; and Japan, 37 tons.

Ore Buyers:

The following firms are users and buyers of molybdenite: J. T. Baker Chemical Co., Phillipsburg, N. J.; Baker & Adamson Chemical Co., Easton, Pa.; Foote Mineral Co., 107 N. 19th St., Philadelphia, Pa.; Goldschmidt Thermit Co., 90 West St., New York; Primos Chemical Co.; Primos, Pa.; S. Schaaf-Regelman, 21 State St., New York; Henry E. Wood & Co., 1734 Arapahoe St., Denver, Colo.; York Metal & Alloys Co., York, Pa.; Electro Metallurgical Co., Niagara Falls, N. Y.; General Electric Co., Schenectady, N. Y.; Imperial Munitions Board, Ottawa, Ont.; International Molybdenum Co., Orillia and Renfrew, Ont.; and the Tivani Steel Co., Belleville, Ontario.

The following companies and individuals are producers, 1916:

American Molybdenum Co., Yucca, Ariz.

Duquesne Mining & Reduction Co., Box 45, Pittsburgh, Pa. Claims 20 miles from Patagonia, in Patagonia district, Santa Cruz County, Arizona. Post office of claims, Duquesne, Ariz.

Thompson & Porter, 322 Story Building, Los Angeles, Cal.

Primos Chemical Co., Primos, Pa. Claims at Camp Boericke, in Clear Creek County, Colorado.

Pingrey Mines & Ore Reduction Co., Leadville, Colo. Claims are on Bartlett Mountains, 1¼ miles from Climax, 10 or 15 miles from Leadville, Colo., in Summit County.

Montana Molybdenum Mining Co., Chico, Mont. Claims are in Emigrant district, 9 miles from Chico, in charge of L. A. Van Horn.

Margarito Romero, Las Vegas, N. Mex.

C. H. Gibbs, Geologist, Utah Fuel Co., Salt Lake City, Utah. Interested with Fred Redmond in claims about 2 miles west of Alta, in Little Cottonwood canyon.

Empire Molybdenite Mining & Milling Co., Spokane, Wash. Claims in T. 37 N., R. 44 E., in Metaline district, Pend Oreille County, Washington.

Aurelia Crown Point Mines, Box 187, Seattle, Wash. Property at Lucerne, Lake Chelan district, Chelan County, Washington.

Canadian Molybdenite Co., Quyon, Quebec.

International Molybdenum Co., Renfrew and Orillia, Ontario.

Renfrew Molybdenum Co., Mt. St. Patrick, Ontario.

NICKEL

Nickel ores, as such are not mined in the U. S., though nickel is saved as a by-product in electrolytic refining of copper, and marketed both in the form of sulphate and as the metal. In 1914 an equivalent of 845,334 lbs. metallic nickel, valued at \$313,000 was produced in this way, it collects in the electrolyte slime and is obtained from there.

Nickel occurs in small amounts in many copper ores, being found in blister copper (in pounds per hundred tons), from the following smelteries: Anaconda, Mont., 22; Great Falls, Mont., 68; Garfield, Utah, 40; Steptoe, Nev., 64; Omaha, Neb., 644; Mountain, Cal., 172; Tacoma, Wash., 770; Aguascalientes, Mex., 182; Cerro de Pasco, Peru, 32; Mount Lyell, Tasmania, 166.

The world's supply comes mainly from Ontario and is imported into the U. S., in the form of copper nickel matte, or as Monel metal from the International Nickel Co.'s smelter at Copper Cliff, Ont., from ores mined at Sudbury, Ont. The refineries are at Constable Hook, Bayonne, N. J., and Port Colborne, Ont. A much smaller quantity of rich matte has also been imported from Belgium and refined at New Brunswick, N. J., by the United States Nickel Co. The British American Nickel Corporation had its reduction works and refinery near Sudbury, Ont., nearly completed in October, 1917.

Canada also produces nickel from the silver ores of the Cobalt district and those of the Alexo mine at Temiskaming. The smelters and refineries treating the Cobalt output make nickel oxide and in 1915 also made refined metallic nickel, the metal content being 361,701 lbs. The Sudbury, Ontario, smelters produced a Bessemer matte, the 1916 output being 80,010 tons holding 44,859,321 lbs. copper and 82,956,862 lbs. nickel. These are considerable increases when compared to the 1915 figures. Exports amounted to 80,441,700 lbs. nickel, valued at 10.77 cts. per lb., against 11.13 cts. in 1915. The refined metal exported from the U. S. was valued at 38.77 cts. in 1916, 37.95 cts. in 1915, and 34 cts. in 1914. Of the Canadian output, 83% went to the United States; but with the new refineries in the Dominion exports to America will show a big drop in 1918.

The market price for 1915 varied from 45 to 50 cts. per lb. for ordinary forms. In 1916 it was much the same; while by Oct., 1917, the price was 55 cts. per lb.

Use: large amounts of nickel are used in the manufacture of armor plate which requires 3 to 4% nickel; it is used in bridge and structural steel; in automobile manufacture, in axles, steering gear, etc.; in the manufacture of German silver, and is a constituent of Monel metal, the converter product of the Sudbury ores which carries 67% nickel, 28% copper, and 5% other metals.

NICKEL PRODUCTION OF CANADA (ONTARIO) IN TONS (2,000 POUNDS)

	Ore mined	Ore smelted	Bess. matte	Copper in matte	Nickel in matte	Value of matte
1911.....	611,511	610,834	32,607	8,966	17,049	\$4,945,592
1912.....	737,594	725,065	41,925	11,116	22,421	6,308,102
1913.....	784,697	823,403	47,150	12,938	24,838	7,076,945
1914.....	1,000,364	947,053	46,396	14,448	22,759	7,189,031
1915.....	1,364,048	1,272,283	67,703	19,608	34,039	10,352,344
1916.....	1,566,333	1,521,689	80,010	22,450	41,298	*14,000,000
1917†.....	.....	.....	.....	15,928	31,064	21,903,200

* Estimated. † 9 months.

CANADIAN NICKEL EXPORTS, IN POUNDS

	1912	1913	1914	1915	1916
Nickel contained in matte, etc.:					
Exported to Great Britain.	5,072,867	5,164,512	10,291,979	13,748,000	11,136,900
Exported to United States.	39,148,993	44,224,119	36,015,642	52,662,400	69,304,800
Exported to other countries	.....	70,386	220,706	.....	.....
	44,221,860	49,459,017	46,538,327	66,410,400	80,441,700

U. S. IMPORTS AND EXPORTS OF NICKEL AND NICKEL OXIDE, IN POUNDS

	1912	1913	1914	1915	1916
Imports of ore and matte, tons	33,101	37,623	29,564	45,798	59,741
Nickel contents, lbs.	42,168,769	47,194,101	35,006,700	56,352,582	72,611,492
Exports of nickel from United States:					
To France, lbs.	5,083,947	3,631,858	3,457,157	3,018,354	2,283,132
To Italy, lbs.	.....	.....	.....	.....	2,715,521
To Netherlands, lbs.	7,387,447	6,622,811	855,168	129,557	516,331
To United Kingdom, lbs.	8,191,364	8,221,640	10,836,369	14,801,565	16,674,487
To other countries, lbs.	5,152,258	10,096,779	12,446,458	8,469,074	2,906,665
Total.....	25,815,016	29,173,088	27,595,152	26,418,550	33,404,011

Imports of ore and matte in 8 months ended Aug. 31, 1917, totaled 40,898 tons, containing 50,346,167 lbs. nickel, valued at \$6,784,150. Exports in the same period amounted to 15,650,750 lbs., worth \$6,306,818. Of this, 70% went to England, and 22% to Italy.

NICKEL PRODUCERS

American Smelting & Refining Co.	Ontario
Athabasca Mining Co.....	Canada
Baltimore Copper Smelting & Rolling Co. (Refinery).....	Maryland
Beaver Mt. Mining Co. (Idle).....	Alaska
British American Nickel Corp. (Not yet producing).....	Canada
Canadian Copper Co.....	Ontario
Canadian Smelting & Refining Co.	Ontario
Cobalt Comet Mines, Ltd.....	Ontario
Coniagas Mines, Ltd.....	Ontario
Coniagas Reduction Co., Ltd.....	Ontario
Deloro Mining & Reduction Co.	Ontario
Hecla Consolidated Mines Co. (Idle).....	Wyoming
Independence Mining Co. (small quantities).....	Wyoming
International Nickel Co	U. S. and Canada
Metals Chemical Co.....	Ontario
Missouri Metals Co.....	Missouri
Mond Nickel Co.....	Ontario
Nipissing Mining Co., Ltd.....	Ontario

PALLADIUM—See Platinum.

PLATINUM

The U. S. production of platinum is very small, Russia and Colombia are the largest producers. The 1916 domestic production of 24,518 oz., compared with 6,495 oz. in 1915, is obtained mainly from the refining of gold and copper bullion of both domestic and foreign origin, but placer mines supplied 488 ounces.

Use: One of the most important uses of platinum is as a catalyzer in the manufacture of fuming sulphuric trioxide; in this use it is technically known as "contact mass," some of which contains as much as 7 to 8% of platinum. The loss in good practice is small. Platinum dishes and utensils are a necessity in chemical laboratories. Its use in the electric industry and in dentistry is becoming less each year, nichrome replacing it in electrical appliances. The increased use of silica-ware is also reducing the consumption of platinum in concentration of sulphuric acid and for other purposes.

PLATINUM IMPORTS

	Quantity, Troy, oz.	Value	Retorts, etc.	Total
1905.....	93,912	\$1,985,107	\$188,156	\$2,173,263
1906.....	137,928	3,601,120	187,639	3,788,759
1907.....	74,292	2,508,991	175,651	2,684,642
1908.....	50,844	1,095,754	134,119	1,229,873
1909.....	118,853	2,557,596	416,352	2,973,948
1910.....	118,280	3,320,699	333,965	3,654,664
1911 { Ore or crude.....	34,412	1,278,239	142,718	4,866,207
1911 { Unmanufactured, etc.....	88,339	3,445,250		
1912 { Ore or crude.....	45,280	1,781,585	169,119	4,503,682
1912 { Unmanufactured, etc.....	59,526	2,552,978		
1913 { Ore or crude.....	45,942	1,863,406	90,694	5,040,210
1913 { Unmanufactured, etc.....	69,551	3,086,110		
1914 { Ore or crude.....	72,032	.....	.....	2,934,080
1914 { Unmanufactured, etc.....		.....	.....
1915.....	61,438	2,341,476	.....	.....
1916.....	53,484	3,138,396	18,923	5,202,120
1917* (Unmanufactured).....	17,799	1,436,638	3,310	243,949

* 8 months.

Exports during 8 months of 1917 were 3,182 oz., valued at \$252,593.

The embargo placed upon the export of platinum from Russia at the beginning of the war is the cause of the greatly reduced imports in 1914.

U. S. PRODUCTION OF PLATINUM FROM DOMESTIC SOURCES, IN TROY OUNCES

Year	Quantity	Value	Year	Quantity	Value
1903.....	110	\$2,080	1910.....	773	\$25,277
1904.....	200	4,160	1911.....	940	40,890
1905.....	318	5,320	1912.....	1,005	45,778
1906.....	1,439	45,189	1913.....	1,034	46,530
1907.....	357	10,589	1914.....	3,430	.....
1908.....	750	14,250	1915.....	6,495	.....
1909.....	638	15,950	1916.....	24,518	.....

WORLD'S PRODUCTION OF PLATINUM BY COUNTRIES, IN TROY OUNCES

Country	1912	1913	1914	1915	1916
Russia, crude.....	*300,000	*250,000	*241,200	124,000	63,900
Canada, crude.....	†30	50	*30	100	60
New South Wales and Tasmania, crude‡.....	*778	1,275	*1,248	.....	222
Colombia, crude.....	*12,000	15,000	*17,500	18,000	25,000
United States, domestic crude.....	721	483	570	*700	750
United States, refined from foreign and domestic matte and bullion§.....	\$1,300	\$1,100	2,905	6,495	24,518
Borneo and Sumatra and other crude¶.....	*200	200	¶	¶	¶
Total.....	315,029	268,108	263,453	*149,295	114,450

* Estimated. †In addition to platinum contained in matte and bullion refined in the United States. ‡Chiefly iridosmine. §Does not include refined platinum from domestic crude. ¶ Includes small production in Madagascar. ¶ No basis for estimate.

Russian production may yet see lower figures, owing to internal dissension, which gives no promise of improvement towards the end of 1917.

PLATINUM PRICES

Average monthly prices of platinum in New York, per Troy ounce. From *Eng. and Mining Journal*:

	1910	1911	1912	1913	1914	1915	1916
January.....	\$29.00	\$39.06	\$46.00	\$45.50	\$43.38	\$41.10	\$90.05
February.....	28.75	39.31	45.63	45.50	43.50	40.00	90.00
March.....	29.13	41.00	45.50	45.50	43.50	39.50	90.75
April.....	29.25	41.35	45.50	45.50	43.50	38.63	83.10
May.....	29.55	42.81	45.50	45.50	43.50	38.50	80.50
June.....	31.38	42.88	45.50	45.50	43.50	38.00	78.13
July.....	33.00	42.95	45.50	45.50	43.50	38.00	63.60
August.....	33.00	44.38	45.50	44.90	50.20	39.25	62.56
September....	33.63	45.31	45.50	43.96	50.00	50.00	84.25
October.....	37.50	46.25	45.50	44.00	49.50	54.50	89.75
November....	39.44	46.13	45.50	43.70	45.45	62.63	101.25
December....	38.75	46.00	45.50	43.45	42.19	85.50	86.87
Year....	\$32.70	\$43.12	\$45.55	\$44.88	\$45.14	\$49.63	\$83.40

During 1917 the price has been from \$100 to \$115 per ounce, in October being \$105

THE PLATINUM METALS

Iridium: The price of iridium remains much higher than that of platinum, because of its relative scarcity and its usefulness in hardening platinum. It is a frequent mistake of the platinum miner to speak of iridosmine as "iridium." Iridosmine is an alloy of osmium and iridium, with osmium varying from 17 to 49%. There is practically no market for osmium, except the use as pen points; iridosmine is valuable for the iridium content only. The extraction of osmium is both very costly and dangerous, on account of the poisonous character of the osmium vapor.

Palladium: The marketable supply for 1915 increased on account of the greater care taken by the copper refineries in extracting it from the electrolytic slimes in which it occurs with gold, silver, etc., particularly in the slime of Canadian matte, and the base bullion from Australia and else-

where. The use of palladium as a catalyzer is well known, and is largely used as an alloy for platinum, as it renders the platinum lighter and of a more brilliant white.

Osmium: The supply of this metal of the platinum group exceeds the demand, tungsten having replaced it in electric light bulbs, and its use in medicine and in silk dyeing being slight.

PLATINUM-GROUP METALS IMPORTED IN THE UNITED STATES

	Domestic		1914		1915		
	Troy oz.	Troy oz.	Value	Troy oz.	Value	Troy oz.	Value
Iridium.....	64	4,094	\$295,864	1,785	\$112,430	4,158	\$243,266
Osmiridium.	195	151	11,872	1,348	84,363	130	5,737
Osmium.....		560	42,924			32	787
Palladium...	2,635	8,891	364,738	1,613	69,547	3,020	103,623
Rhodium.....		64	3,668	32	1,905		

Imports of iridium and osmium during 8 months ended Aug. 31, 1917, were 2,668 oz., valued at \$255,671; compared with 6,967 oz. and \$320,354 in same period of 1916.

Some of the more important buyers of crude platinum and sweeps are listed below:

American Platinum Works, Newark, N. J.
 Baker & Co. (Inc.), Newark, N. J.
 J. Bishop & Co., Malvern, Pa.
 Commercial Research Co., Long Island City, N. Y.
 Thomas J. Dee & Co., Chicago, Ill.
 Elizabethtown Smelting Co., Newark, N. J.
 Goldsmith Bros. Smelting & Refining Co., Chicago, Ill.
 Pacific Platinum Works, Los Angeles, Cal.
 Roessler & Hasslacher Chemical Co., Perth Amboy, N. J.
 S. S. White Dental Manufacturing Co., Philadelphia, Pa.
 Tiffany & Co., New York.

PALLADIUM PRODUCERS

American Smelting & Refining Co. Oro Amigo Platino Mining Co....Nevada
 Boss Gold Mining Co.....Nevada

PLATINUM PRODUCERS

American Smelting & Refining Co. Irvington Smelting & Refining Co.
 Azurite Mining Co.....Nevada (Refining).....New Jersey
 Boss Gold Mining Co.....Nevada Oro Amigo Platino Mining Co....Nevada
 Hecla Consolidated Mines Co. (Idle) Platinum Mining & Milling Co. Wyoming

Little is heard of the Nevada and Wyoming platinum-palladium producers, whose output must be negligible, but in November, 1917, the new plant of the Boss company was reported to be extracting platinum.

PYRITE

Pyrite mining is an important industry at several localities in the U. S., but its sole use being for sulphuric acid manufacture. The market is limited by transportation costs and by the competition of the copper and zinc smelting plants, at which such acid is made, the principal ones being

at Anaconda, Montana; Garfield, Utah; Douglas, Arizona; Trail, B. C.; Ducktown, Tenn., and Hillsboro, Danville, Peru, La Salle, Springfield and East St. Louis, all in Illinois; Langeloth and Donora, Penna., Argentine, Kansas, and Clarksburg, and Moundville, W. Va. The bulk of the pyrite consumed in the U. S. still comes from Spain, the value and the amount of the imported article being over 3 times that of the domestic production, but on account of shipping conditions the outlook in 1917 is far from reassuring for continuance of shipments from Spain. This has led to exploitation of domestic pyrite and pyrrhotite deposits, also utilization of "coal brasses."

PRODUCTION OF PYRITE IN THE UNITED STATES, 1882-1916, IN LONG TONS

1882... 12,000	\$72,000	1894... 105,940	\$363,134	1906... 261,422	\$931,305
1883... 25,000	137,500	1895... 99,549	322,945	1907... 247,387	794,949
1884... 35,000	175,000	1896... 115,483	320,163	1908... 222,598	857,113
1885... 49,000	220,500	1897... 143,201	391,541	1909... 247,070	1,028,157
1886... 55,000	220,000	1898... 193,364	593,801	1910... 241,612	977,978
1887... 52,000	210,000	1899... 174,734	543,249	1911... 301,458	1,164,871
1888... 54,331	167,658	1900... 204,615	749,991	1912... 350,928	1,334,259
1889... 93,705	202,119	1901... *241,691	1,257,879	1913... 341,338	1,286,084
1890... 99,854	273,745	1902... *207,874	947,089	1914... 336,662	1,283,346
1891... 106,536	338,880	1903... *233,127	1,109,818	1915... 394,124	1,674,933
1892... 109,788	305,191	1904... 207,081	814,808		
1893... 75,777	256,552	1905... 253,000	938,492		

* Includes production of natural sulphur.

The 1916 output of United States was probably over 400,000 tons.

IMPORTS OF PYRITE, CARRYING LESS THAN 3½% COPPER

1910.....	803,551 long tons	1913.....	850,592 long tons
1911.....	1,006,310 " "	1914.....	1,026,617 " "
1912.....	970,785 " "	1915.....	964,634 " "

Imports during 1916 and 1917 will show a direct falling off. Spanish pyrite was quoted in November, 1917, at 15c per unit of sulphur.

Imports of pyrite during 8 months of 1917 totaled 610,716 tons, valued at \$3,962,219; compared with 916,369 tons and \$4,885,098 in same period of 1916. Spanish supplies decreased 60%, while Canada increased over 100%.

PYRITE MINES

Arminius Chemical Co.....	Virginia	Sulphur Mining & R. R. Co.....	Virginia
Eagle Copper Co.....	California	(Subsidiary of Virginia-Carolina Chemical Co.)	
Eustis Mining Co.....	Quebec	Virginia Zinc & Chem. Corp., Ltd.	
Northern Ore Co.....	New York	Virginia-Carolina Chemical Co.	
St. Lawrence Pyrites Co.....	New York	Virginia Mining Co.....	Virginia
		(Controlled by Gen. Chem. Co.)	

Canada and Norway are large producers, the former reporting 310,000 tons in 1916, and the latter about 500,000 tons in 1915.

QUICKSILVER

Most of the domestic supply of quicksilver comes from California and Nevada, Texas producing the remainder, as Arizona has as yet only a small output. In 1914 there were 30 producers, including small prospects, 7 more

than in 1913. In 1915, 1916, and 1917 there were certainly more than in 1914, owing to high prices. In recent years much of the California output has been from old mines, whose richest ore was extracted long ago, and which are now difficult to operate profitably, except when the price is high.

Beside the new supply each year there is also recovered an annual output of old quicksilver in the clean-up of old amalgamation mills, and from other sources; this supply has but little effect on the market. Austria, Italy, and Spain furnish $\frac{5}{6}$ of the world's supply.

Quicksilver is used mainly in the manufacture of fulminate of mercury for explosive caps, of scientific and electric apparatus, of drugs and in the recovery of precious metals; the latter use is gradually diminishing. It is also used in manufacturing paints for protective coatings.

The primary domestic market for quicksilver is San Francisco; the price is averaged from the market quotations published in the *Mining and Scientific Press*. Prices are given in dollars per flask of 75 lbs. Since the war started it can hardly be said that San Francisco is the principal market, as witness the break in prices late in 1915 from \$300 to \$80 per flask, caused by the Allies dumping a large quantity on the American market. Until the war is over munition requirements will dominate the market.

MONTHLY AVERAGE PRICES OF QUICKSILVER, IN DOLLARS

	San Francisco				New York		
	1914	1915	1916	1917	1914	1915	1916
January.....	39.25	51.90	222.00	81.00	38.75	51.60	214.76
February.....	39.00	60.00	295.00	126.25	39.00	59.38	288.50
March.....	39.00	78.00	219.00	113.75	38.60	73.13	223.91
April.....	38.90	77.50	141.60	114.50	38.00	71.50	140.10
May.....	39.00	75.00	90.00	104.00	37.90	77.20	96.95
June.....	38.60	90.00	74.70	85.50	38.00	95.63	73.04
July.....	37.50	95.00	81.20	102.00	36.75	95.50	79.80
August.....	80.00	93.75	74.50	115.00	83.00	92.90	74.75
September.....	76.25	91.00	75.00	112.00	74.38	89.50	75.50
October.....	53.00	92.90	78.20	102.00	53.75	94.70	79.40
November.....	55.00	101.50	79.50	102.50	50.30	108.13	79.25
December.....	53.10	123.00	80.00	117.60	51.25	135.00	80.00
Average.....	49.05	85.79	125.89	106.34	48.31	87.01	125.50

NOTE.—San Francisco quotations from *Mng. & Sci. Press*; New York quotations, 1914 and 1915, *Eng. & Mng. Journal*; 1916 quotations from *The Steel & Metal Digest*.

QUICKSILVER PRODUCTION OF THE UNITED STATES, IN FLASKS OF 75 POUNDS

State	1914		1915		1916	
	Quantity	Value	Quantity	Value	Quantity	Value
Arizona.....	(*)	(*)	(*)	(*)	(*)	(*)
California.....	11,303	\$554,414	14,283	\$1,174,881	20,550	\$2,587,245
Nevada.....	2,089	102,465	6,744	651,611	7,975	1,004,052
Texas.....	(*)	(*)	(**)	(**)	(**)	(**)
States not shown separately†.	3,156	154,801	6	1,420	417	52,503
Total.....	16,548	\$811,680	21,033	\$1,828,912	28,942	\$3,643,800

* Included in States not shown separately.

† Nevada and Texas combined in 1912; Arizona and Texas in 1913 and 1914.

** Included with Nevada.

QUICKSILVER IMPORTED IN THE UNITED STATES, IN POUNDS

Year	Quantity	Value	Year	Quantity	Value
1905.....	2,690	\$1,710	1911.....	471,944	251,386
1906.....	84	50	1912.....	82,706	39,920
1907.....	16,567	6,719	1913.....	171,653	75,361
1908.....	15,113	8,216	1914.....	614,868	271,984
1909.....	15,968	8,203	1915.....	421,884	282,852
1910.....	667	\$381	1916.....	424,396	515,919

EXPORTS OF QUICKSILVER FROM THE UNITED STATES, IN FLASKS OF 75 POUNDS

Year	Quantity	Value	Year	Quantity	Value
1905.....	13,534	\$489,756	1912.....	310	\$13,360
1906.....	6,456	243,914	1913.....	1,140	43,574
1907.....	5,132	192,094	1914.....	1,446	70,753
1908.....	2,996	124,960	1915.....	3,370	225,509
1909.....	6,802	266,243	1916.....	8,980	670,475
1910.....	1,923	91,077	1917*.....	8,469	744,512
1911.....	291	13,905			

* 8 months.

WORLDS' PRODUCTION OF QUICKSILVER IN FLASKS OF 75 POUNDS (U. S. G. S.)

Country	1905	1906	1907	1908	1909	1910	1911	1912	1913	1914
United States.....	30,534	26,083	21,554	19,752	21,075	20,601	21,256	25,064	20,213	16,548
Austria-Hungary.....	16,755	16,961	16,667	18,519	17,902	20,400	23,310	23,016	26,720	
Italy.....	10,847	12,287	12,424	19,989	22,664	26,379	27,367	28,983	29,513	22,340
Russia.....	9,348	6,173	3,821	1,440	206	118				
Spain.....	25,074	46,062	35,627	31,394	40,947	32,746	43,681	43,799	43,799	
Mexico and other countries.....	5,585	5,879	5,879	5,879	4,409	4,409	4,409	4,409	4,409	
Total.....	98,143	113,445	95,982	96,973	107,203	104,553	120,023	125,271	124,654	

Foreign production is unobtainable under present conditions.

QUICKSILVER MINES

Alpine.....	California	New Almaden Quicksilver Mines..	Calif.
Chisos Mining Co.....	Texas	New Idria Quicksilver Mining Co..	Calif.
Colquitt-Tigner Quicksilver Mine..	Texas	Oceanic Quicksilver Mine.....	California
Goldbanks.....	Nevada	Patriquin Quicksilver Mine....	California
Guadalupe.....	California	Quicksilver Investment Co., Inc., (The)	California
Kings Quicksilver Mining Co., Ltd..	Calif.		
L. & N. Group.....	Arizona	Quicksilver Mining Co.....	California
Mercury Mining Co.....	Nevada	Ruby King Copper Co. (Ore contains cinnabar)	California
Nevada Cinnabar Co.....	Nevada	St. Johns Mines Co.....	California

RADIUM—(See Uranium, Vanadium.)

Radium, uranium, and vanadium are closely connected, in occurrence and always found together in an ore. Colorado and Utah contain the largest known radium-bearing deposits of the world, but Europe has been the chief market for the ore, which accounts for the greatly reduced output for 1915. In 1913, over 100 teams were hauling the waste dumps and tailing from the carnotite mines of Paradox Valley to the railway to be shipped to Germany for fertilizer.

PRODUCTION FROM CARNOTITE ORES

	Uranium Oxide tons	Radium grams	Vanadium tons
1916.....	.....	8 to 10	.....
1915.....	23.4	6	635
1914.....	87.2	22.3	435
1913.....	41	10.5	.....
1912.....	26	6.7	.....

At Joachimsthal, Bohemia, Austria, the government works in 1915 yielded radium compounds valued at \$209,365.

Carnotite is a complex ore consisting essentially of vanadium oxide or with potassium as double silicate, and associated with or loosely combined with uranium oxide. A ton of ordinary carnotite ore assaying about 2½% uranium oxide contains only 12.5 milligrams radium, or one part out of a hundred million, recoverable radium. For companies producing carnotite or other uranium ores, see Uranium, in this chapter. The following firms are producers of radium:

Standard Chemical Co., Pittsburgh, Pa.
 W. L. Cummings Chemical Co., Lansdowne, Pa.
 Radium Company of America, Sellersville, Pa.
 Schlesinger Radium Co., Box 1316, Denver, Colo.
 Carnotite Reduction Co., 2600 Iglehart Court, Chicago, Ill.
 Pittsburgh Radium Co., Denver, Colo.
 Chemical Products Co., Denver, Colo.

RADIUM MINES

National Radium Mines Co. (Uranium and Vanadium).....	Utah	Radium Mines Co. (Vanadinite not found in commercial quantities). Arizona
National Radium Products Co.	Colorado	Rare Metals Co. (Operates a custom mill).....
Penna. Mining, Power & Reduction Co. (Ore contains uranium and vanadium).....	Colorado	Government mines in Bohemia....
		Austria

SELENIUM

The commercial supply of selenium is obtained from the slime or mud resulting from the electrolytic refining of blister copper.

SELENIUM RECOVERED FROM 100 TONS OF BLISTER COPPER

Smelter supplying blister copper:	Selenium pounds	Smelter supplying blister copper:	Selenium pounds
Garfield, Utah.....	56	Tacoma, Washington.....	42
Steptoe, Nevada.....	110.1	Aguascalientes, Mexico.....	170
Omaha, Nebraska.....	26.0	Cerro de Pasco, Peru.....	13.7
Mountain, California.....	36	Mount Lyell, Tasmania.....	42

Eilers, A., Notes on the occurrence of some of the rarer metals in blister copper: Am. Inst. Min. Eng. Trans., vol. 47, pp. 217-218, 1914.

Eilers comments as follows:

Garfield, Utah, copper comes from the Bingham porphyry copper mines. Steptoe, Nev., blister copper is from the Nevada Consolidated porphyry deposits.

Omaha, Nebr., blister copper comes from concentrated copper-lead mattes from the lead-silver plants of the Rocky Mountain region.

Iron Mountain, Cal., ores occur in connection with diorite(?).

Tacoma, Wash., the blister is produced from Pacific coast and Alaska copper ores.

Aguascalientes, Mexico, blister is produced from the smelting of silver and gold ores with mostly low-grade copper ores, coming from all parts of Mexico and from many different geological occurrences and connections.

Cerro de Pasco, Peru, blister from copper and lead-copper mattes produced at the Cerro de Pasco works. Ore originates in veins occurring in limestone near andesite masses.

Mount Lyell, Tasmania, blister is from the well-known low-grade copper deposit of Tasmania, in schists.

Selenium is ordinarily sold in small pigs, in sticks $\frac{1}{2}$ " thick by 4" in length, and also in a fairly coarse powder form. It is an amorphous brilliant black substance which looks much like pitch or one of the asphalts.

Use: Selenium is chiefly used in coloring glass to which it gives a red color. The unique property possessed by this metal of an increasing electrical resistance with decrease of light has led to the invention of many electrical wonders including Hammond's dirigible torpedo as well as in measuring Roentgen rays; in controlling electric signs, moving pictures, street lights and the flame on gas buoys; in transmitting pictures over a wire. It is also used medicinally to a small extent.

SILVER

Average monthly prices of silver per ounce, as published by The American Metal Market:

	1903	1905	1910	1911	1912	1913	1914	1915	1916	1917
January....	47.57	60.69	52.37	53.79	56.22	62.93	57.56	48.89½	56.77	75.14
February....	47.89	61.02	51.53	52.22	59.04	61.64	57.50½	48.48	56.75	77.54
March.....	48.72	58.05	51.45	52.74	58.37	57.87	58.07	50.24	57.93	74.13
April.....	50.56	56.60	53.22	53.33	59.23	59.49	58.52	50.25	64.41	72.51
May.....	54.11	57.83	53.87	53.31	60.88	60.36	58.18	49.91½	74.27	74.61
June.....	52.86	58.43	53.40	53.04	61.29	58.99	56.47	49.03	65.02	76.44
July.....	53.92	58.92	54.15	52.63	60.66	58.72	54.68	47.52	62.94	78.92
August.....	55.36	60.26	52.91	52.17	61.61	59.29	54.34	47.18	66.08	85.40
September..	58.00	61.69	53.30	53.43	63.08	60.64	53.29	48.68	68.51	100.73
October....	60.36	62.03	55.49	53.34	63.47	60.79	50.65	49.38½	67.85	87.38
November..	58.11	63.85	55.64	55.72	62.79	58.99	49.10	51.71	71.60	85.97
December..	55.37	64.85	54.43	54.90	63.37	57.76	49.38	54.97	75.76	85.94
Average..	53.57	60.35	53.49	53.30	60.83	59.79½	54.81	49.69	65.66	81.40

The average price for 25 years past is not a true index, as it includes the artificial price of \$1.29 per oz., due to free coinage, giving a fictitious average of 60 cts. per oz. The average for 14 years, 1903-1916, is 57.52 cts. per oz.

After remaining around 70 to 80 cts. per oz., from January to July, 1917, silver commenced advancing in price rapidly until September 25, when it stood at \$1.076. Further gains were expected, but the reverse took place; and due probably to profit-taking, and reluctance of India and China to buy at high prices, quick drops took place until October 26, when quotations were steady at 82½ cts. Judging by past performances, the price is about bedrock on this movement and an advance may be expected again. By November 13 the price had gained to 96.12c., one jump being 5c. in a day. At the end of

November quotations were steady at around 84c., probably due to the British and United States Governments about to fix the price around 85c. per oz. Early in December, 1917, it was reported from Washington, D. C., that it was proposed to fix the rice at \$1 per oz., in other words, bimetallism. An international monetary system was suggested to provide for the expanding credit of the world due to war exigencies.

SILVER PRODUCTION OF THE UNITED STATES, IN OUNCES

Year	Quantity	Commercial Value	Year	Quantity	Commercial Value
1880.....	30,318,700	\$34,717,000	1900.....	57,647,000	\$35,741,100
1881.....	33,257,800	37,657,500	1901.....	55,214,000	33,128,400
1882.....	36,196,900	41,105,900	1902.....	55,500,000	29,415,000
1883.....	35,732,800	39,618,400	1903.....	54,300,000	29,322,000
1884.....	37,743,800	41,921,300	1904.....	57,682,800	33,456,000
1885.....	39,909,400	42,503,500	1905.....	56,101,600	34,222,000
1886.....	39,694,000	39,482,400	1906.....	56,517,900	38,256,400
1887.....	41,721,600	40,887,200	1907.....	56,514,700	37,299,700
1888.....	45,792,700	43,045,100	1908.....	52,440,800	28,050,600
1889.....	50,094,500	46,838,400	1909.....	54,721,500	28,455,200
1890.....	54,516,300	57,242,100	1910.....	57,137,900	30,854,500
1891.....	58,330,000	57,630,000	1911.....	60,399,400	32,615,700
1892.....	63,500,000	55,682,500	1912.....	63,766,800	39,197,500
1893.....	60,000,000	46,800,000	1913.....	66,801,500	40,348,100
1894.....	49,500,000	31,422,100	1914.....	72,455,100	40,067,700
1895.....	55,727,000	36,445,500	1915.....	74,961,075	37,397,300
1896.....	58,834,800	39,654,600	1916.....	72,883,800	47,957,540
1897.....	53,860,000	32,316,000	1917.....	74,244,500	60,435,000
1898.....	54,438,000	32,118,400			
1899.....	54,764,500	32,858,700			
			Total...	2,053,223,175	\$1,486,146,340

SILVER PRODUCTION OF THE UNITED STATES

(Bureau of the Mint and the Geological Survey Figures)

	1916		1915	
	Fine oz.	Value	Fine oz.	Value
Alaska.....	1,426,300	\$935,500	1,054,634	\$526,100
Arizona.....	6,711,800	4,416,300	5,665,672	2,828,500
California.....	1,937,300	1,274,700	1,689,924	843,100
Colorado.....	7,771,500	5,113,600	7,199,745	3,591,900
Georgia.....	100	70	141	100
Idaho.....	10,504,100	6,911,900	13,042,466	6,506,800
Illinois.....			3,892	1,900
Maryland.....				
Michigan.....	572,600	374,800	581,874	290,300
Missouri.....	52,000	34,200	55,534	27,700
Montana.....	14,751,000	9,706,200	14,423,173	7,195,600
Nevada.....	12,784,600	8,412,300	14,453,085	7,210,500
New Hampshire.....	300	200		
New Mexico.....	2,000,000	1,316,000	2,337,064	1,165,900
North Carolina.....	400	270	1,496	700
Oklahoma.....	400	270		
Oregon.....	163,800	108,400	125,400	62,600
Philippine Islands.....	17,900	11,800	15,148	7,600

SILVER PRODUCTION OF THE UNITED STATES (Continued)

	1916		1916	
	Fine oz.	Value	Fine oz.	Value
Porto Rico.....	500	\$330	.....	.....
South Dakota.....	212,800	141,000	197,569	\$98,600
Tennessee.....	103,400	68,100	99,171	49,500
Texas.....	689,500	453,700	724,580	361,500
Utah.....	12,965,700	8,531,500	13,073,471	6,522,200
Vermont.....	2,000	1,320	150	100
Virginia.....	4,900	3,300	.....	.....
Washington.....	200,200	135,680	213,877	106,700
Wyoming.....	4,700	3,100	2,910	1,400
Total.....	72,883,800	*\$47,957,540	74,961,075	*\$37,397,300

* At the average price of silver per fine ounce for the calendar year 1915, \$0.49889; and \$0.658 for 1916.

PRODUCTION OF GOLD AND SILVER IN ORES OF DIFFERENT KINDS, IN TONS (U. S. G. S. FIGURES) *

	Silicious Per ton	Copper Per ton	Lead Per ton
Alabama and Georgia...	6,829 \$2.46	.....	.....
Alaska.....	1,738,127 2.80	153,605 \$2.14	.....
Arizona.....	428,805 8.46	7,508,020 .33	26,687 \$11.92
California.....	2,050,797 5.53	397,868 1.84	16,820 16.99
Colorado.....	2,157,762 10.25	12,196 13.38	193,087 7.66
Idaho.....	43,513 8.85	93,040 1.66	1,421,893 3.42
Maryland and Virginia†.	11 20.00	1,495 .84	.....
Michigan†.....	.....	2,000,000 .20	.....
Montana.....	342,085 9.37	4,346,034 1.14	29,636 8.62
Nevada.....	1,594,486 11.39	2,882,121 .39	16,088 13.13
New Mexico.....	169,046 10.11	2,005,024 .20	2,491 6.20
North Carolina†.....	19,441 7.17	10 14.90	.....
Oklahoma.....	190 18.00	.....	.....
Oregon.....	124,274 8.99	.....	57 32.98
South Carolina.....	7,531 .92	.....	.....
South Dakota.....	2,019,255 3.68	.....	7 35.57
Tennessee†.....	.....	653,621 .09	.....
Texas.....	40,375 7.09	231 16.34	.....
Utah.....	149,902 7.38	7,578,220 .39	600,481 7.91
Washington.....	73,892 8.66	21,752 2.51	303 10.41
Wisconsin†.....	.....	37 .27	.....
Wyoming.....	345 9.22	78 .56	.....
Total, 1914.....	10,966,666 \$6.95	27,653,352 \$0.49	2,307,550 \$5.29
Percentage of tonnage..	25.46	64.26	5.36
Total, 1913.....	10,856,738 \$7.15	30,850,693 \$0.54	2,563,904 \$4.98
Percentage of tonnage..	23.29	67.43	5.60

* Illinois, Missouri, the Philippines, and Porto Rico not included; crude-ore tonnage, containing precious metals not known. † Includes only copper ore yielding precious metals. ‡ Lead and zinc ores yielded no precious metals.

PRODUCTION OF GOLD AND SILVER IN ORES OF DIFFERENT KINDS,
IN TONS (U. S. G. S. FIGURES)* (Continued)

	Zinc ores		Copper-lead and copper-lead-zinc ores		Lead-zinc ores		Total
Alabama and Georgia.....							\$6,829
Alaska.....							1,891,732
Arizona.....	18,079	\$2.86	4,892	\$4.08	23,444	\$2.53	8,009,927
California.....							2,465,485
Colorado.....	145,656	.004	1,192	43.11	167,633	1.72	2,677,526
Idaho.....	8,473	.34			668,430	2.91	2,235,349
Maryland and Virginia.†	14,004						15,510
Michigan†.....							2,000,000
Montana.....	9,066	3.05	168	18.17	401,967	3.40	5,128,956
Nevada.....	9,490	3.90	3,762	12.77	16,075	3.96	4,522,022
New Mexico.....	†55,912		380	11.45			2,232,853
North Carolina.†							19,451
Oklahoma.....							190
Oregon.....							124,331
South Carolina.....							7,531
South Dakota.....							2,019,262
Tennessee.....	357,437						1,011,058
Texas.....	24				1,640	2.21	42,270
Utah.....	4,670		1,183	18.76	209,558	2.75	8,544,014
Washington.....							95,947
Wisconsin†.....							37
Wyoming.....							423
Total, 1914.....	622,811	\$0.19	11,577	\$12.87	1,488,747	\$2.90	\$43,050,703
Percentage of tonnage..	1.44		0.02		3.46		
Total, 1913.....	231,547	\$0.31	24,399	\$22.61	1,427,027	\$2.48	\$45,754,308
Percentage of tonnage..	.51		.05		3.12		100.00

* Illinois, Missouri, the Philippines, and Porto Rico not included; crude-ore tonnage, containing precious metals not known. † Includes only copper ore yielding precious metals. ‡ Lead and zinc ores yielded no precious metals.

PERCENTAGE OF OUTPUT OF SILVER BY PROCESSES IN THE UNITED
STATES IN 1912, 1913, AND 1914

Production by—	Percentage of total output			
	1912	1913	1914	1915
Placers.....	0.2	0.2	0.2	0.2
Gold and silver mills:				
By amalgamation.....	1.2	.6	.4	.4
By cyanidation.....	17.8	19.7	22.1	22.1
Total milling.....	19.0	20.3	22.5	22.5
Smelting*.....	80.8	79.5	77.3	77.3
Total†.....	100.0	100.0	100.0	100.0

* Both crude ore and concentrates. † Philippine Islands and Porto Rico excluded.

AMERICAN SILVER-LEAD SMELTING WORKS

Company—	Place	Furnaces	Annual Capacity*
American Smelting and Refining Co.....	Denver.....	7	510,000
American Smelting and Refining Co.....	Pueblo.....	7	380,000
American Smelting and Refining Co.....	Durango.....	4	210,000
American Smelting and Refining Co.....	Leadville.....	10	510,000
American Smelting and Refining Co.....	Murray.....	8	657,000
American Smelting and Refining Co.....	East Helena.....	4	306,000
American Smelting and Refining Co.....	Omaha†.....	2	82,000
American Smelting and Refining Co.....	Chicago†.....	1	36,000
American Smelting and Refining Co.....	Perth Amboy†.....	4	170,000
American Smelting and Refining Co.....	El Paso.....	6	380,000
Bunker Hill & Sullivan M. & C. Co.....	Kellogg, Idaho.....	3	200,000
Selby Smelting and Lead Co.....	Selby.....	3	210,000
Ohio & Colorado Smelting Co.....	Salida, Colo.....	4	345,000
United States Smelting Co.....	Midvale, Utah.....	6	500,000
Needles Smelting Co.....	Needles, Cal.‡.....	2	70,000
Northport Smelting and Refining Co.....	Northport, Wash.....	3	300,000
Pennsylvania Smelting Co.....	Carnegie, Pa.....	2	60,000
International Smelting Co.....	Tooele, Utah.....	5	525,000
Totals, United States.....		78	4,951,000
American Smelting and Refining Co.....	Monterey.....	10	584,000
American Smelting and Refining Co.....	Aguascalientes.....	1	40,000
American Smelting and Refining Co.....	Chihuahua.....	7	400,000
American Smelters Securities Co.....	Velardeña.....	3	150,000
Compañía Metalúrgica Mexicana.....	San Luis Potosi.....	10	250,000
Compañía Metalúrgica de Torreon.....	Torreon.....	8	360,000
Compañía Minera de Peñoles.....	Mapimi†.....	6	325,000
Totals, Mexico.....		45	2,109,000
Consolidated Mining and Smelting Co.....	Trail, B. C.....	4	140,000

* Tons of charge. † Smelt chiefly refinery between-products. ‡ Not operated in 1914 and 1915. § Plant being remodeled.

Imports of silver in 8 months of 1917 were valued at \$27,253,782; and exports at \$51,768,583. The respective figures in 1916 were \$20,355,129 and \$41,194,057.

SILVER PRODUCTION OF THE WORLD

(Report of the Director U. S. Mint)

	Quantity	Value		Quantity	Value
1882.....	86,472,091	\$98,232,300	1893.....	165,472,621	\$129,119,900
1883.....	89,175,023	98,984,300	1894.....	164,610,394	104,493,000
1884.....	81,587,801	90,785,000	1895.....	167,500,960	109,545,800
1885.....	91,609,959	97,518,800	1896.....	157,061,370	105,859,300
1886.....	93,297,290	92,793,500	1897.....	160,421,082	96,252,700
1887.....	96,123,586	94,031,000	1898.....	169,055,253	99,742,800
1888.....	108,827,606	102,185,900	1899.....	168,337,452	101,002,600
1889.....	120,213,611	112,414,100	1900.....	173,591,364	107,628,400
1890.....	126,095,062	131,937,000	1901.....	173,011,283	103,806,700
1891.....	137,170,000	135,500,200	1902.....	162,763,483	86,264,700
1892.....	153,151,762	133,404,400	1903.....	167,689,322	90,552,200

(SILVER PRODUCTION OF THE WORLD *Continued*)

(Report of the Director U. S. Mint)

	Quantity	Value		Quantity	Value
1904.....	164,195,266	\$95,233,300	1911.....	226,192,923	\$122,143,800
1905.....	172,317,688	105,113,700	1912.....	224,310,654	137,883,800
1906.....	165,054,497	111,721,100	1913.....	223,907,845	135,246,400
1907.....	184,206,984	121,577,100	1914.....	211,339,749	116,849,900
1908.....	203,131,404	108,655,100	1915.....	179,753,978	93,292,315
1909.....	212,149,023	110,364,400	1916.....	175,933,000	115,763,914
1910.....	221,715,763	119,727,000			

The accompanying tables give the silver production of the important producers in the United States and Canada.

UNITED STATES

	Production, Oz., 1915	Production, Oz., 1916
American Smelting and Refining Co.....	76,117,453	71,868,451
Anaconda Copper Mining Co. (Montana).....	9,005,618	11,837,769
International Smelting Co. (Tooele).....	5,090,157	5,549,777
U. S. Smelting Co.....	12,071,863	11,647,205
Bunker Hill & Sullivan M. and C. Co.....	1,300,000	1,406,260
Butte & Superior Mining Co.....	3,895,090	3,850,021
Calumet & Arizona Mining Co.....	1,381,078	1,267,735
Federal Mining and Smelting Co.....	983,830	.....
Hecla Mining Co.....	692,444	1,195,841
Nevada Wonder Mining Co.....	1,199,246 ¹	1,243,753
North Butte Copper Co.....	944,285	960,247
Copper Queen Con. Mining Co.....	757,543	816,828
Tonopah Belmont Development Co.....	2,968,565 ²	2,629,466
Tonopah Extension Mining Co.....	2,106,519	1,387,557
Tonopah Mining Co.....	2,340,000	1,882,402

¹ Year ended Sept. 30, 1915. ² Year ended Feb. 28.

CANADA

Beaver Consolidated.....	900,000 ¹	566,964
Buffalo Mines.....	822,791 ⁷	684,274
Coniagas.....	2,002,054 ³	1,773,287
Crown-Reserve.....	657,395	274,470
McKinley-Darragh-Savage.....	1,112,976 ⁵	925,779
Kerr Lake.....	2,036,962 ⁴	2,433,793
La Rose.....	1,366,247 ³	1,135,143
Nipissing.....	4,623,958	3,819,769
Temiskaming Mining Co.....	278,961 ⁶	1,263,848
Consolidated Mining and Smelting Co.....	2,230,500 ⁶	2,285,631

¹ Year ended Feb. 28, 1915. ² Year ended Oct. 31, 1915. ³ Year ended Aug. 31, 1915. ⁴ Year ended Aug. 31, 1915. ⁵ Calendar year 1914. ⁶ Year ended Sept. 30, 1915. ⁷ Year ended April 28, 1915.

The real silver producers are those at Tonopah and Cobalt. The first four in the table are metallurgical companies whose production is largely derived from ore purchased; the bulk of the Anaconda and U. S. Smelting productions comes from their own mines, also the Consolidated M. & S. Co of Canada.

The Butte & Superior being a zinc-mining company, the silver actually recovered is considerably less than is the content of the ore.

TIN

Very little tin is produced in this country, and the most of it comes from Alaska, which yielded 232 tons of 66% concentrate in 1916. In 1914 South Dakota furnished a few hundred pounds of stream tin, and there are promises of a revival in lode mining in that State. Workable deposits exist near Deeth, Nevada, and El Paso, Texas. Practically all the tin used in the United States is brought from Europe and the Straits Settlements. Bolivia ranks second to the Straits as a tin producer; its ores were formerly sent to Europe for reduction, but the reverberatory tin-smelting plant of the American Sm. & Ref. Co. at Perth Amboy, N. J., built to handle Bolivian "barilla" or concentrates, will materially change conditions. This plant was blown in March 1, 1915, and the first crude tin drawn off March 7. This metal is refined electrolytically at the plant.

UNITED STATES TIN PRODUCTION (U. S. GEOL. SURVEY)

	Tons Concts.	Percent Tin	Value
1916.....	232	66	.....
1915.....	200	66	.....
1914.....	157.5	66	\$66,560
1913.....	84	60	36,970
1912.....	147	60	124,800
Secondary tin recovered in the United States:			
		Tons	Value
1916.....		17,400	\$15,131,040
1915.....		13,650	10,544,180
1914.....		12,447	8,887,158

The United States is the largest user (48% of the world's output) of tin among the countries of the world, and hence a large importer of the metal. The U. S. Steel Corporation is the greatest single user of the metal.

Tin Prices in New York

Extreme fluctuations and yearly average prices of Pig Tin in New York:

Year	Highest	Lowest	Aver.	Year	Highest	Lowest	Aver.
1885.....	23.50	16.10	19.50	1901.....	33.50	23.12½	28.94
1886.....	23.25	20.45	21.55	1902.....	30.62½	22.60	26.95
1887.....	37.25	21.90	24.85	1903.....	30.80	24.95	28.19
1888.....	37.25	16.90	26.20	1904.....	30.12½	25.75	28.08
1889.....	22.25	19.50	20.93	1905.....	36.45	28.65	31.55
1890.....	25.10	19.50	21.42	1906.....	50.00	35.65	39.82
1891.....	22.00	19.50	20.25	1907.....	44.10	26.00	38.43
1892.....	22.15	19.40	20.60	1908.....	32.37½	26.45	29.54
1893.....	21.25	18.15	20.14	1909.....	34.12½	27.30	29.76
1894.....	20.45	13.45	18.08	1910.....	38.75	31.75	34.27
1895.....	15.15	13.00	14.06	1911.....	48.50	37.60	42.68
1896.....	13.70	12.62½	13.24	1912.....	51.05	42.05	46.43
1897.....	14.12½	13.00	13.60	1913.....	51.00	36.75	44.32
1898.....	19.00	13.70	15.64	1914.....	65.00	28.50	35.70
1899.....	33.12½	19.87½	27.19	1915.....	57.00	32.00	38.66
1900.....	35.00	25.20	30.00	1916.....	56.00	37.50	43.48

From American Metal Market.

Average price for 37 years..... 28.12

Monthly Average Prices of Tin

Month	New York				London			
	1913	1914	1915	1916	1913	1914	1915	1916
January.....	50.298	37.779	34.260	41.825	238.273	171.905	156.550	175.548
February.....	48.766	39.830	37.415	42.717	220.140	181.556	176.925	181.107
March.....	46.832	38.038	48.426	50.741	213.615	173.619	180.141	193.609
April.....	49.115	36.154	47.884	51.230	224.159	163.963	166.225	199.736
May.....	49.038	33.360	38.790	49.125	224.143	150.702	162.675	196.511
June.....	44.820	30.577	40.888	42.231	207.208	188.321	167.636	179.466
July.....	40.260	31.707	37.423	38.510	183.511	142.517	167.080	168.357
August.....	41.582	*	34.389	38.565	188.731	*	151.440	169.870
September.....	42.410	32.675	33.125	38.830	193.074	*	152.625	171.345
October.....	40.462	30.284	33.080	41.241	184.837	*	151.554	179.307
November.....	39.810	33.304	39.224	44.109	180.869	139.291	167.670	186.932
December.....	37.635	33.601	38.779	42.635	171.786	147.102	167.000	183.368
Aver. Year...	44.252	.....	38.590	43.480	206.279	.....	163.960	182.096

Engineering and Mining Journal.

New York in cents per pound; London in pounds sterling per long ton.

* No quotations.

In 1917 prices were as follows by months to October, inclusive: 44.10; 51.47; 54.27; 55.63; 63.21; 61.93; 62.60; 62.53; 61.54, and 61.85c. per lb. Scarcity of supplies during October and November sent the price up, this being firm at 80c. early in December. The average for 1917 was 61.55c. per lb.

Tin Imports in the United States, Short Tons

Year	Quantity	Value	Year	Quantity	Value
1906.....	50,477	\$37,447,315	1912.....	58,016	\$50,372,478
1907.....	41,257	32,074,263	1913.....	53,315	46,946,756
1908.....	41,267	23,923,560	1914.....	52,919	32,943,059
1909.....	47,662	27,558,546	1915.....	57,818	38,736,909
1910.....	52,528	33,913,255	1916.....	69,036	51,803,384
1911.....	53,527	43,346,394	1917*	46,165	43,745,985

* Also 4,907 tons of ore (probably Brazilian concentrate) worth \$2,623,811. Exports amounted to 127 tons of pig and oxide valued at \$157,457 (8 months).

Consumption of Tin in the United States

Monthly deliveries of Tin in the United States, exclusive of Pacific Coast.

	1907	1908	1909	1910	1911	1912	1913	1914	1915	1916*
January.....	3,950	1,500	3,200	3,500	3,200	3,700	3,700	3,600	2,300	4,452
February.....	2,600	2,400	2,700	3,800	3,800	4,050	3,500	3,300	3,375	6,388
March.....	3,900	3,150	3,900	4,000	5,100	4,000	5,900	4,450	3,200	4,726
April.....	3,650	3,000	3,200	4,100	3,300	5,400	3,450	4,300	3,200	4,202
May.....	2,500	4,000	3,900	3,600	3,400	4,200	3,350	3,800	5,600	5,455
June.....	3,050	3,000	3,200	5,000	2,900	2,850	3,800	2,650	3,900	6,398
July.....	3,800	2,300	3,600	3,800	4,300	5,150	3,900	3,900	5,300	4,432
August.....	3,200	2,600	3,300	3,700	3,800	4,300	3,600	2,900	4,500	4,335
September.....	2,800	2,300	3,200	3,300	4,200	3,600	3,100	3,600	4,300	4,025
October.....	2,800	3,000	4,100	3,350	3,500	3,850	3,700	3,700	4,900	4,556
November.....	1,550	3,300	4,000	3,800	3,109	4,300	2,800	2,600	2,975	3,165
December.....	1,200	2,850	3,200	3,800	3,700	4,050	3,100	1,900	5,200	4,082
Total.....	35,000	33,400	41,500	45,350	44,300	49,500	43,900	41,700	48,750	56,216
Average.....	2,916	2,783	3,458	3,779	3,692	4,125	3,658	3,475	4,062	4,685

From American Metal Market.

* Includes Pacific Coast deliveries.

Deliveries from Jan. 1 to Oct. 1, 1917, totaled 45,951 tons, or 5,105 tons per month.

Visible Supply of Tin

Total visible supply of tin at the end of each month.

	1905	1906	1907	1908	1909	1910	1911	1912	1913	1914	1915	1916
January.....	15,645	14,286	13,462	14,986	21,895	23,024	18,616	16,707	13,971	16,244	13,901	17,041
February.....	14,911	13,414	13,189	14,780	20,746	21,288	17,260	14,996	12,304	17,308	14,548	16,512
March.....	14,592	11,848	13,130	13,385	19,208	20,208	16,882	15,694	11,132	16,989	15,467	18,789
April.....	13,063	11,104	9,839	12,241	18,825	17,932	14,441	11,893	9,822	15,447	15,785	19,789
May.....	12,967	12,607	12,015	15,424	19,208	18,998	15,938	14,345	13,710	17,862	14,646	19,614
June.....	11,938	11,956	11,376	14,166	16,208	15,700	16,605	12,920	11,101	16,027	16,927	19,368
July.....	12,270	12,184	18,025	15,962	20,244	17,433	16,707	13,346	12,063	14,167	16,084	18,404
August.....	11,572	12,840	11,865	17,267	19,182	17,943	16,619	11,285	11,261	14,452	15,127	18,042
September.....	14,608	12,209	12,498	18,109	21,419	18,999	16,672	13,245	12,943	14,613	16,191	16,192
October.....	12,812	11,162	11,072	17,524	18,724	18,183	14,161	10,735	11,857	10,894	12,154	17,415
November.....	13,174	12,395	12,340	19,953	20,025	18,875	16,630	12,348	14,470	11,483	16,451	21,186
December.....	13,451	12,998	12,058	19,928	20,918	17,194	16,514	10,977	13,898	13,398	16,216	20,737
Average....	13,492	12,417	12,239	16,390	19,883	18,815	16,404	13,207	12,377	14,907	15,208	18,585

From American Metal Market.

TITANIUM

Titanium is obtained from the two minerals: rutile, titanic oxide, 60% titanium; and ilmenite or titanic iron ore, FeOTiO_2 , with 31.6% titanium. The supply of rutile comes from Virginia, being mined by the American Rutile Co. at Roseland, Nelson county. Its output in 1914 was 94 tons of rutile, containing 95% oxide, and 89 tons of ilmenite, with 55% oxide.

Rutile is used for making ferro-titanium, used in cast iron and steel, in electrodes for arc lamps, in dyeing leather and wool and in chemicals. A little ilmenite has been used in making ferro-titanium and arc lamp electrodes.

TITANIUM MINE

American Rutile Co.....Virginia

TUNGSTEN

The 1915 production of tungsten ores in the United States broke all previous records. This increased output was due to the demand for high-speed tungsten tool steel required for completing war orders in the United States and abroad. Prices soared with demand; starting from \$5.80 to \$9 per unit for 60% ore early in 1915 they reached \$66 per unit early in 1916; by the end of March some ore sold for \$93.50 per unit at the mills. Consumption could not keep pace with production; prices dropped and by July 60% ore was selling around \$25 per unit; by the middle of August sales were made as low as \$20 per unit. Previous to 1915 the highest price reported was \$15 per unit, paid in 1907; normal price has been \$6 to \$7.

During 1916 prices fell to \$17 per unit in September, remaining there until December, then slowly gaining until \$26 was reached by August, 1917. In October, the quotation is from \$23 to \$26 per unit. The demand is steady, and some sort of price agreement may possibly be keeping it so; not among producers, but consumers.

All tungsten ores in Great Britain are under the control of the Government, and they are sold at the uniform price of 55 shillings per unit of a long ton, that is 55 shillings for 22.4 pounds of tungsten trioxide, WO_3 .

The unit in the United States is 1 per cent of a short ton in tungsten trioxide, that is 20 pounds, containing a minimum of 60% WO_3 .

Besides its use for high-speed tool steel, a considerable quantity of tungsten is used for incandescent electric lamp filaments, there being over

200,000,000 tungsten lamps made in 1916, an increase of 33%. The metal is also used for contact points in automobile spark plugs, spark coils, and telegraph relays.

There were 7 tungsten mills in 1916 in the Nederland district, Boulder Co., and one at Rollinsville, Gilpin Co., Colo.; 4 at Dragoon, 3 at Arivaca, and one at Yucca, Ariz.; and one each at Atolia, Goffs, Johannesburg and Nipton, and two at Bishop, Cal. There were two at Sodaville, Nev., and one at Toy, also several near Ely. After the drop in prices some of the plants ceased work. In South Dakota the Homestake and Wasp No. 2 companies operate small concentrators. Connecticut, Alaska, Missouri, Idaho, and Washington are small producers.

U. S. Production of Tungsten

	1916	1915
	Tons	Tons
Arizona.....	240	127
California.....	2,200	1,050
Colorado.....	4,000	963
Nevada.....	700	55
South Dakota.....	200	140

The following figures from the United States Geological Survey show the production of 60% concentrate in recent years, from all States:

Year	Tons	Per unit	Total value
1910.....	1,821	\$7.62	\$832,992
1911.....	1,139	5.97	407,985
1912.....	1,330	6.28	502,158
1913.....	1,537	7.30	672,118
1914.....	990	7.31	435,000
1915.....	2,332	29.33	4,100,000
1916.....	7,469	70.00	31,500,000

Buyers of tungsten ores include Primos Chemical Co., Foote Mineral Co. and others, whose addresses are given in the advertising pages of the book.

World's Production of Tungsten Ore, by Countries, Estimated in Short Tons Containing 60% Concentrates (U. S. G. S.)

Country	1907	1908	1909	1910	1911	1912	1913	1914	1915	1916
Africa: South Africa.....	241	40	16	.....	.....	.....	.....	.....	.....	.....
Asia:										
Burma and the Shan States.....	.....	.....	.....	407	1,119	2,098	1,908	2,055	2,883	4,123
Federated Malay States.....	89	83	99	105	205	275	278	317	.....	.....
French Indo-China (Tonkin).....	.....	.....	.....	19	.....	81	.....	.....	.....	.....
India (not including Burma).....	.....	.....	7	23	.....	.....	.....	.....	.....	.....
Japan.....	71	220	292	276	287	225	327	226	439	.....
Siam.....	10	.....	.....	.....	200	200	1	33	297	468
Trengganu (Malay Peninsula).....	.....	.....	.....	.....	.....	.....	.....	173	.....	.....
Australia:										
New South Wales.....	451	269	431	413	812	298	220	220	100	146
Northern Territory.....	177	40	49	78	71	44	.....	.....	.....	.....
Queensland.....	703	516	679	1,148	750	944	587	442	640	800
Tasmania.....	46	5	20	75	86	87	89	.....	.....	.....
Victoria.....	.....	.....	.....	15	31	33	13	.....	.....	.....
Western Australia.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
New Zealand.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
East Indies:										
Billiton.....	4	11	12	21	.....	21	.....	.....	.....	.....
Singkep.....	1	14	12	12	.....	8	.....	.....	.....	.....

World's Production of Tungsten Ore, by Countries, Estimated in Short Tons Containing 60% Concentrates (U. S. G. S.)—Continued

Country	1907	1908	1909	1910	1911	1912	1913	1914	1915	1916
Europe:										
Austria.....	50	44	43	54	50	73				
England.....	391	261	421	307	298	216	204	230	360	350
France.....	67	124	55	33	188	252	245	200	200	200
German Empire (Saxony).....	68	46	106	105	89	111	150	220	250	300
Italy.....	18									
Portugal.....	702	684	609	1,132	1,078	1,466	900	967	1,400	1,600
Spain.....	383	240	142	169	106	202	179	84	511	
North America:										
Nova Scotia.....				83		17	12	6		
United States.....	1,640	671	1,619	1,821	1,139	1,330	1,537	990	2,322	7,469
South America:										
Argentina.....	507	548	900	826	683	702	591	435	171	700
Bolivia.....	500	187	168	232	370	547	328	320	793	920
Brazil.....		16								
Peru.....				15	57	241	327	130	371	400
Total.....	6,137	4,113	5,774	7,570	7,517	9,654	10,000	8,000	12,000	19,000

Development and production in foreign countries expanded rapidly during the past two years, especially in Burma, Bolivia, and Portugal.

TUNGSTEN MINES

Algrove Mining & Milling Co.....	Colorado
American Tungsten Co.....	Arizona
American Tungsten Consolidated Corporation.....	Washington
Atkins Kroll Co. (San Francisco).....	Nevada
Atolia Mining Co.....	California
Black Hawk Mine (Developing in 1915).....	California
Boulder Tungsten Production Co.....	Colorado
Chicago-Nevada Tungsten Co.....	Nevada
Consolidated Mines Co.....	California
Consolidated Tungsten Co.....	Nevada
Crucible Steel Co. of America.....	Colorado
Dege Clarke Tungsten Mill.....	Colorado
Emery-Whitcomb Tungsten Co. (Acquired by International Tungsten Corp.).....	Arizona
Homestake Mining Co.....	S. Dakota
Idaho Tungsten Co. (Leases property of Ima Cons. Mng. and Mfg. Co.).....	Idaho
Ima Consolidated Mining and Milling Co. (Property leased by Idaho Tungsten Co.).....	Idaho
Intermountain Tungsten Milling Co.....	Colorado
International Tungsten Corp.....	Arizona
Mojave Tungsten Co.....	California
National Tungsten Co. (Acquired by International Tungsten Corp.).....	Ariz.
Nederland-Beaver Tungsten Mining Co.....	Colorado
Nevada Hills Mining Co.....	Nevada
Nevada Scheelite.....	Nevada
Nevada Tungsten Mines Co.....	Nevada
Nobe Tungsten Mine.....	Nevada
Penna. Mining Power & Reduction Co.....	Colorado
Pilot Knob Group.....	Nevada
Pioneer Mining, Milling, Power & Tunnel Co.....	Colorado
Powers Gulch Development Co., (Prospect).....	Arizona
Primos Chemical Co.....	Colorado, etc.
Rare Metals Ore Co.....	Colorado
Redlich Tungsten Co.....	Nevada
Rose Consolidated Mining Co.....	Montana
Saint Anthony Mines Co.....	Nevada
Saint Anthony Tungsten Mines (See Toy Tungsten).....	Nevada
Salt Lake Tungstonia Mines Co.....	Utah
Scheelite Mines, Ltd.....	Nova Scotia
Silver Tungsten Mining Co., (A "mush-room company").....	Nevada
Standard Tungsten Co.....	California
Sun Tungsten Co.....	Colorado
Tip Top Consolidated Mining Co.....	Arizona
Toy Tungsten Mine.....	Nevada
Tungsten Co. of America.....	Connecticut
Tungsten Exploration Co.....	Colorado
Tungsten Girl Co.....	Colorado
Tungsten Metals Corporation.....	Colorado
Tungsten Mines Co.....	California
Union Hill Mining Co., (Some tungsten).....	California
U. S. Tungsten Corporation.....	Nevada
Utah Minerals Concentration Co.....	Utah
Uvada Tungsten Co.....	Nevada
Vasco Mining Co.....	Colorado
Wah-Chang Mining & Smelting Co.....	China
Wasp No. 2 Mining Co.....	S. Dakota
Western Tungsten Mines Co.....	Colorado
White Oaks Mines Cons. Co.....	N. Mexico
Williams Tungsten Co.....	Arizona
Wolf Tongue Mining & Milling Co.....	Colorado
Yucca Tungsten Co.....	Arizona

Figures deduced by the Boulder County (Colorado) Metal Mining Association prove that the cost of producing tungsten ore averages about \$16.50 per unit. This applies, of course, to conditions prevailing in this one district, but it is here that the bulk of American tungsten emanates.

Tungsten ores from Bolivia are laid down in New York at \$7 per unit. In that country, the ore occurs in more persistent shoots than in our American districts. The mining of tungsten is therefore conducted with less deadwork and more regularity of production from each mine than is possible with us. Another point is that labor is much cheaper abroad than at home.

Our nation will always need all the tungsten that can be mined in our own country and the Government has been urged to declare an import duty that will largely eliminate foreign competition in supplying this necessity. A tax of \$10 per unit has been suggested.

Imports of tungsten ore in 8 months of 1917 totaled 2,737 tons, valued at \$2,791,451, equal to about \$1,000 per ton, or nearly \$17 per unit of 60% material. Of the total, 1,870 tons came from Chile and Peru, presumably of Bolivian origin, as exports from this country pass through the others.

URANIUM

As uranium is the source of radium, the production of uranium ore has already been given under radium. Uranium ores occur in many places in the United States, but are found in greatest abundance in the Paradox Valley region of Colorado and Utah. The following list of producing properties, practically covers the field.

Colorado-Utah Carnotite Mines Co., Grand Junction, Colo. Claims in Grand County, Utah.

Consolidated Uranium & Vanadium Co., Uranium, Colo.

German-Belcher Mines, Central City, Colo.

Curran & Hudson, Naturita, Colo.

A. C. Titcomb, Uranium, Colo.

Ike W. Stevens, Cedar, Colo.

Cliff Mines, Nucla, Colo.

American Rare Metals Co., Cedar, Colo.

A. M. Wilson, Naturita, Colo.

E. T. Herrmann, 1738 Broadway, Denver, Colo.

Ward & Reams, Nucla, Colo.

Ewing Williams, Redvale, Colo.

J. M. Belisle, Norwood, Colo.

J. S. McArthur & Co., Glasgow, Scotland. Claims at Greenriver, Utah.

VANADIUM

Vanadium occurs with uranium in carnotite, the mineral of greatest commercial importance. When vanadium is 14% and uranium but 3% the mineral is a dark olive green; when the uranium content is 20%, the mineral is a beautiful yellow. The ore is usually low-grade, 2% to 4%, but of widespread occurrence, the sandstone looking as if dusted with sulphur.

The American Vanadium Co. is said to control 92% of the world's vanadium supply. Its mines in Peru yielded 2526 tons of ore in 1915. The demand is for vanadium steel, used in aeroplane construction, in automobiles, for military helmets and wherever extreme strength and lightness are required. In 1916 the price of ferro-vanadium was from \$2.25 to \$3 per pound. In 1917 there was a small advance on this quotation.

The three principal producers in the United States are:

Primos Chemical Co., Primos, Pa. Mines at Vanadium, San Miguel County, Colo.

Standard Chemical Co., Pittsburgh, Pa. Mines in Colorado.

American Vanadium Co., Pittsburgh, Pa. Minas-ragra mines, Peru.

VANADIUM MINES

American Vanadium Co. Peru Shattuck-Arizona Copper Co. . . . Arizona
Primos Chemical Co. Colorado (etc.) Standard Chemical Co. . . . Colorado-Utah

ZINC (SPELTER)

Zinc mining has been a war industry in 1915-'16-'17, prices exceeding those ever known. American smelters in 1916 treated 1,777,891 tons of ore,

compared with 1,257,528 tons in 1915, and 872,767 tons in 1914. These tonnages yielded 683,004; 507,142, and 370,312 tons of spelter, respectively. Production in 1917 continues at a fair price, but many blocks of retorts are cold on account of uncertain conditions.

The following regulation was made in 1916 by the New York Metal Exchange.

Prime Western Spelter shall be virgin spelter resulting from the distillation of zinciferous material, and shall not contain on the average, in excess of 2% lead and .08% iron.

In case of dispute one slab out of every ten shall constitute a proper sample.

Remelted spelter shall not be a good delivery.

This ruling goes into effect at once, and replaces Rule 1 of the Spelter Trade Rules.

C. MAYER,
Secretary.

New York, August 31, 1916.

An illustration of the effect of the abnormal price upon the earnings of zinc companies is shown in the Butte & Superior returns: In 1914, with zinc averaging 4.94c per pound, the net profit was \$372,984, or \$3.90 per ton, treating 18.28% ore. In the first quarter of 1916, with zinc at 16.1c, the profit was \$3,554,939, or \$21.55 per ton, treating 15.69% ore.

The ore supply heretofore from many small mines is now in large part from a few large properties, the Butte & Superior mine and its neighbor the Elm Orlu at Butte, Mont., and the Consolidated Interstate-Callahan at Wallace, Idaho, these mines furnishing a third of the entire American production; although the new fields in Arkansas and Oklahoma must not be forgotten as being a factor in the supply. The use of concentration by flotation has entirely altered the ore situation at many mines. Oxidized or calamine ores furnish about 29% of the production.

Spelter Prices in New York

Highest, lowest and average yearly prices of spelter in New York:

Year	Highest	Lowest	Average	Year	Highest	Lowest	Average
1885.....	4.62½c	4.00c	4.34c	1901.....	4.50	3.90	4.08½
1886.....	4.60	4.25	4.40	1902.....	5.62½	4.10	4.90
1887.....	5.62½	4.40	4.62½	1903.....	6.25	4.70	5.62
1888.....	5.50	4.50	4.91	1904.....	6.12½	4.75	5.17
1889.....	5.40	4.62½	5.02	1905.....	6.65	5.30	6.00
1890.....	6.17½	5.00	5.55	1906.....	6.85	6.00	6.27½
1891.....	6.00	4.65	5.02	1907.....	7.25	4.35	6.20½
1892.....	4.90	4.35	4.63	1908.....	5.17½	4.35	4.74
1893.....	4.50	3.55	4.08	1909.....	6.50	4.75	5.52
1894.....	4.00	3.25	3.52	1910.....	6.35	5.25	5.66
1895.....	4.35	3.10	3.63	1911.....	7.00	5.50	5.91
1896.....	4.25	3.60	3.94	1912.....	7.65	6.45	7.11
1897.....	4.35	3.75	4.12	1913.....	7.35	5.10	5.80
1898.....	5.30	3.87½	4.57	1914.....	6.20	4.75	5.30
1899.....	7.00	4.45	5.75	1915.....	27.50	5.70	14.44
1900.....	4.80	4.10	4.40	1916.....	21.17	8.37½	13.75
				1917.....	11.05	7.67½	9.11

Average price for 31 years, 5.63c.
From American Metal Market.

Monthly Average Price of Spelter

Month	New York			St. Louis			London					
	1913	1914	1915	1916	1913	1914	1915	1916	1913	1914	1915	1916
January.....	5.931	5.262	6.386	16.915	6.854	5.112	6.211	16.745	26.114	21.533	30.884	89.810
February.....	5.239	5.377	8.436	18.420	6.089	5.228	8.285	18.960	28.338	21.413	39.819	97.762
March.....	6.078	5.250	8.541	16.846	5.926	5.100	8.366	16.676	24.606	21.460	44.141	95.048
April.....	5.641	5.113	10.012	16.695	5.491	4.963	9.837	16.525	25.313	21.569	49.888	99.056
May.....	5.406	5.074	14.781	14.276	5.256	4.924	14.610	14.106	24.583	21.393	68.100	94.217
June.....	5.124	5.900	21.208	11.752	4.974	4.850	21.038	11.582	22.143	21.346	100.614	68.591
July.....	5.278	4.920	19.026	8.925	5.128	4.770	18.856	8.755	20.592	21.568	97.250	50.750
August.....	5.658	5.568	12.781	8.730	5.508	5.418	12.611	8.560	20.706	†	67.786	51.867
September.....	5.694	5.380	13.440	8.990	5.544	5.230	12.270	8.820	21.148	†	67.841	52.095
October.....	5.340	4.909	12.800	9.829	5.188	4.750	12.596	9.659	20.614	†	66.536	54.159
November.....	5.229	5.112	15.962	11.592	5.083	4.962	15.792	11.422	20.581	25.016	88.409	56.023
December.....	5.154	5.592	16.391	10.665	5.004	5.430	16.221	10.495	21.214	27.369	89.409	55.842
Year.....	5.648	5.213	13.230	12.804	5.504	5.081	13.054	12.634	22.746	.....	67.553	72.071

New York and St. Louis, cents per pound; London, pounds sterling per long ton. †Not reported.

From *Eng. and Mng. Journal*.

Prices in 1917 were as follows: 9.62, 10.05, 10.30, 9.46, 9.36, 9.37, 8.64, 8.36, 8.14, 7.98, 7.90, and 7.77c. per lb. for each month.

Comparison of Foreign and Domestic Spelter Prices

Compiled from annual averages. Price per pound (Exchange \$4.87).

Year	New York		Dif- ference	New York		Dif- ference	
	York	London		York	London		
1884.....	4.44c	3.14c	1.30c	4.40	4.40	.....
1885.....	4.34	3.04	1.30	1900.....	4.08½	3.70	38½
1886.....	4.40	3.10	1.30	1901.....	4.90	4.03	.87
1887.....	4.62½	3.30	1.32½	1902.....	5.62	4.56	1.06
1888.....	4.91	3.93	.98	1903.....	5.17	4.91	.26
1889.....	5.02	4.30	.72	1904.....	6.00	5.51	.49
1890.....	5.55	5.05	.50	1905.....	6.27½	5.88	.39½
1891.....	5.02	5.05	.03	1906.....	6.20½	5.18	1.02½
1892.....	4.63	4.52	.11	1907.....	4.74	4.38	.36
1893.....	4.08	3.78	.30	1908.....	5.52	4.82	.70
1894.....	3.52	3.35	.17	1909.....	5.66	5.01	.65
1895.....	3.63	3.17	.46	1910.....	5.91	5.49	.42
1896.....	3.94	3.60	.34	1911.....	7.11	5.74	1.37
1897.....	4.12	3.80	.32	1912.....	5.80	4.94	.86
1898.....	4.57	4.44	.13	1913.....	5.30	5.07	.23
1899.....	5.75	5.40	.35	1914.....	14.44	14.34*	.10
				1915.....	13.75	6.52†	2.77
				1916.....			

* Exchange figured at \$4.75. †\$4.87 in 1916.

From American Metal Market.

Annual Production of Spelter in the United States from Domestic and Foreign Ores, in Short Tons.*

Year	From Foreign Ore			From Domestic Ore		
	Foreign Ore	Domestic Ore	Total	Foreign Ore	Domestic Ore	Total
1873.....	7,343	7,343	1883.....	36,872	36,872
1875.....	15,833	15,833	1884.....	38,544	38,544
1880(census).....	23,239	23,239	1885.....	40,688	40,688
1882.....	33,765	33,765	1886.....	42,641	42,641

Annual Production of Spelter in the United States from Domestic and Foreign Ores, in Short Tons.*—Continued

Year	From	From	Total	Year	From	From	Total
	Foreign	Domestic			Foreign	Domestic	
	Ore	Ore			Ore	Ore	
1887.....		50,340	50,340	1902.....		156,927	156,927
1888.....		55,903	55,903	1903.....		159,219	159,219
1889.....		53,860	53,860	1904.....		186,702	186,702
1890.....		63,683	63,683	1905.....		263,849	263,849
1891.....		80,873	80,873	1906.....	25,076	199,694	224,770
1892.....		87,260	87,260	1907.....	26,115	223,745	249,860
1893.....		78,832	78,832	1908.....	19,675	190,749	210,424
1894.....		75,328	75,328	1909.....	25,535	230,225	255,760
1895.....		89,686	89,686	1910.....	16,705	252,479	269,184
1896.....		81,499	81,499	1911.....	14,905	271,621	286,526
1897.....		99,980	99,980	1912.....	14,899	323,907	338,806
1898.....		115,399	115,399	1913.....	9,424	337,252	346,676
1899.....		129,051	129,051	1914.....	9,631	343,418	353,049
1900.....		123,886	123,886	1915.....	31,384	453,135	489,519
1901.....		140,822	140,822	1916.....	104,005	563,451	667,456

* U. S. Geological Survey.

Receipts of Zinc Ore

(In tons of 2,000 lbs. This table includes the receipts of ore by the smelters only, and does not include the production of ore exported or what was taken by the manufacturers of zinc oxide.)

State	1910(a)	1911(a)	1912	1913	1914	1915	1916
Arizona.....	7,568	6,395	11,987	9,347	6,357	14,718	17,243
Arkansas.....	190	860	1,567	1,500	1,737	7,017	12,854
California.....	(d)	3,754	6,639	6,796	8,827	27,445	41,291
Colorado.....	77,065	158,528	212,423	220,166	164,739	148,359	194,418
Idaho.....	10,248	9,667	19,482	31,835	57,001	78,767	104,575
Kentucky.....	179	575	947	441	434	1,863	2,460
Missouri-Kansas.	289,913	268,500	289,177	280,000	247,724	278,099	369,397
Montana.....	33,514	56,593	34,034	91,257	125,663	200,528	233,645
Nevada.....	4,915	5,666	20,654	22,313	20,447	24,949	51,670
New Mexico....	15,959	10,184	25,889	14,593	15,369	37,042	35,734
Oklahoma.....	1,640	8,750	4,325	23,500	26,247	25,231	42,799
Tennessee.....	2,775	3,439	6,635	8,297	18,708	38,527	43,309
Utah.....	27,318	19,933	24,539	27,073	20,322	21,535	43,240
Wisconsin(b)....	51,333	71,565	90,762	89,662	74,311	90,128	91,561
Others.....	46,905	44,896	56,099	57,241	57,936	122,490	111,273
Totals.....	569,572	669,305	805,109	884,021	845,821	1,116,698	1,395,469
Mexico.....	29,198	28,596	29,436	19,965	16,414	49,171	142,687
Canada.....	11,795	2,356	9,707	6,012	10,532	14,000	31,877
Australia.....						68,448	134,464
Other foreign....						9,211	73,394

Grand totals(c). 610,565 700,257 844,252 909,998(c) 872,767 1,257,528 1,777,891

(a) Smelters' receipts: reports missing from three small smelters. (b) Including Illinois and Iowa. (c) In addition to the ore reported from Canada and Mexico, zinc smelters received a few thousand tons from Europe and Eastern Siberia in 1913. - (d) Included in others.

Zinc ore imported in the 8 months of 1917 amounted to 156,589 tons, containing 60,082 tons of spelter, valued at \$3,583,391. There was also imported 171 tons of pig metal and 322 tons of dust. Of the ore imported, Australia sent 11,713 tons, Mexico 36,038 tons and Spain 6,083 tons.

Exports in this period were 7,332 tons of dross, worthy of \$1,239,941, and 137,420 tons of metal, valued at \$33,154,824. Of this, 50% went to England and 33% to France.

Production of Spelter

(In tons of 2,000 lb.)

By Ore Smelters Only.

States	1912	1913	1914	1915	1916	1917(b)
Arkansas.....					7,637	
Colorado.....	8,860	8,637	8,152	8,984	8,908	
Illinois.....	94,902	111,551	130,587	161,665	181,495	95,149
Missouri-Kansas....	111,761	85,157	53,424	111,052	154,396	42,359
Oklahoma.....	76,837	83,230	92,467	111,405	169,064	109,130
East and others(a)..	56,278	69,687	85,682	114,036	161,504	114,500
Totals.....	348,638	358,262	370,312	507,142	683,004	361,138

(a) Includes Anaconda and other electrolytic output in 1915 and 1916.

Figures are from *Engineering and Mining Journal*.

(b) 6 months.

World's Production of Spelter

The figures are those of Henry R. Merton & Co., except for the United States, where the figures of the U. S. Geological Survey have been used; in tons of 2,000 lbs.

	1885	1890	1895	1900	1905	1910	1912	1913
Belgium (c).....	145,324	154,145	192,791	131,437	160,496	190,233	220,678	217,928
Germany—West.....	(a)	(a)	(a)	57,607	(b)	(b)	(b)	(b)
Germany—East.....	89,177	97,972	104,854	112,789	217,356	251,046	298,794	313,075
Holland.....				7,666	15,176	23,121	26,380	26,811
Great Britain.....	27,314	32,642	33,034	33,409	56,140	69,531	63,086	65,197
France and Spain.....	16,628	20,428	25,642	46,429	55,524	65,191	79,543	78,289
Austria and Italy.....	6,283	7,991	9,357	7,812	10,315	14,666	21,609	23,228
Poland.....	6,621	4,054	5,555	6,580	8,422	9,514	9,659	8,339
Norway.....							8,959	10,237
Total, Europe.....	290,247	317,232	371,233	403,729	523,429	622,302	728,708	742,854
United States*.....	40,688	63,683	89,685	123,885	203,349	269,184	338,306	346,676
Australia (c).....						560	2,531	4,105
World's Total.....	330,935	380,915	460,918	527,614	727,278	893,046	1,070,045	1,093,635

(a) Included with Belgium. (b) Included with East Germany. * Includes spelter made from Mexican ore. Figures for 1914, 1915 and 1916 are not available. (c) Belgium produces very little spelter from its own ore, and the metal credited that country came from Australia in the form of concentrate. Some of the German total also came from Australia.

World's Consumption of Spelter, by Countries, 1907-1913, in Short Tons

(Stocks disregarded except in the United States.)

	1907	1908	1909	1910	1911	1912	1913
Austria-Hungary..	34,171	35,925	36,155	37,258	47,950	51,588	44,533
Belgium.....	60,627	74,936	71,209	84,326	81,240	85,098	84,216
France.....	76,720	85,956	73,744	62,059	90,389	90,389	89,286
Germany.....	192,792	198,580	207,343	196,320	241,734	248,890	255,734
Great Britain.....	154,653	152,627	171,408	195,989	193,674	204,146	214,508
Holland.....	4,189	4,189	4,409	4,409	4,409	4,409	4,409
Italy.....	7,496	9,257	9,039	8,929	11,133	11,795	12,015

World's Consumption of Spelter, by Countries, 1907-1913, in Short Tons—Continued

	1907	1908	1909	1910	1911	1912	1913
Russia.....	19,290	19,946	20,282	27,447	31,856	30,754	36,767
Spain.....	5,180	5,512	4,960	4,630	5,291	5,181	6,508
Other countries...	13,228	11,020	9,921	13,668	19,621	21,715	23,038
United States.....	226,969	214,167	270,730	245,884	280,059	340,341	295,370
Total.....	795,315	812,115	879,200	880,919	1,007,356	1,094,315	1,066,319

Figures for 1914, 1915, and 1916 are not available.

Consumption of Primary Spelter in United States, in Short Tons

Supply:	1913	1914	1915	1916	1917*
Stock, January 1:					
In bonded warehouses.....	48	.....	111	32	.....
At smelters.....	4,474	40,659	19,984	14,221	17,598
Production:					
From domestic ore.....	337,252	343,418	458,135	563,451	311,539
From foreign ore.....	9,424	9,631	31,384	104,005	49,599
Imports.....	6,100	880	904	684	136
Total available.....	357,298	394,588	510,518	682,393	378,872
Withdrawn:					
Exports, foreign, from warehouse..	6,027	5,580	12,776	43,230	30,691
Exports, foreign, under drawback..	7,459	4,961	255	.....	.....
Exports, domestic.....	7,783	64,807	118,603	163,137	93,600
Stock, December 31:					
In warehouses.....	.....	111	32	90	.....
At smelters.....	40,659	19,984	14,221	17,508	33,147
Total withdrawn.....	61,928	95,463	145,887	223,965	157,438
Apparent consumption.....	295,370	299,125	365,438	458,428	221,434

* First half (U. S. G. S.).

Summarizing the spelter situation for 1916, W. R. Ingalls stated in the *Engineering and Mining Journal* of July 7, 1917, that: (1) the United States production was 683,000 tons; (2) exports were 192,000 tons; (3) domestic consumption was about 450,000 tons; (4) use for galvanizing was more and for brass-making was less than was estimated in 1916; and (5) although stock in smelters' hands increased only 2,000 tons, there was really a large increase in stock, which was unavailable owing to delays in transit, and did not become released until 1917.

A feature of 1916 and 1917 was the starting of electrolytic zinc treatment plants, not only in United States, but in Australia and Canada. At present the following are in operation:

Company	Situation	Daily spelter capacity, tons
American Smelting & Refining.....	Murray, Utah.....	Experimental
Anaconda Copper Mining.....	Great Falls, Montana.....	200
Bully Hill Copper Co.....	Bully Hill, California.....	Experimental
Consolidated Mining & Smelting.....	Trail, B. C.....	20
Electrolytic Zinc Co. of Australia.....	Tasmania.....	20
Electrolytic Zinc.....	Baltimore, Md.....	10

Company	Situation	Daily spelter capacity, tons
Judge Mining & Smelting.....	Park City, Utah.....	15
Mammoth Copper.....	Kennett, California.....	25
River Smelting & Refining.....	Keokuk, Iowa.....	10
Western Metals.....	Georgetown, Colorado.....	100

During 1916, 10,229 tons of spelter was made from ore by the new process; and in 1917 the capacity of all domestic plants was rated at 85,000 tons per annum.

Active Zinc Smelters in the United States, and Capacity in 1916

(Includes plants working on ore alone, on ore and drosses, and on drosses alone.)

Arkansas

Operating Company	Location	Retorts at Close of 1915	Retorts at Close of 1916	Planned
Fort Smith Spelter Co.....	Fort Smith.....	.....	2,560	.....
Arkansas Zinc & Smelting Corp.....	Van Buren.....	.....	2,400	.....
Athletic Mining & Smelting Co.....	Fort Smith.....	2,400

Colorado

United States Zinc Co.....	Pueblo.....	2,208	1,984	264
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Illinois

American Zinc Co. of Illinois†.....	Hillsboro.....	4,000	4,864
Collinsville Zinc Co.....	Collinsville.....	1,792	2,304
Granby Mining & Smelting Co.†.....	E. St. Louis.....	3,220	4,820	.....
Hegeler Zinc Co.†.....	Danville.....	3,600	5,400	.....
Illinois Zinc Co.†.....	Peru.....	4,640	4,640	800
Matthiesson & Hegeler Zinc Co.†.....	La Salle.....	6,168	6,168	.....
Missouri Zinc Co.....	Beckemeyer.....	352	352	.....
Mineral Point Zinc Co.†.....	Depue.....	9,068	9,068	.....
National Zinc Co.†.....	Springfield.....	3,200	4,480	.....
Robert Lanyon Zinc & Acid Co†.....	Hillsboro.....	1,840	3,200	.....
Sandoval Zinc Co.....	Sandoval.....	672	672	.....

Kansas

American Spelter Co.....	Pittsburgh.....	896	992	.....
American Zinc, Lead & Smelting Co.....	Caney.....	6,080	6,080	.....
American Zinc, Lead & Smelting Co.....	Dearing.....	4,480	4,480	.....
Chanute Spelter Co.....	Chanute.....	1,280	1,280	.....
Cherokee Smelting Co.....	Bruce.....	896	896	.....
Edgar Zinc Co.....	Cherryvale.....	4,800	4,800	.....
Granby Mining & Smelting Co.....	Neodesha.....	3,760	3,760	.....
Iola Zinc Co.....	Concreto.....	660	1,320	.....
Joplin Ore & Spelter Corporation.....	Pittsburgh.....	1,444	1,792	.....
Lanyon Smelting Co.....	Pittsburgh.....	448	448	.....
Owen Zinc Co.....	Caney.....	1,280	1,280	640
Pittsburgh Zinc Co.....	Pittsburgh.....	910	910	.....
Prime Western Spelter Co.†.....	Gas.....	4,868	4,868	.....
United States Smelting Co.....	Altoona.....	3,960	4,600	.....
United States Smelting Co.....	Iola.....	3,440	3,440	.....

Active zinc Smelters in the United States, and Capacity in 1916—Continued
 Kansas—Continued

Operating Company	Location	Retorts at Close of 1915	Retorts at Close of 1916	Planned
United States Smelting Co.	La Harpe	1,924	1,924	.....
Weir Smelting Co.	Weir	.....	288	.....

Missouri

Edgar Zinc Co.	St. Louis	2,000	2,000	.....
Missouri Zinc Smelting Co.	Rich Hill	.....	448	.....
Nevada Smelting Co.	Nevada	672	672	.....

Oklahoma

Bartlesville Zinc Co.	Bartlesville	5,184	6,336	.....
Bartlesville Zinc Co.	Blackwell	.....	9,600	.....
Bartlesville Zinc Co.	Collinsville	10,752	13,440	.....
Bartlesville Zinc Co. (Lanyon-Starr plant)	Bartlesville	3,456	3,456	.....
Eagle-Picher Lead Co.	Henryetta	.....	4,000	.....
Henryetta Spelter Co.	Henryetta	.....	3,000	.....
J. B. Kirk Gas & Smelting Co.	Checotah	.....	2,560	2,560
Kusa Spelter Co.	Kusa	3,720	7,720	.....
La Harpe Spelter Co.	Kusa	.....	4,000	.....
National Zinc Co.	Bartlesville	4,970	4,970	.....
Oklahoma Spelter Co.	Kusa	.....	1,600	.....
Quinton Spelter Co.	Quinton	.....	1,344	1,344
Tulsa Fuel & Manufacturing Co.	Collinsville	6,232	6,232	.....
United States Smelting Co.	Checotah	.....	5,120	.....
United States Zinc Co.	Sand Springs	5,680	8,000	.....
Western Spelter Co.	Henryetta	.....	2,400	.....

Pennsylvania

American Steel & Wire Co.†	Donora	3,648	9,120	.....
American Zinc & Chemical Co.†	Langeloth	3,648	7,296	.....
New Jersey Zinc Co. (of Penna.)	Palmerton	6,720	7,200	.....

West Virginia

Clarksburg Zinc Co.	Clarksburg	3,648	3,648	.....
Grasselli Chemical Co.†	Clarksburg	5,760	5,760	.....
Grasselli Chemical Co.†	Meadowbrook	8,592	8,592	.....
United Zinc Smelting Corporation†	Moundsville	6,912

Total for all States	156,568	219,418	13,632
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Plants with special retorts:

Eastern Zinc Refining Co.	Brooklyn, N. Y.	8	16
John Finn Metal Works	San Francisco, Cal.	2	1
M. M. S. Metal Co.	Buffalo, N. Y.	.....	21	.....
Michael Hayman & Co.	Buffalo, N. Y.	12	12	.....
Trenton Smelting & Refining Co.	Trenton, N. J.	96	96	.....
William Cramp & Sons Ship & Engine Building Co.	Philadelphia, Pa.	32	32

† Has acid plant.

140	171	17
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CHAPTER VI

RESUMÉ OF THE COPPER INDUSTRY

In this chapter, the essential, vital facts concerning the copper industry, both of the United States and of all countries of the world are presented in a series of tables, giving price and production with trade statistics, covering imports, exports, and consumption. A list of copper smelting plants and refineries and their capacities and outputs, and of copper stocks, is supplemented by the figures for the Michigan field, and the porphyry coppers.

The figures presented are mainly those of the Mineral Statistics Division of the U. S. Geological Survey, but the prices given are those reported by the Eng. & Mng. Journal, for the excellent reason that all ore sales are settled upon these figures, and no other journal or organization has access to reports of sales, made by the four or five greatest selling agencies, handling 95% of the North American output.

Figures for 1916 are summarized in the accompanying tables. The first gives the reported sales of electrolytic copper, the second of Lake copper; while the third gives comparative figures over the period of the last 12 years. Referring to the table of electrolytic sales, it appears that upward of 1,200,000,000 lb. of copper realized an average of 25.71c per lb. This accounts for a very large proportion of the copper produced and sold in 1916. Indeed, we may say that it accounts for all of it, for it may be assumed reasonably that the Anaconda production of upward of 300,000,000 lb., together with the other unreported copper that is sold through its agency, probably realized about the same price as was got for the Inspiration copper, namely, 25.39c.; while unreported copper sold through the American Smelting & Refining Co. undoubtedly realized about the same as was got for the copper of the Hayden-Stone-Jackling companies; taking account, moreover, of the large amount of copper that is sold to consumers on the quotational average, we may assume that the entire production—about 2,300,000,000 lb.—of American refiners in 1916 was sold at an average of about 25.71c. That figure is, if anything, too high, for without any doubt it includes in many cases prices that were gross; that is, including amounts that producers had to pay out for freight in delivering to their customers or allowances that they had to make for bills discounted.

Reports of the Michigan companies show the sale of 257,000,000 lb. of copper at an average of 25.02c per lb. Their reports represent practically all the Michigan production.

The average realized for all the copper sold in 1916 was far below the quotational average. This is explained by the fact that in 1916 the conditions were, in general, those of a rising market. Copper was sold by the producers in large blocks, after which the market, continuing to rise, was made on relatively small transactions. The difference between the sales average and the quotational average in 1916 is, therefore, the difference between a quantitative and an arithmetical average.

The same condition is reflected in the wide range of price received by the several companies. These averages ranged from 23.18c in the case of Shattuck Arizona to 27.35c in the case of United Verde. The low prices were due to the early sale of large quantities of copper at times when the market was

relatively low. The highest prices were realized by those companies that did not adopt the policy of selling all their output ahead, but reserved all or a considerable proportion of it and followed the market upward. The concerns that did that realized approximately the quotational average.

COPPER SALES IN 1916 BY ELECTROLYTIC PRODUCERS

Company	Pounds	Proceeds	Av. Price
Braden.....	42,153,270	\$12,648,111	26.350c (e)
Calumet & Arizona.....	74,898,788	18,498,503	24.698c (d)
Chino.....	72,319,508	19,139,269	26.465c (b)
Inspiration.....	120,772,637	30,667,796	25.393c (c)
Miami.....	53,433,863	13,072,440	24.465c (c)
Kennecott.....	108,372,783	28,042,396	25.340c (e)
Nevada Consolidated.....	90,735,287	23,436,637	25.830c (a)
North Butte.....	21,505,584	5,009,726	23.295c (f)
Phelps, Dodge & Co.....	247,303,587	60,539,918	24.480c (d)
Old Dominion.....	17,654,643	4,734,276	26.810c (b)
Ray Consolidated.....	74,983,540	20,038,448	26.724c (b)
Shattuck Arizona.....	18,161,763	4,209,897	23.18 c (g)
U. S. Smelting, Refining and Mining.....	28,888,093	7,886,583	27.297c (b)
United Verde.....	58,299,573	15,946,145	27.352c (c)
Utah Copper.....	187,531,824	49,019,308	26.139c (b)
Total.....	1,217,014,743	\$312,889,453	25.710
<i>E. & M. J. average.....</i>			27.202

(a) f. o. b., Atlantic Seaboard. (b) Probably price delivered; not stated in report. (c) Price delivered. (d) Sold and delivered in 1916; net price f. o. b., New York. (e) Net price. (f) Probably gross price. (g) Average for copper delivered.

COPPER SALES IN 1916 BY LAKE COMPANIES

Company	Pounds	Proceeds	Av. Price
Ahmeek Mining Co.....	24,142,158	\$6,210,245	25.72c
Allouez Mining Co.....	10,219,290	2,586,011	25.30c
Baltic Mining Co.....	12,425,804	3,141,243	25.28c
Calumet & Hecla Mining Co.....	76,762,240	19,559,019	25.48c
Centennial Copper Mining Co.....	2,367,400	592,269	25.02c
Champion Copper Co.....	33,601,136	8,494,367	25.28c
Franklin Mining Co.....	3,116,566	792,623	25.43c
Isle Royale Copper Co.....	12,412,111	3,209,537	25.86c
LaSalle Copper Co.....	1,380,352	354,409	25.68c
Mass Cons. Mining Co.....	4,752,588	1,248,780	26.27c
Mohawk Mining Co.....	18,468,100	3,496,860	25.28c
Osceola Mining Co.....	19,586,501	5,040,013	25.73c
Quincy Mining Co.....	21,065,612	5,374,715	25.50c
Superior Copper Co.....	3,034,656	748,732	24.67c
Trimountain Mining Co.....	8,720,558	2,204,557	25.28c
Victoria Copper Mining Co.....	1,127,193	293,297	26.02c
White Pine Copper Co.....	4,207,449	1,062,802	25.26c
Total.....	257,339,714	\$64,409,479	25.024c

The following table (from the Eng. & Mng. Journal) gives the essential figures of the Copper Industry for the past twelve years. The column headed "Pounds reported" represents the sales of the eight largest producers aggre-

gating 40% of the United States production, so that the prices given may be considered as representative of the entire industry.

Production, Sale and Price for Copper for 12 Years (✓)

Year	Total Production	Pounds Reported	Average Realized, Cents	Quotational Average, Cents
1905.....	219,000,000	82,372,955	15.597	15.099
1906.....	224,071,000	113,411,645	19.146	19.616
1907.....	220,317,041	66,316,025	18.043	20.661
1908.....	222,267,444	125,949,248	13.348	13.424
1909.....	226,602,134	136,005,773	13.211	13.335
1910.....	221,400,864	126,710,763	12.960	13.039
1911.....	216,412,867	135,329,098	12.657	12.634
1912.....	1,228,333,298	552,155,308	15.841	16.341
1913.....	1,406,448,665	658,533,402	15.222	15.269
1914.....	1,342,634,206	566,687,750	13.458	13.602
1915.....	1,411,652,418	619,832,987	17.299	17.275
1916.....	2,300,000,000	1,217,014,743*	25.710	27.202

* 15 producers.

The 1914 price is an average for nine months. No quotations in August, September and October. The bulk of the copper sold in 1914 was disposed of before and after those months. So the nine month's basis is approximately correct.

For the first half of 1917, copper production of chief North and South American mines totaled about 1,085,815,000 lb. Up to 1912 the figures represent Michigan copper production and sales, and later figures represent electrolytic copper only. The figures for "pounds reported" and "average realized" do not include the United Metals Selling Co. (Anaconda), but John D. Ryan has stated that in the 10 years ending with 1913 his companies sold 5,560,000,000 lbs. of copper at an average of 14.82c, delivered to the buyers in Europe and America. This would be equivalent to 14.62 to 14.67c, net cash, New York. During the same 10-year period, Phelps, Dodge & Co. reported an average of 14.56c per lb., net cash, New York, actually realized. The arithmetical mean of the quotational averages for electrolytic copper in this period is 15.06c.

The figures for each company for 1915, a year of violent fluctuation with war demands and unusual conditions of delivery, are given below.

Copper Sales in 1915

Company	Pounds	Proceeds	Av. Price
Chino.....	64,887,788	\$11,303,957	17.42c (a)
Miami.....	41,907,754	7,262,884	17.331c (b)
Nevada Consolidated.....	62,726,651	11,069,671	17.647c (a)
North Butte.....	19,725,510	3,294,752	16.703c (c)
Phelps, Dodge & Co.....	194,925,668	31,342,098	16.079c (d)
Ray Consolidated.....	60,338,936	10,470,274	17.352c (a)
U. S. Smelting, Refining and Mining.....	26,923,674	4,895,532	18.183c (e)
Utah Copper Co.....	148,397,006	26,235,331	17.679c (a)
Total.....	619,832,987	.....	17.299
E. & M. J. average.....	.....	.....	17.275

(a) Probably figured on copper produced and sold in 1915 but partly delivered and paid for in 1916. Whether gross price or net price not stated. (b) Gross price. (c) Produced and delivered in 1915. Whether gross price or net price not stated. (d) Produced and delivered in 1915. Net price. (e) Average of sales. Whether gross price or net price not stated.

Commenting editorially on these figures, the E. & M. Journal says that it is uncertain whether the price given is gross, including freight to delivery point of the refined copper or is net, and it is probable that the figures given do not represent the same thing. The Phelps-Dodge report 16.079c, realized from copper produced, sold and delivered, while others include copper sold, but not delivered and paid until 1916. A further discrepancy between the prices shown in the above table is due to differences in reported sales. Steadily rising prices were accompanied by increased production, partly sold in 1915, but not delivered and paid for until 1916, is by some companies all included in 1915 figures; thus the North Butte Co. delivered 19,725,510 lbs. @ 16.703c per pound but sold 27,805,869 lbs. @ 18.114c.

The Utah, Nevada, Chino and Ray report an "aggregate 396,950,381 lbs. @ 17.524c. All this copper was sold by the American Smelting and Refining Co., which reported a production of 551,798,000 lbs. valued at 16.13c. The returns of other companies selling through that agency were more in line with the latter figure than the former. In 1914 there was no such discrepancy, for the matter of carry-over does not make so great a difference when the prices over the turn of the year is not very different, as often is the case. The Hayden-Jackling companies in 1914 reported 275,938,710 lbs. of copper sold at an average of 13.313c, while the American Smelting and Refining Co. reported a production of 529,686,000 lbs., valued at 13.46c."

Two noteworthy features of these figures are the realization of a lower average for Lake copper than for electrolytic and the relatively slight variation among the prices received by the Lake producers.

COPPER-SMELTING WORKS OF NORTH AMERICA

Company	Situation of Works	Blast Furnaces	Annual Capacity	Reverb. Furnaces	Annual Capacity	Convt's	Ann'l Capacity in Ore*
American Sm. & Ref. Co.	Aguaascalientes, Mex.	10	800,000	..	.....	4	↑
American Sm. & Ref. Co.	Perth Amboy, N. J.	1	90,000	..	.....	2	↑
American Sm. & Ref. Co.	Omaha, Neb.	..	.....	..	.....	2	↑
American Sm. & Ref. Co.	El Paso, Tex.	3	300,000	3	435,000	3	↑
American Sm. & Ref. Co.	Matehuala, S.L.P., Mex.	3	325,000	..	.....	..	↑
American Sm. & Ref. Co.	Hayden, Ariz.	..	.....	2	290,000	3	↑
American Sm. Sec Co.	Garfield, Utah	4	800,000	6	875,000	6	↑
American Sm. Sec Co.	Tacoma, Wash.	2	375,000	1	.....	7	↑
American Sm. Sec Co.	Valerdefia, Dgo., Mex.	3	250,000	..	.....	..	↑
Anaconda C. Mg. Co.	Anaconda, Mont.	3	1,750,000	9	1,750,000	7	105,000
Anaconda C. Mg. Co.	Great Falls, Mont.	2	280,000	2	330,000	2	49,000
Arizona Cop. Co.	Clifton, Ariz.	..	.....	3	300,000	3	.....
Balakala Cons. Cop. Co.††	Coram, Calif.	3	630,000	1	52,500	2	.....
Compagnie du Boleo.	Santa Rosalia, Mex.	8	650,000	..	.....	..	.....
Brit. Col. Cop. Co.	Greenwood, B. C.	3	912,500	..	.....	2	.....
Calumet & Ariz. Mining Co.	Douglas, Ariz.	2	649,500	4	486,500	6	33,500
Canadian Copper Co.	Copperhill, Ont.	7	1,020,000	2	300,000	5	43,200
Cananea Cons. Cop. Co.	Cananea, Son.	8	868,000	2	153,000	6	35,000
Cerro de Pasco Copper Co.	La Fundician, Peru.	4	438,000	6	.....	..	.....
Cons. Ariz. Sm. Co.	Humboldt, Ariz.	..	.....	2	150,000	2	10,000
Cons. Mg. & Smg. Co.	Trail, B. C.	5	450,000	..	.....	2†	.....
Copper Queen Cons C. Co.	Douglas, Ariz.	10	1,225,000	3	275,000	7	34,160
Detroit Copper Mng. Co.	Morenci, Ariz.	1	132,857	..	.....	3	7,578
Ducktown Sulph. C. & I. Co.	Isabella, Tenn.	2	171,500	..	.....	..	.....
East Butte Cop. Mng. Co.	Butte, Mont.	2	350,000	..	.....	3	5,000
Granby Con. M., S. & P. Co.	Grand Forks, B. C.	8	1,440,000	..	.....	4	7,000
Granby Con. M., S. & P. Co.	Anox, B. C.	4	1,080,000	..	.....	3	28,000
International Smg. Co.	Tooele, Utah.	..	.....	5	525,000	5	14,000
International Smg. Co.	Miami, Ariz.	..	.....	3	420,000	5	7,000
Mt. Lyell M. & R. Co.	Queenstown, Tasmania	3	.....	..	.....	3	.....
Mt. Morgan G. M. Co.	Mt. Morgan, Queensland.	2	.....	..	.....	3	.....
Mammoth Cop. Mng. Co.	Kennett, Calif.	5	730,000	..	.....	2	28,500

COPPER-SMELTING WORKS OF NORTH AMERICA—Continued

Company	Situation of Works	Blast Furnaces	Annual Capacity	Reverb. Furnaces	Annual Capacity	Con- v'rs	Ann'l Capacity in Ore*
Mason Valley Mines Co.††	Thompson, Nev.	2	800,000	..	..	2	22,000
Massipi Copper Co.††	Concepcion del Oro, Zac., Mex.	4	250,000	..	..	..	..
Mond Nickel Co.	Coniston, Ont.	3	630,000	..	..	3	70,000
Mountain Cop. Co.	Martinez, Calif.	..	..	3	125,000	2	..
Nevada Cons. Cop. Co.	McGill, Nev.	1	175,000	5	900,000	4	40,000
Nichols Copper Co.	Laurel Hill, N. Y.	2	94,500	..	..	2	..
Norfolk Smelting Co.	West Norfolk, Va.	1	140,000	..	..	2	4,200
Old Domin. C. M. & S. Co.	Globe, Ariz.	5	562,500	..	..	1	6,062
Orford Wks., Int. Nickel Co.	Constable Hook, N. J.	2	94,500	..	..	3	..
Penn Mining Co.	Campo Seco, Calif.	1	50,000	2‡	96,000	..	..
Pioneer Smelting Co.	Corwin, Ariz.	1	60,000	..	..	..	..
Santa Fe G. & Cop. Co.	San Pedro, N. M.	1	45,000	..	..	..	..
Shannon Copper Co.	Clifton, Ariz.	3	500,000	..	..	2	8,000
Swansea C. G. & C. M. Co.††	Bouse, Ariz.	1	190,000	..	..	2	..
Tennessee Copper Co.	Copperhill, Tenn.	7	1,000,000	..	..	4	15,000
Tezuitlan C. M. & S. Co.††	Tezuitlan, Puebla, Mex.	2	350,000	..	..	3	..
Cia. Metal de Torreón.	Torreón, Coah., Mex.	2	175,000	..	..	2	..
Tyce Copper Co.††	Ladysmith, B. C.	2	175,000	..	..	..	..
U. S. Metals Refining Co.	Chrome, N. J.	2	200,000	..	..	2	†
U. S. Smelting Co.††	Midvale, Utah.	6	670,000	1	40,000	4	36,000
United Verde Copper Co.	Clarkdale, Ariz.	4	720,000	3	324,000	5	54,000
Wanakah Mining Co.	Ouray, Colo.	2	105,000	..	..	..	..
Western Sm. & P. Co.‡	Cooke, Mont.	1	..	..	..	..	..

* Raw ore smelted as flux. † Included in furnace tonnages. ‡ Under construction. § Penn. Min. Co. has 2 reverberatories, each with capacity of 48,000 tons per annum, but only one is run at a time. ** No raw ore charged. †† Not in operation, but being overhauled during 1917.

ELECTROLYTIC COPPER REFINERIES OF THE UNITED STATES

Name	Location	Capacity in Pounds	
		1915	1916
Nichols Copper Co.	Laurel Hill, N. Y.	400,000,000	450,000,000
Raritan Copper Works	Perth Amboy, N. J.	400,000,000	480,000,000
Baltimore Copper Smelting & Rolling Co.	Canton, Md.	354,000,000	600,000,000
American Smelting & Refining Co.	Perth Amboy, N. J.	240,000,000	240,000,000
U. S. Metals Refining Co.	Chrome, N. J.	200,000,000	250,000,000
Balbach Smelting & Refining Co.	Newark, N. J.	48,000,000	48,000,000
Anaconda Copper Mining Co. (old)	Great Falls, Mont.	65,000,000	65,000,000
Anaconda Copper Mining Co. (new)	Great Falls, Mont.	..	180,000,000
Tacoma Smelting Co.	Tacoma, Wash.	120,000,000	130,000,000
Calumet & Hecla Mining Co.	Calumet, Mich.	65,000,000	65,000,000
Consolidated Mining & Smelting Co.	Trail, B. C.	..	13,000,000
Tottenville Copper Co.	Tottenville, N. Y.	..	100,000,000
Total	..	1,892,000,000	2,601,000,000

† All of the figures were officially furnished.
(Engineering and Mining Journal)

GRADES OF COPPER ✓

LAKE.—Copper from the native copper mines of the Lake Superior district. The standard range of conductivity is 99.5%.

ELECTROLYTIC.—Copper refined by the electrolytic process and running 99.93% upwards for cathodes. Conductivity to 108%.

CASTING.—Copper analyzing 99 to 99.75% made from ore and scrap. Used for casting purposes.

BEST SELECTED.—British copper averaging 99.75% fine. Largely used in the British brass trades.

TOUGH.—British copper largely used for casting, rolling and drawing. Runs about 99.25%.

CHILE BARS.—Copper smelted in CHILE running 95 to 99% pure and in some cases carrying bullion.

STANDARD.—Practically anything running from 96% upwards, dealt in on London Metal Exchange.

MATTE.—A semi metallic compound made from ores and usually running from 25 to 55% copper. An intermediate product between the ore and the finished copper.

DESCRIPTION OF COPPER ✓

WIRE BARS.—About 3" to 4" square and 3' to 7' long. Average weight 135 to 175 lbs. Used for wire drawing.

INGOTS.—Average weight about 18 to 20 lbs. Notched. Used for casting.

INGOT BARS.—Notched bars for casting. Weight about 55 to 60 lbs.

CAKES.—Weight 100 lbs. and upward. Used for rolling.

ANODES.—About 2' by 3', 1½" thick, weighing 250 lbs. Crude copper used by electrolytic refiners.

CATHODES.—About 2' by 3' but thicker at the top than the bottom. Refined copper from the electrolytic tanks which is run down to wire bars, etc.—From American Metal Market.

BRANDS OF COPPER IN UNITED STATES

Lake Superior

	Refined at:	Branded
Adventure	Hancock, Mich.	Adv. C. Co.
Atlantic	Houghton, Mich.	A.
Calumet & Hecla	Hubbell, Mich.	C. & H. M. Co.
Centennial	Hancock, Mich.	C. C. M. Co.
Copper Range	Houghton, Mich.	C. R.
Franklin	Hancock, Mich.	F. M. Co.
Isle Royale	Dollar Bay, Mich.	I. R. C. Co.
Mass.	Hancock, Mich.	Mass.
Michigan	Houghton, Mich.	M. C.
Mohawk	Houghton, Mich.	M. M.
Osceola	Dollar Bay, Mich.	T. O.
Quincy	Hancock, Mich.	Q. M. Co.
Tamarack	Dollar Bay, Mich.	T. O.
Victoria	Hubbell, Mich.	V. C.
Winona	Hubbell, Mich.	W. A.
Wolverine	Houghton, Mich.	W.

Electrolytic

	Refined at:	Branded
American S. & R. Co.	Perth Amboy, N. J.	P. A.
Balbach S. & R. Co.	Newark, N. J.	Bb.
Baltimore Copper Works	Baltimore, Md.	B. E. R.
Boston & Montana Co.	Great Falls, Mont.	B. & M.
Chicago Copper Ref. Co.	Blue Island, Ill.	C. C. R.
Copper Queen	Laurel Hill, L. I.	C. * Q.
Miami	Laurel Hill, L. I.	A. L. S.
Nichols Copper Co.	Laurel Hill, L. I.	L. N. S.
Orford Copper Co.	Chrome, N. J.	O. E. C.
Raritan Copper Works	Perth Amboy, N. J.	N. E. C.
U. S. Metals Ref. Co.	Chrome, N. J.	D. R. W.
United Metals Selling Co.	Laurel Hill, L. I.	R. M. C.

BRANDS OF COPPER IN UNITED STATES—Continued

Casting

	Refined at:	Branded
Balbach S. & R. Co.	Newark, N. J.	N. B. C.
Boston & Montana Co.	Great Falls, Mont.	M. A.
Chicago Copper Ref. Co.	Blue Island, Ill.	C. C. R.
Duquesne Reduction Co.	Pittsburgh, Pa.	D. E. C.
Nichols Copper Co.	Laurel Hill, L. I.	C. N. C.
Phelps, Dodge & Co.	Laurel Hill, L. I.	P. D. Co.
Tottenville Copper Co.	Tottenville, N. Y.	C. T. C.
U. S. Metals Ref. Co.	Chrome, N. J.	D. S.
White & Bro., Inc.	Philadelphia, Pa.	W. B.

Above table from *American Metal Market*.

PRICE TABLES

Monthly Average Price of Copper

Month	New York Electrolytic				London Standard					
	1913	1914	1915	1916	1917	1913	1914	1915	1916	1917
January	16.488	14.223	13.641	24.008	28.073	71.741	64.304	60.756	88.083	131.921
February	14.971	14.491	14.394	26.440	31.750	65.519	65.259	63.494	102.667	137.895
March	14.713	14.131	14.787	26.310	31.480	65.329	64.276	66.152	107.714	136.750
April	15.291	14.211	16.811	27.895	27.935	68.111	64.747	75.096	124.319	133.842
May	15.436	13.996	18.506	28.625	28.788	68.807	63.182	77.800	135.457	130.000
June	14.672	13.603	19.477	26.601	29.962	67.140	61.336	82.574	112.432	130.000
July	14.190	13.223	18.796	23.865	26.620	64.166	60.540	76.011	95.119	128.499
August	15.400	*	16.941	26.120	26.380	69.200	*	68.673	110.283	122.391
September	16.328	*	17.502	26.855	25.073	73.125	*	68.915	113.905	117.500
October	16.337	*	17.686	27.192	23.500†	73.383	*	72.601	122.750	.....
November	15.182	11.739	18.627	30.625	23.500	68.285	53.227	77.744	134.659	.....
December	14.224	12.801	20.133	31.890	23.500	65.223	56.841	80.773	145.316	.....
Year	15.269	.....	17.375	27.202	27.180	68.335	.....	72.532	116.059	.....

New York, cents per pound. London, pounds sterling per long ton of standard copper. * No quotations.

† On Sept. 21, 1917, the Federal Government fixed copper prices at 23.50c per lb. for itself and the public during the duration of the War.

In explanation of the prices given in the *Engineering and Mining Journal*, the following quotation from that magazine is of interest:

"On any given day copper is apt to be sold at a range of price even when the market is stationary, such range exhibiting the competition among sellers and the shopping among buyers; also there are differences in price according to conditions of sale. In periods of activity there are, moreover, changes in price between the beginning and end of a day. In quoting figures in this annual review we have reference to what we have in our weekly market reports during the year computed as the daily average price. Quotations are reduced in terms of net cash, New York. Copper for domestic delivery is commonly sold on "regular terms." "Regular terms" in the sale of copper means that the seller delivers the copper to the buyer, paying the freight on it, and allows him 30 days after his receipt of the copper in which to make payment, or if he chooses to pay cash, the bill is discounted at the rate of ½%. To arrive at the difference between a sale upon these terms and a cash sale f.o.b. refinery, which is regarded as being f.o.b. New York, the interest on the value of the copper while in transit is commonly reckoned. This is a matter of 10 days. When copper sells at 18¼c, regular terms, the equivalent net price is therefore about 18.03c, there being 0.09125c discount, 0.1c freight and 0.0304c loss of interest, a total of 0.22c. The freight rate is naturally a variable, being less to some nearby factories and more to some of the more remote ones. About 10c per 100 lbs. is regarded as being an average transportation cost."

In discussing the copper producing mines of America it is worth while remembering that a very large part of the silver production of the United States and a respectable part of the gold output come from our copper mines. In the last year, several copper companies have also become zinc producers. The new metallurgy has made the recovery of the latter metal profitable in ores formerly worthless because of the presence of zinc. Thus the copper mines around Kennett, Calif. yielded 315,549 tons copper ore in 1915 with a value of \$17.97 per ton, made up as follows: gold, \$1.51 per ton; silver, \$1.26 per ton; copper, \$11.96 per ton; zinc, \$3.24 per ton. A perusal of statements of several companies at Butte, in another part of this volume will show the advance made along this line.

HIGH, LOW AND AVERAGE PRICES OF LAKE COPPER ✓

Year		Highest		Lowest		Average
		Price	Month	Price	Month	
1860	Prices per cts. per lb.	24.000	January	19.750	December	22.875
1861	.....	27.000	December	17.500	July	22.250
1862	.....	32.875	November	20.750	May	21.875
1863	.....	38.750	December	29.000	July	33.875
✓ 1864	Highest.....	55.000	July	39.000	January	47.000
1865	.....	50.500	January	28.000	July	39.250
1866	.....	42.000	January	26.500	November	34.250
1867	.....	29.250	January	21.500	December	25.375
1868	.....	24.500	December	21.500	January	23.000
1869	.....	27.000	February	19.500	December	24.250
1870	.....	23.375	November	19.000	March	21.188
1871	.....	27.000	December	21.250	April	24.125
1872	.....	44.000	April	27.125	January	35.563
1873	.....	35.000	January	21.000	November	28.000
1874	.....	25.000	January	19.000	August	22.000
1875	.....	23.875	September	21.500	January	22.688
1876	.....	23.250	January	18.750	August	21.000
1877	.....	20.500	February	17.500	December	19.000
1878	.....	17.625	January	15.500	October	16.563
1879	.....	21.750	November	15.500	January	18.625
1880	.....	25.000	January	17.875	June	21.438
1881	.....	20.375	December	16.000	July	18.188
1882	.....	20.375	January	17.875	April	19.125
1883	.....	18.125	January	14.875	November	16.600
1884	.....	15.000	December	11.000	December	13.000
1885	.....	11.875	February	9.800	May	10.838
1886	.....	12.125	December	10.000	May	11.063
1887	.....	17.750	December	9.950	May	13.850
1888	.....	17.600	November	15.850	January	16.775
1889	.....	17.500	January	11.000	September	13.490
1890	.....	17.250	July	14.000	March	15.600
1891	.....	15.000	January	10.250	December	12.760
1892	.....	12.375	December	10.500	February	11.560
✓ 1893	.....	12.500	January	9.600	August	10.750
✓ 1894	Lowest.....	10.250	January	9.000	June	9.250
1895	.....	12.250	August	9.375	April	10.730
1896	.....	12.000	June	9.750	January	10.980
1897	.....	12.000	January	10.750	November	11.360
1898	.....	13.250	December	11.000	January	12.050
1899	.....	19.375	April	13.250	January	17.760

HIGH, LOW AND AVERAGE PRICES OF LAKE COPPER—Continued

Year	Highest		Lowest		Average
	Price	Month	Price	Month	
1900	17.250	April	16.000	February	16.650
1901	17.000	January	13.000	December	16.720
1902	13.500	February	11.000	January	12.160
1903	15.375	March	12.000	December	13.720
1904	15.375	November	12.250	February	13.010
1905	18.875	December	15.000	May	15.890
1906	24.000	December	17.875	February	19.616
1907	26.250	March	12.500	October	20.004
1908	14.750	December	12.500	February	13.500
1909	14.750	January	12.500	March	13.480
1910	14.125	January	12.500	July	13.125
1911	14.250	December	12.250	June	12.779
1912	18.000	October	14.250	January	16.695
1913	17.250	October	14.500	July	16.695
1914	14.491	February	11.739	November	13.602*
1915	20.133	December	13.641	January	17.275
1916	33.07½	December	24.100	January	28.170

* 9 months. No quotations in Aug., Sept., Oct., 1914.

HIGH AND LOW MONTHLY PRICES OF LAKE COPPER

Year	January		February		March		April		May		June	
	High	Low	High	Low	High	Low	High	Low	High	Low	High	Low
1860	24	23½	24	23¾	23¾	23	23½	23	23¼	22¾	22½	21¾
1861	20	19	19½	19	19¾	19¾	19¾	19	19¾	19¼	19	18
1862	28	27	28	25	25	23	23	21½	21½	20¾	23	20¾
1863	35	31	37	35	37	31	31	30	30½	30	30½	30
1864	41¼	39	42	41¼	42½	41½	44	42½	44	43	49	44
1865	50½	46	46	44	44½	34	35	34	34	30	30½	28½
1866	42	38	38	35½	35½	29½	30	28½	31	29	33	31
1867	29¼	27	27¾	27½	27½	24	24½	23½	24¼	24	24½	24
1868	23½	21½	24	22½	24	23¼	24¼	24¼	24¼	24	24	23½
1869	26¼	23¼	27	26	26¾	24	24	23¼	24¼	23¾	23¾	22
1870	22	21½	21¼	20⅞	20¾	19	19¾	19¼	19½	19	20⅞	19
1871	22¾	22	22¾	21¾	22	21½	21¼	21¼	21¾	21¾	21½	21¼
1872	28½	27½	28½	28¼	30½	28½	44	30½	42	36	34¼	33
1873	35	32½	35	34	35	34½	34½	30½	33½	32	31½	29½
1874	25	24½	25	24⅞	24¾	24	25	24¾	25	24½	24¾	24¼
1875	23½	21½	22¾	21¾	21¾	21½	21¼	21½	23¼	22½	23	23
1876	23¼	23	22½	22½	22¼	22	22½	22	22½	21	21	19¾
1877	19½	19	20½	19½	19¼	19	19½	19¼	19¼	19	19½	19
1878	17⅞	17¼	17½	17⅞	17⅞	16⅞	17	16⅞	16¾	16¼	16⅞	16¼
1879	16	15½	15½	15½	15¾	15¾	16	15¾	16¼	16	16¼	16½
1880	25	21½	24½	24	24	22½	22½	21	21	18	18½	17½
1881	19¾	19½	19½	19½	19½	19	19	18¾	18¾	18¼	18¼	16¾
1882	20⅞	20¼	20	19	19¼	18⅞	18⅞	17⅞	18¼	18	18¼	18
1883	18¾	18	17¾	17¾	17¾	17½	16	15¾	16	15½	15½	15
1884	15	14⅞	15	14⅞	15	14⅞	15	14½	14¼	14⅞	14¼	14
1885	11½	10¾	11½	10½	11½	10½	11¼	10½	11½	10½	11½	11
1886	11½	11½	11½	11½	11½	11½	11½	11½	11½	10	10½	10
1887	12	11½	11½	10½	10½	10½	10	10	10	9½	10½	10
1888	17¼	15½	16½	16	16⅞	15½	16½	16	16¾	16½	16½	16½

HIGH AND LOW MONTHLY PRICES OF LAKE COPPER—Continued

Year	January		February		March		April		May		June	
	High	Low	High	Low	High	Low	High	Low	High	Low	High	Low
1889	17½	16½	16¾	16½	15¾	15	16	15½	12½	12	12¼	12
1890	14½	14¼	14¼	14¼	14¼	14	14½	14¾	15¼	14½	16¾	15¼
1891	15	14½	14¾	14¼	14¼	13¾	13¾	13½	13¾	12¾	13	12¾
1892	11	10¾	10¾	10½	12	10¾	12	11¾	12¼	12	11¾	11¾
1893	12½	12¼	12¼	12	12	11¾	11½	11¼	11½	11	11	10¾
1894	10¼	10	10	9¾	9¾	9¾	9½	9¾	9¾	9¾	9½	9
1895	10	9¾	9¾	9½	9½	9¼	9¼	9¾	10¾	9¾	10¾	10½
1896	10½	9¾	11¼	10	11¼	10¾	11	10¾	11½	10¾	11¼	11½
1897	12	11½	12	11	11½	11½	11½	11	11½	10¾	11½	10¾
1898	11	10¾	11¾	11¾	12	11¾	12½	11¾	12½	12	11¾	11¼
1899	17	13¼	18½	17	18	17¼	19¾	18	19¼	18½	18½	17¾
1900	16½	16¼	16½	16	17	16¼	17¼	17	17¼	16½	16½	16¼
1901	17	17	17	17	17	17	17	17	17	17	17	17
1902	13	11	13½	12¼	12½	12¼	12½	12	12¾	12	12¾	12¼
1903	12¾	12¼	13½	12¾	15¾	13¾	15¾	14¾	15¼	14¾	15¼	14
1904	13	12½	12¾	12¼	13	12½	13¾	13	13¾	13	13¾	12½
1905	15¾	15½	15¾	15¾	15¾	15¾	15¾	15¾	15	15	15	15
1906	19	18½	18¾	17¾	18¾	18¼	18¾	18¾	18¾	18¾	18¾	18¾
1907	25¾	25	25¾	25¾	26¼	25¾	25¾	25¼	25¼	25½	24¾	24¾
1908	14¼	13¾	14½	12¾	13½	12½	13½	13	13½	12¾	13½	12¾
1909	14¾	14	14½	12¾	13¾	12½	13¾	13	13¾	13	13¾	13¼
1910	14¼	13¾	14	13¾	14	13¾	13¾	13	13¾	12¾	13½	12¾
1911	13¼	12¾	12¾	12¾	12¾	12¾	12½	12¼	12½	12¼	13	12¼
1912	14¾	14¼	14¾	14¾	15¼	14¾	16¼	16	17	16	17¾	16¾
1913	18	16½	16¾	15¼	15¼	15¾	15¾	15¾	16	15¾	16¾	14¾
1914	15½	14	15	15	15	15	.....	.....	.....	.....	.....	.....
1915	14¾	13	15	14½	16½	14¾	19	16	19½	18½	20½	18½
1916	25½	23	28½	25¼	28¼	26¼	30	27½	30¼	28	28½	26½

Year	July		August		September		October		November		December	
	High	Low	High	Low	High	Low	High	Low	High	Low	High	Low
1860	21¼	21½	21½	21½	22	21¼	22	21½	21½	20¼	20¼	19¾
1861	18	17½	19	17¾	20¼	19	20¼	20	22½	20¼	27	22½
1862	24½	22½	24½	24	27	24¼	32¾	27	32¾	30½	31½	30½
1863	32	29	31	29	32¼	31	34¼	32¼	38½	34½	38¾	38¾
1864	55	49	52½	50	52½	47½	48	47	49	47	50	48½
1865	30¼	28	32	30½	32¾	31½	33	32½	45½	33	45½	39¼
1866	33½	31	31	30	31½	30¾	31	30¾	30¾	26½	29	26½
1867	26	24	26¼	25¾	27¼	26¼	26¾	22¾	23	22¾	23	21¾
1868	24½	23½	24¼	24	24	23¾	24	23	24	22½	24½	24½
1869	22¼	21½	23½	21¾	23	22	22¾	22	22½	22	22	21¼
1870	20½	20¾	21¾	20¾	21½	20¾	21¾	21½	23¾	21¾	22½	22¼
1871	22¼	21½	23	22¾	22¾	22¾	23¾	23¼	24¼	23¼	27	24½
1872	34	33	35	32½	35¼	33	34¾	31¼	32¼	30¾	32½	30½
1873	29	26½	27½	27	27	25½	25½	24	24	21	25	23
1874	24¼	20	21	19	21¼	21	22¼	21¼	23¾	22¼	23¼	23¼
1875	23	22¾	23¾	23	23¾	23¾	23¼	23	23¼	23	23¾	23¾
1876	20	19½	19½	18¾	21	18¾	21¼	20½	20	20	20	19¾
1877	19¼	19	19	17¾	18½	17¾	18	17¾	17¾	17¾	17¾	17½
1878	16¼	16	16	16	16¼	16	16	15½	15¾	15½	16	15¾
1879	16½	16	16¾	16	17	16¼	21½	18	21¼	21	21½	21
1880	18½	18½	19½	19	18¾	18¾	18¾	18¾	18¾	18¾	19½	18¾

HIGH AND LOW MONTHLY PRICES OF LAKE COPPER—Continued

Year	July		August		September		October		November		December	
	High	Low	High	Low	High	Low	High	Low	High	Low	High	Low
1881	16½	16	16½	16½	18½	16½	18½	18	19	18½	20½	19½
1882	18½	18½	18½	18½	18½	18	18½	18	18½	18	18	17½
1883	15½	15	15	15	15½	15½	15½	15½	15	14½	15	14½
1884	14½	13½	14	13½	13½	13	13½	12½	13	12½	12½	11
1885	11½	10½	11½	11	11½	10½	11½	10½	11½	10½	11½	11½
1886	10½	10	10½	10	11½	10½	11½	11½	12	11½	12½	11½
1887	10½	10½	10½	10½	11	10½	12½	10½	14½	11½	17½	14½
1888	16½	16½	17	16½	17½	16½	17½	17½	17½	17½	17½	17½
1889	12	12	12	12	12	11	11	11	13½	11½	14½	14
1890	17½	16½	17½	17	17	17	16½	16½	16½	16½	16	15
1891	12½	12½	12½	12	12½	12½	12½	11½	11½	11	11½	10½
1892	11½	11½	11½	11½	11½	11½	11½	11½	12	11½	12½	12½
1893	10½	10½	10½	9½	9½	9½	9½	9½	10½	9½	10½	10½
1894	9½	9	9½	9	9½	9½	9½	9½	9½	9½	10	9½
1895	11½	10½	12½	11½	12½	12	12	11½	11½	11	11	10
1896	11½	11	11½	10½	10½	10½	10½	10½	11½	10½	11½	11½
1897	11½	11	11½	11	11½	11½	11½	11	11	10½	11	10½
1898	11½	11½	12½	11½	12½	12½	12½	11½	12½	11½	12½	12½
1899	18½	18½	18½	18½	18½	18½	18½	17	17½	17	17	16½
1900	16½	16½	16½	16½	16½	16½	16½	16½	17	16½	17	16½
1901	17	16½	16½	16½	16½	16½	16½	16½	16½	16½	17	13
1902	12½	12	12½	11½	12½	11½	12½	11½	12	11½	12	11½
1903	14½	13	13½	13	13½	13½	14	13	13½	12½	12½	12
1904	12½	12½	12½	12½	13	12½	14	12½	15½	13½	15½	14½
1905	15½	15	16½	15½	16½	16½	16½	16½	17½	16½	18½	17½
1906	18½	18½	18½	18½	20½	18½	22½	20½	22½	22½	24	22½
1907	24½	22½	22½	20	19½	15½	15½	12½	14½	13½	14	13½
1908	13½	12½	14	13½	14	13½	14	13½	14½	14	14½	14½
1909	13½	13½	13½	13½	13½	13	13½	12½	14	13½	14½	13½
1910	12½	12½	13	12½	13	12½	13½	12½	13½	13	13	12½
1911	13	12½	13	12½	12½	12½	12½	12½	13½	12½	14½	12½
1912	17½	17	17½	17½	17½	17½	18	17½	17½	17½	17½	17½
1913	15½	14½	16½	15½	17	16½	17½	16½	17½	15	15½	15
1914					12½	12	12½	11½	12½	11½	13½	12½
1915	20	18½	18½	16½	18½	17½	18½	17½	20	18	23	19½
1916	26½	25	27½	25½	28½	27	28½	28½	34	28½	35	31

AVERAGE AMERICAN AND ENGLISH PRICES

The following table of average annual prices of copper in England and the United States is based upon the New York price for Lake copper and the London price for Standard copper. The two last columns give the American prices in cents and fractions and the English equivalent in sterling. English prices are for long tons of 2,240 pounds, and American prices for pounds avoirdupois, the last column, giving English equivalent of the American prices, being figured in long tons.

Year	English Prices									American Prices						
	Lowest			Highest			Fluctuation			Average						
	£	s.	d.	£	s.	d.	£	s.	d.	£	s.	d.	Cents	£	s.	d.
1880	54	10	0	74	0	0	10	10	0	62	14	7	21.438	99	0	8
1881	57	0	0	72	10	0	15	10	0	61	16	9	18.188	84	0	8

AVERAGE AMERICAN AND ENGLISH PRICES—Continued

Year	English Prices												American Prices					
	Lowest			Highest			Fluctuation			Average			Average			Average		
	£	s.	d.	£	s.	d.	£	s.	d.	£	s.	d.	Cents	£	s.	d.		
1882	63	0	0	71	10	0	8	10	0	66	10	5	19.125	88	6	11		
1883	57	0	0	67	10	0	9	10	0	62	17	11	16.500	76	3	7		
1884	47	5	0	58	0	0	10	15	0	53	17	6	13.000	59	19	0		
1885	38	10	0	61	12	6	23	2	6	43	11	0	10.838	49	6	5		
1886	38	10	0	43	15	0	5	5	0	40	1	8	11.063	51	1	10		
1887	38	7	6	85	5	0	46	17	6	46	0	6	13.850	64	0	0		
1888	73	0	0	105	0	0	32	0	0	81	11	3	16.775	77	10	1		
1889	35	0	0	80	0	0	45	0	0	49	14	8	13.490	62	6	5		
1890	46	10	0	61	12	6	15	2	6	54	5	3	15.600	72	1	10		
1891	44	1	3	56	10	0	12	8	9	51	9	4	12.760	58	19	1		
1892	43	10	0	47	18	9	4	8	9	45	13	2	11.560	53	8	4		
1893	40	12	6	46	16	3	6	3	9	43	15	6	10.750	49	13	10		
1894	37	17	6	43	0	0	5	2	6	40	7	4	9.520	44	0	0		
1895	38	13	9	47	8	9	8	15	0	42	19	7	10.730	49	12	0		
1896	40	10	0	50	8	9	9	18	9	46	18	1	10.790	50	14	9		
1897	47	0	0	51	15	0	4	15	0	49	2	6	11.980	52	10	2		
1898	49	5	0	57	8	9	8	3	9	51	16	7	12.360	55	13	10		
1899	58	1	3	79	2	6	21	1	3	73	13	9	17.760	82	0	11		
1900	70	14	2	78	7	1	7	12	11	73	12	6	16.650	76	18	2		
1901	47	0	0	72	17	6	25	17	6	66	19	8	16.720	77	4	7		
1902	47	10	0	56	15	0	9	5	0	52	11	5	12.160	56	3	8		
1903	53	13	7	64	0	7	10	7	0	58	3	2	13.720	63	4	8		
1904	55	5	0	68	7	6	13	2	6	62	12	2	13.010	60	2	6		
1905	64	2	6	80	12	6	16	10	0	69	9	2	15.890	73	7	9		
1906	78	5	1	105	4	3	26	19	2	87	8	6	19.610	90	4	10		
1907	55	0	0	113	0	0	58	0	0	84	0	0	20.004	91	19	10		
1908	57	7	8	63	8	10	6	1	2	59	18	3	13.500	62	7	0		
1909	54	15	0	63	17	6	9	1	6	58	15	3	13.480	62	5	10		
1910	52	15	0	62	0	0	9	5	0	57	7	6	13.125	60	12	6		
1911	54	0	8	62	1	3	8	0	7	56	1	9	12.779	59	0	4		
1912	62	15	2	78	15	3	16	0	1	73	1	2	16.695	77	2	1		
1913	61	15	0	77	2	6	15	7	6	68	5	9	15.70	70	10	4		
1914	49	0	0	66	15	0	17	15	0	59	11	3	13.61	62	17	3		
1915	57	2	6	86	7	6	29	5	0	72	10	7	17.64	81	9	6		
1916	88	2	11	145	9	2	57	6	3	116	1	3	27.202	125	12	7		

English prices for 1913, 1914, 1915 and 1916 are from *American Metal Market*.

CONVERSION TABLE FOR AMERICAN AND ENGLISH PRICES

This table gives the equivalents, in American and English currency, for the prices of copper, from £35 to £150 per ton. The American basis of weight is the avoirdupois pound; the English basis is the long ton of 2,240 pounds avoirdupois. The rate of exchange is figured at £1=\$4.85:

Pounds Sterling and Cents		Pounds Sterling and Cents	
£35.....	7.58c.	£43.....	9.31c.
£36.....	7.80c.	£44.....	9.53c.
£37.....	8.01c.	£45.....	9.75c.
£38.....	8.23c.	£46.....	9.96c.
£39.....	8.45c.	£47.....	10.18c.
£40.....	8.66c.	£48.....	10.39c.
£41.....	8.88c.	£49.....	10.61c.
£42.....	9.10c.	£50.....	10.83c.
£51.....	11.04c.	£59.....	12.77c.
£52.....	11.26c.	£60.....	12.99c.
£53.....	11.48c.	£61.....	13.21c.
£54.....	11.69c.	£62.....	13.42c.
£55.....	11.91c.	£63.....	13.64c.
£56.....	12.12c.	£64.....	13.86c.
£57.....	12.34c.	£65.....	14.07c.
£58.....	12.56c.	£66.....	14.29c.

CONVERSION TABLE FOR AMERICAN AND ENGLISH PRICES
Continued

Pounds Sterling and Cents		Pounds Sterling and Cents	
£67.....14.51c.	£ 88.....19.05c.	£109.....23.60c.	£130.....28.14c.
£68.....14.72c.	£ 89.....19.27c.	£110.....23.82c.	£131.....28.36c.
£69.....14.94c.	£ 90.....19.49c.	£111.....24.03c.	£132.....28.58c.
£70.....15.16c.	£ 91.....19.70c.	£112.....24.25c.	£133.....28.80c.
£71.....15.37c.	£ 92.....19.92c.	£113.....24.47c.	£134.....29.01c.
£72.....15.59c.	£ 93.....20.14c.	£114.....24.68c.	£135.....29.23c.
£73.....15.81c.	£ 94.....20.35c.	£115.....24.90c.	£136.....29.45c.
£74.....16.02c.	£ 95.....20.57c.	£116.....25.12c.	£137.....29.66c.
£75.....16.24c.	£ 96.....20.79c.	£117.....25.33c.	£138.....29.88c.
£76.....16.46c.	£ 97.....21.00c.	£118.....25.55c.	£139.....30.10c.
£77.....16.67c.	£ 98.....21.22c.	£119.....25.77c.	£140.....30.31c.
£78.....16.89c.	£ 99.....21.43c.	£120.....25.98c.	£141.....30.53c.
£79.....17.10c.	£100.....21.65c.	£121.....26.20c.	£142.....30.75c.
£80.....17.32c.	£101.....21.87c.	£122.....26.41c.	£143.....30.96c.
£81.....17.54c.	£102.....22.08c.	£123.....26.63c.	£144.....31.18c.
£82.....17.75c.	£103.....22.30c.	£124.....27.85c.	£145.....31.39c.
£83.....17.97c.	£104.....22.52c.	£125.....27.06c.	£146.....31.61c.
£84.....18.19c.	£105.....22.73c.	£126.....27.28c.	£147.....33.83c.
£85.....18.40c.	£106.....22.95c.	£127.....27.50c.	£148.....34.04c.
£86.....18.62c.	£107.....23.16c.	£128.....27.71c.	£149.....34.26c.
£87.....8.184c.	£108.....23.38c.	£129.....27.93c.	£150.....34.48c.

PRODUCTION TABLES

PRODUCTION OF COPPER IN THE UNITED STATES
SINCE 1845 (U. S. G. S.)

Year	Production Pounds	Increase		Average Annual Increase, by Decades	
		Pounds	Per Cent	Pounds	Per Cent
1845.....	224,000	.....	.....
1846.....	336,000	112,000	50.1		
1847.....	672,000	336,000	100.0	246,400	50.0
1848.....	1,120,000	448,000	67.0		
1849.....	1,568,000	448,000	47.0		
1850.....	1,456,000	-112,000	-7.1		
1851.....	2,016,000	560,000	38.4		
1852.....	2,464,000	448,000	22.2		
1853.....	4,480,000	2,016,000	81.8		
1854.....	5,040,000	560,000	12.5		
1855.....	6,720,000	1,730,000	33.3	1,472,200	28.5
1856.....	8,960,000	2,240,000	33.3		
1857.....	10,752,000	1,792,000	20.0		
1858.....	12,320,000	1,568,000	14.6		
1859.....	14,112,000	1,792,000	14.5		
1860.....	16,128,000	2,016,000	14.3		
1861.....	16,800,000	672,000	4.1		
1862.....	21,160,000	4,360,000	26.0		
1863.....	19,040,000	-2,120,000	-10.0		
1864.....	17,920,000	-1,120,000	-5.9		
1865.....	19,040,000	1,120,000	6.3	1,209,600	6.2
1866.....	19,936,000	896,000	4.7		
1867.....	22,400,000	2,464,000	12.3		
1868.....	25,984,000	3,584,000	16.0		
1869.....	28,000,000	2,016,000	7.7		
1870.....	28,224,000	224,000	.8		

PRODUCTION OF COPPER IN THE UNITED STATES
SINCE 1845 (U. S. G. S.)—Continued

Year	Production, Pounds	Increase		Average Annual Increase, by Decades	
		Pounds	Per Cent	Pounds	Per Cent
1871	29,120,000	896,000	3.2		
1872	28,000,000	-1,120,000	-3.8		
1873	34,720,000	6,720,000	24.0		
1874	39,200,000	4,480,000	12.9		
1875	40,320,000	1,120,000	2.9	3,225,600	8.2
1876	42,560,000	2,240,000	5.6		
1877	47,040,000	4,480,000	10.0		
1878	48,160,000	1,120,000	2.4		
1879	51,520,000	3,360,000	7.0		
1880	60,480,000	8,960,000	17.4		
1881	71,680,000	11,200,000	18.5		
1882	90,646,232	18,966,232	26.5		
1883	115,526,053	24,879,821	27.4		
1884	144,946,653	29,420,600	25.5		
1885	165,875,766	20,929,113	14.4	18,928,949	14.8
1886	156,735,381	-9,140,385	-5.5		
1887	180,920,524	24,185,143	15.4		
1888	226,361,466	45,440,942	25.0		
1889	226,775,962	414,496	.2		
1890	259,763,092	32,987,130	14.5		
1891	284,121,764	24,358,672	9.4		
1892	344,998,679	60,876,915	21.4		
1893	329,354,396	-15,644,281	-4.5		
1894	354,188,374	24,833,976	7.5		
1895	380,613,404	26,425,030	7.4	34,635,407	9.4
1896	460,061,430	79,448,026	20.0		
1897	494,078,274	34,016,844	7.4		
1898	526,512,987	32,434,713	6.6		
1899	568,666,921	42,153,934	8.0		
1900	606,117,166	37,450,245	6.6		
1901	602,072,519	-4,044,647	-7		
1902	659,508,644	57,436,125	9.5		
1903	698,044,517	38,535,873	5.8		
1904	812,537,267	114,492,750	16.4		
1905	888,784,267	76,247,000	11.0	47,404,234	6.1
1906	917,805,632	15,897,839	1.7		
1907	868,996,401	-48,809,191	-5.3		
1908	942,570,721	73,074,230	8.4		
1909	1,092,951,624	150,380,903	15.9		
1910	1,080,159,509	-12,792,115	-1.2		
1911	1,097,232,749	17,073,240	1.6		
1912	1,243,268,720	146,035,971	13.3		
1913	1,224,484,098	-18,784,622	1.5		
1914	1,150,137,192	-74,346,906	6.1		
1915	1,388,009,527	237,872,335	20.7		
1916	1,927,850,548	539,741,021	28.0		
Total	23,323,474,177				

- Decrease.

The 1917 production will probably show a decrease of over 200,000,000 lb. due to labor troubles and other factors in the copper districts of the United States.

AMERICAN COPPER PRODUCTION. (Long Tons)

Year	United States			United States			
	Pro- duction	Pro- duction	Per Cent	Pro- duction	Pro- duction	Per Cent	
1850	650	572	88	1868	11,600	9,346	80
1852	1,100	792	72	1869	12,500	11,886	95
1854	2,250	1,819	81	1870	12,600	10,992	87
1855	3,000	2,593	86	1871	13,000	11,942	91
1856	4,000	3,666	91	1872	12,500	10,961	87
1857	4,800	4,255	88	1873	15,500	13,433	86
1858	5,500	4,088	74	1874	17,500	15,327	87
1859	6,300	3,985	63	1875	18,000	16,089	89
1860	7,200	5,388	74	1876	19,000	17,085	89
1861	7,500	6,713	89	1877	21,000	17,422	83
1862	9,000	6,065	67	1878	21,500	17,719	82
1863	8,500	5,797	68	1879	23,000	19,129	83
1864	8,000	5,576	69	1880	27,000	22,204	82
1865	8,500	6,410	75	1881	32,000	74,363	76
1866	8,900	6,138	69	1882	40,467	25,439	62
1867	10,000	7,824	78				

Year	United States			—Montana—		—Arizona—	
	Pro- duction	Pro- duction	Per Cent	Pro- duction	Per Cent	Pro- duction	Per Cent
1883	51,574	26,653	51	11,011	21	10,658	21
1884	64,708	30,961	47	19,256	30	11,935	18
1885	74,052	32,209	43	30,267	41	10,137	14
1886	70,430	36,124	51	25,362	36	6,990	10
1887	81,017	33,941	42	35,133	43	7,910	10
1888	101,054	38,604	38	43,704	43	14,195	14
1889	101,239	39,364	38	43,849	43	13,654	13
1890	115,966	45,273	39	50,437	43	15,534	13
1891	126,839	50,992	40	50,028	39	17,800	14
1892	154,018	54,999	36	72,860	47	17,160	11
1893	147,033	50,270	34	69,290	47	19,200	13
1894	158,120	51,031	32	81,729	52	19,873	13
1895	169,917	57,737	34	84,900	50	21,408	13
1896	205,384	63,418	31	99,071	48	32,560	16
1897	220,571	63,706	29	102,807	47	36,398	17
1898	235,050	66,056	28	92,041	39	49,624	21
1899	253,870	65,603	26	100,503	40	59,399	23
1900	269,111	63,461	24	120,865	45	52,820	20
1901	268,522	69,501	26	102,620	38	58,383	22
1902	294,297	76,050	26	128,975	44	53,546	18
1903	311,582	85,848	27	121,677	39	65,914	21
1904	362,739	93,001	26	133,176	38	85,179	23
1905	402,704	102,874	25	140,514	35	105,316	26
1906	409,414	102,514	25	131,563	32	117,216	29
1907	386,655	96,480	25	100,118	26	114,633	30
1908	420,953	99,408	23	112,724	27	129,251	30
1909	485,473	101,342	21	140,561	29	129,959	27

AMERICAN COPPER PRODUCTION. (Long Tons)—Continued

Year	United States	—Michigan—		—Montana—		—Arizona—	
	Pro- duction	Pro- duction	Per Cent	Pro- duction	Per Cent	Pro- duction	Per Cent
1910.....	484,935	99,019	21	126,374	26	132,701	28
1911.....	483,865	97,741	20	121,346	24	135,358	29
1912.....	554,835	96,701	18	137,844	25	160,858	30
1913.....	546,645	69,516	12	127,553	23	180,482	33
1914.....	513,454	70,540	14	105,717	21	170,736	33
1915.....	619,647	106,577	17	119,760	19	193,066	31
1916.....	860,650	111,400	13	157,200	18	310,200	36

To the above table should be added 103,700 tons for Utah, or 12% of the 1916 total; and 50,800 tons for Alaska, equal to 6%.

WORLD'S PRODUCTION OF COPPER (*)

(In Metric Tons)

Country	1912	1913	1914	1915	1916
United States.....	563,260	555,990	525,529	646,212	881,237
Mexico.....	73,617	58,323	36,337	30,969	55,128
Canada.....	34,213	34,880	34,027	47,202	47,985
Cuba.....	4,393	3,381	6,251	8,836	7,816
Australasia.....	†47,772	†47,325	†37,592	32,512	36,000
Peru.....	26,483	25,487	23,647	†32,440	41,625
Chile.....	39,204	39,434	40,876	47,142	64,636
Bolivia.....	4,681	†3,658	†1,306	**3,000	4,000
Japan.....	*62,486	†73,152	†72,938	†75,415	†81,280
Russia.....	†33,550	†34,316	†31,933	**34,918	**31,500
Germany.....	†24,303	†25,308	†30,480	**34,918	**45,000
Africa.....	†16,632	†22,870	†24,135	**27,327	**34,572
Spain and Portugal....	†59,873	†54,696	†37,099	**46,200	**42,000
Other countries.....	†29,555	†27,158	†25,176	**25,000	**25,000
Totals.....	1,020,022	1,005,978	923,888	1,082,059	1,396,779

* The statistics in this table are *Engineering and Mining Journal* figures. † As reported by Henry R. Merton & Co. ‡ As officially reported. § Privately communicated to *Engineering and Mining Journal* from Japan. ** Estimated. †† Communicated by L. Vogelstein & Co.

WORLD'S COPPER PRODUCTION FOR NINETEENTH CENTURY AND AFTER

(Long Tons)

Decade	Average Price of Rough Copper	Cents per Pound	World's Production of each Decade	Increase of Production over Previous Decades	Average Annual Production for each Decade	Increase of Average Annual Production
1801 to 1810.....	£160	30.31	91,000	.....	9,100	.....
1811 to 1820.....	130	28.14	96,000	5,000	9,600	500
1821 to 1830.....	161	21.87	135,000	39,000	13,500	3,900
1831 to 1840.....	94	20.35	218,400	83,400	21,840	8,340
1841 to 1850.....	83	17.97	291,000	72,600	29,100	7,260

WORLD'S COPPER PRODUCTION FOR NINETEENTH CENTURY AND AFTER—Continued

Decade	(Long Tons)		World's Increase of		Average Annual Production for each Decade	Increase of Average Annual Production
	Average Price of Rough Copper	Cents per Pound	Production of each Decade	Production over Previous Decades		
1851 to 1860.....	111	24.03	506,999	215,999	50,699	21,599
1861 to 1870.....	87	18.84	900,000	393,001	90,000	39,300
1871 to 1880.....	79	17.10	1,189,000	289,000	118,900	28,900
1881 to 1890.....	60	12.99	2,373,398	1,084,398	237,339	108,439
1891 to 1900.....	52	11.26	3,708,901	1,335,503	370,890	133,550
Totals and Averages. £ 96	.....	.....	9,507,298	.....	95,073	361,790
1901 to 1910.....	65.55	14.76	6,968,000	5,632,497	696,800	563,250
1911 to 1916.....	74.56	17.01	6,277,320	.....	.....	.....

U. S. COPPER SMELTERS' PRODUCTION. (In Pounds)

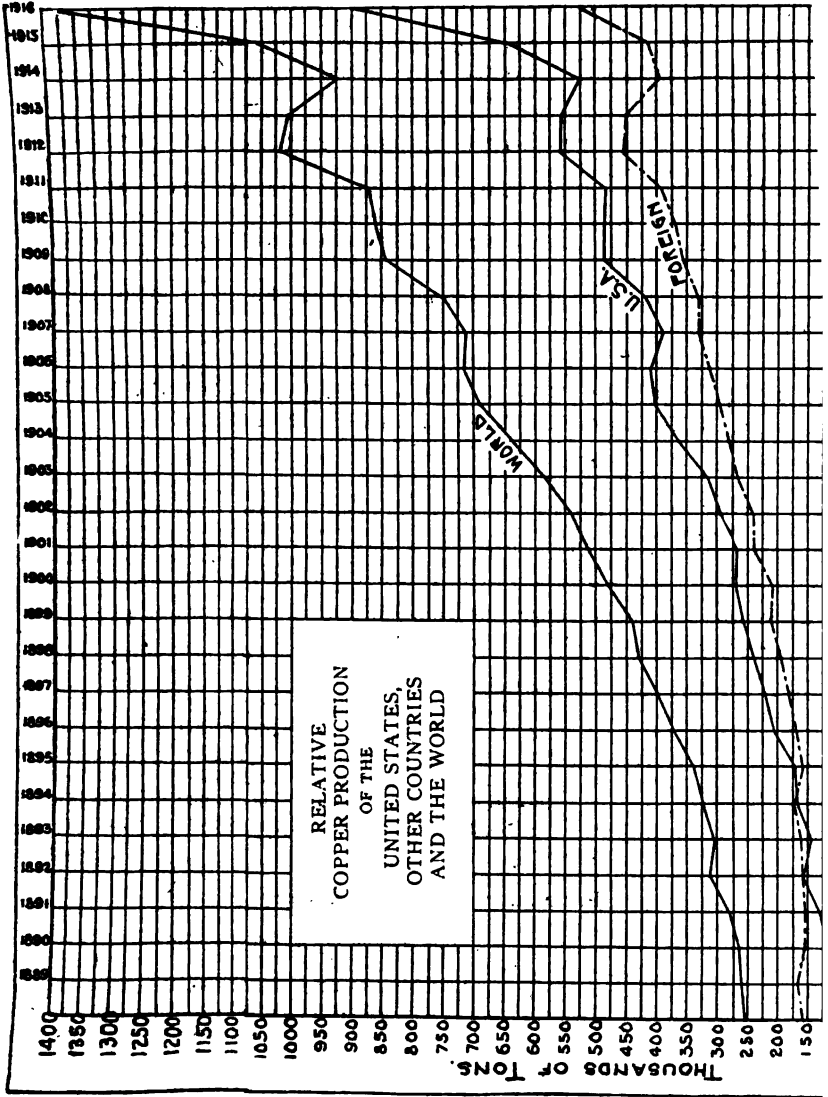
	N. American Ore	Foreign Ore	Scrap	To Foreign Refineries	Crude Imported	Total Crude
1916.....	1,928,000,000	73,391,517	37,380,759	38,423,577	171,391,347	2,431,068,910
1915.....	1,612,450,828	44,749,105	29,827,203	89,794,120	140,415,341	1,787,708,387
1914.....	1,327,488,479	50,101,308	20,894,559	36,765,920	131,125,076	1,492,843,502
1913.....	1,438,565,881	55,803,202	22,427,389	36,882,608	169,315,869	1,649,430,236
1912.....	1,489,176,562	53,701,307	11,949,348	45,735,673	144,480,144	1,663,471,688

Above statistics from *Engineering and Mining Journal*.

PRODUCTION OF COPPER IN THE UNITED STATES IN 1913-1916

(Smelter output, in pounds fine, U. S. G. S. figures.)

	1913	1914	1915	1916
Alaska.....	23,423,070	24,985,847	70,695,286	113,823,064
Arizona.....	404,278,809	382,449,922	432,467,060	694,847,307
California.....	32,492,265	29,784,173	37,658,444	43,400,876
Colorado.....	9,052,104	7,316,066	7,272,178	9,536,193
Georgia.....	.....	.....	.....	803,694
Idaho.....	8,711,490	5,875,205	6,217,728	7,248,799
Maryland.....	.....	12,248	15,426	126,965
Michigan.....	155,715,286	158,009,748	238,956,410	269,794,531
Missouri.....	576,204	53,519	306,406	377,575
Montana.....	285,719,918	236,805,845	268,263,040	352,139,768
Nevada.....	85,209,536	60,122,904	67,757,322	100,816,724
New Jersey.....	.....	.....	.....	4,119
New Mexico.....	50,196,881	64,204,703	62,817,234	79,863,435
North Carolina.....	180	19,712	33,383	5,961
Oregon.....	77,812	5,599	797,471	2,433,567
Pennsylvania.....	245,337	422,741	.....	904
Tennessee.....	19,489,654	18,661,112	18,205,308	14,556,278
Texas.....	39,008	34,272	38,971	86,463
Utah.....	148,057,450	160,589,660	175,177,695	232,335,960
Vermont.....	5,771	.....	23,995	324,400
Virginia.....	46,961	17,753	50,008	1,066,143



PRODUCTION OF COPPER IN THE UNITED STATES IN 1913-1916—Continued

(Smelter output, in pounds fine, U. S. G. S. figures.)

	1913	1914	1915	1916
Washington.....	732,742	683,602	903,661	2,473,481
Wyoming.....	362,235	17,082	351,871	1,784,351
Undistributed.....	51,385	65,479	.....	.....
	1,224,484,098	1,150,137,192	1,388,009,527	1,927,850,548
From imported ores and mattes.....	408,778,954	306,350,827	†246,498,925	462,000,000
Grand totals.....	1,633,262,052	1,456,488,019	1,634,508,452	2,389,850,548

† Production of primary and secondary copper by the regular refining plants.

PRODUCTION OF PRIMARY AND SECONDARY COPPER BY THE REGULAR REFINING PLANTS, IN POUNDS

Primary:	Electrolytic	Lake	Casting	Pig	Foreign	Totals
1911.....	823,507,764	218,185,236	22,977,534	36,600,269	323,604,223	1,423,875,026
1912.....	914,935,371	231,113,228	24,777,266	32,852,030	360,000,000	1,568,104,478
1913.....	1,022,497,601	155,715,286	22,606,040	36,004,986	378,243,869	1,615,067,782
1914.....	991,573,073	158,009,748	21,506,325	39,324,043	323,358,205	1,533,781,394
1915.....	1,114,345,342	236,757,062	21,555,129	15,047,990	246,498,925	1,634,204,448
1916.....	1,579,620,513	269,794,531	12,649,050	26,868,105	370,635,116	2,259,387,315

Secondary: includes copper of domestic and foreign origin.

	Electrolytic	Casting	Total Secondary	Total Output Prim. and Sec.
1911.....	19,093,622	8,803,105	27,896,727	1,461,771,753
1912.....	23,932,166	5,150,137	29,082,303	1,597,186,781
1913.....	14,862,577	22,360,182	37,222,759	1,652,290,541
1914.....	27,702,928	4,224,052	31,926,980	1,565,708,374
1915.....	38,156,789	21,417,901	59,574,690	1,693,779,138
1916.....	78,585,296	25,838,511	104,423,807	2,363,811,122

Production of Refined Copper

	Supplies	Production	Stock Dec. 31
1913.....	1,649,430,326	1,622,450,829	91,438,867
1914.....	1,492,843,502	1,533,781,394	162,566,683
1915.....	1,776,250,869	1,652,775,822	82,429,666
1916.....	2,341,816,981	2,259,387,315	128,055,229

COPPER PRODUCERS' STATISTICS

The monthly statistics of the Copper Producers' Association, which were suspended in August, 1914, at the outbreak of the War, have not been resumed. A summary of the statistics up to that time follows:

Production of Refined Copper

	Year	Monthly Average
1909	1,405,403,056	117,116,921
1910	1,452,122,120	121,010,177
1911	1,431,938,338	119,328,195
1912	1,581,920,287	131,826,690
1913	1,622,450,829	135,204,235
1914*	835,137,652	139,189,609

Domestic Deliveries

	Year	Monthly Average
1909	705,051,591	58,754,299
1910	749,426,542	62,452,212
1911	709,611,605	59,134,300
1912	819,665,948	68,305,495
1913	767,351,760	63,945,980
1914*	330,643,117	55,107,186

Export Deliveries

	Year	Monthly Average
1909	680,942,620	56,745,218
1910	722,431,494	60,202,624
1911	754,902,233	62,908,520
1912	746,396,452	62,199,705
1913	809,062,784	72,421,898
1914*	489,822,739	81,637,123

Surplus Stocks

	At Beginning of Year	Fluctuation
1909	122,357,266	
1910	141,766,111	+19,408,845
1911	122,030,195	-19,735,916
1912	89,454,695	-32,575,600
1913	105,312,582	+15,857,887
1914	91,438,867	-13,873,715
June 30, 1914	106,110,663	+14,671,796

* For six months ending June.

AMERICAN COPPER SUPPLY

The following table gives the figures of American copper supply, deliveries and stocks, in pounds, according to the statistics gathered by the American Copper Producers' Association:

1909	Stocks	Production	Deliveries	Changes
January	122,357,266	112,135,200	90,862,421	+ 21,772,779
February	144,130,045	103,700,817	74,546,614	+ 29,154,203
March	173,284,248	117,058,661	108,063,007	+ 8,995,654
April	182,279,902	113,574,292	112,656,121	+ 918,171
May	183,198,073	118,356,146	131,706,078	- 13,349,932
June	169,848,141	116,567,493	131,557,573	- 14,990,080
July	154,858,061	118,277,603	150,539,057	- 32,261,454
August	122,596,607	120,597,234	107,996,911	+ 12,600,323
September	135,196,930	118,023,139	102,182,932	+ 15,840,207
Adjustment		3,007,738	2,572,103	+ 435,635
October	151,472,772	124,657,709	122,620,855	+ 2,036,854
November	153,509,626	121,618,369	122,124,468	- 506,094
December	153,003,527	117,828,655	129,066,071	- 11,237,416
1910				
January	141,766,111	116,547,287	159,850,059	- 43,302,772
February	98,463,339	112,712,493	103,987,840	+ 8,724,653
March	107,187,992	120,067,467	103,430,585	+ 16,636,882
April	123,824,874	117,477,639	99,318,354	+ 18,159,285
May	141,984,159	123,242,476	104,800,662	+ 18,441,814
June	160,425,973	127,219,188	119,259,144	+ 7,960,044
July	168,386,017	118,370,003	116,115,342	+ 2,254,661
August	170,640,678	127,803,618	129,563,051	- 1,759,433
September	168,881,245	119,519,983	139,607,514	- 20,087,531
October	148,793,714	126,469,284	136,001,084	- 9,531,800
November	139,261,914	119,353,463	128,226,308	- 8,872,845
December	130,889,069	123,339,219	131,698,093	- 8,358,874

AMERICAN COPPER SUPPLY—Continued

1911	Stocks	Production	Deliveries	Changes
January.....	122,030,195	115,096,591	95,287,296	+ 20,409,295
February.....	142,439,490	109,828,297	95,630,017	+ 14,198,280
March.....	156,637,770	130,532,080	125,191,916	+ 5,370,164
April.....	162,007,934	118,085,223	114,537,249	+ 3,547,974
May.....	165,555,908	126,962,544	126,522,520	+ 440,024
June.....	165,996,932	124,554,312	133,616,080	- 8,561,768
July.....	157,434,169	112,167,934	131,863,240	- 19,695,306
August.....	137,738,858	125,493,667	129,791,024	- 4,297,357
September.....	133,441,501	115,588,950	108,135,595	+ 7,453,355
October.....	140,894,856	118,255,442	124,152,656	- 5,897,214
November.....	134,997,642	111,876,601	135,089,055	- 23,212,454
December.....	111,785,188	122,896,697	145,227,190	- 22,330,493
1912				
January.....	89,454,695	119,387,753	142,511,805	- 23,174,052
February.....	66,280,643	116,035,809	119,376,464	- 3,340,655
March.....	62,939,988	125,694,601	126,267,032	- 572,431
April.....	62,367,557	125,464,644	122,766,172	+ 2,698,472
May.....	65,066,029	126,737,836	142,188,222	- 15,450,386
June.....	49,615,643	122,315,240	127,595,879	- 5,280,639
July.....	44,335,004	137,161,129	131,215,712	+ 5,945,417
August.....	50,280,421	145,628,521	149,207,568	- 3,579,047
September.....	46,701,374	140,069,819	123,725,606	+ 16,364,213
October.....	63,065,587	145,405,453	131,726,076	+ 13,679,377
November.....	76,744,964	134,695,400	125,276,345	+ 9,419,095
December.....	86,164,059	143,354,042	124,205,519	+ 19,148,523
1913				
January.....	105,312,582	143,479,625	125,593,875	+ 17,885,750
February.....	123,198,332	130,948,881	131,845,015	- 896,134
March.....	122,302,198	136,251,849	154,284,777	- 18,032,928
April.....	104,269,270	135,333,402	164,053,564	- 28,720,162
May.....	75,549,108	141,319,416	149,394,299	- 8,074,883
June.....	67,474,225	121,860,853	136,520,470	- 14,569,619
July.....	52,904,606	138,074,602	137,384,263	+ 690,339
August.....	53,594,945	131,632,362	146,913,270	- 15,280,908
September.....	38,314,037	131,401,229	139,922,172	- 8,520,943
October.....	29,793,094	139,070,481	136,297,193	+ 3,773,288
November.....	32,556,382	134,087,708	118,724,661	+ 15,363,047
December.....	47,992,429	138,990,421	95,480,983	+ 43,509,438
1914				
January.....	91,438,867	131,770,274	135,912,456	- 4,142,182
February.....	87,296,685	122,561,007	131,485,840	- 8,924,833
March.....	78,371,852	145,651,982	159,414,515	- 13,762,533
April.....	64,609,319	151,500,531	145,772,849	+ 5,727,682
May.....	70,337,001	142,308,287	128,302,647	+ 14,005,640
June.....	84,342,641	141,345,571	119,577,549	+ 21,768,022
July†.....	106,110,663			

† Latest statistics published by the Copper Producers' Association.

AMERICAN COPPER SUPPLY (In Pounds)

Year	Domestic Production	Imports	Total Supply	Exports	Net Supply
1892.....	344,998,879	8,066,647	353,065,526	96,515,736	256,549,590
1893.....	329,354,398	11,045,297	340,399,695	188,984,128	151,415,567
1894.....	354,188,374	11,445,441	365,633,815	168,143,000	197,490,815
1895.....	380,613,404	14,616,223	395,229,627	136,528,390	258,701,237
1896.....	480,061,430	17,297,272	477,358,702	282,105,860	195,252,842
1897.....	494,078,274	28,578,420	522,656,694	288,662,340	233,994,354
1898.....	526,512,987	73,916,467	600,429,454	321,023,873	279,405,581
1899.....	568,666,921	95,722,340	664,389,261	252,876,480	411,512,781
1900.....	606,117,166	105,176,808	711,293,974	348,402,853	362,891,121
1901.....	602,072,519	137,826,406	739,898,925	222,137,911	517,761,014
1902.....	659,225,014	194,501,757	853,726,771	354,668,849	499,057,922
1903.....	729,943,131	168,707,995	898,651,126	310,729,524	587,921,602
1904.....	812,537,267	181,292,205	993,829,472	554,550,030	439,279,442
1905.....	902,057,843	210,724,685	1,112,782,528	534,907,619	577,874,909
1906.....	917,086,889	225,843,281	1,142,930,170	454,752,018	688,178,152
1907.....	865,818,368	238,031,320	1,103,849,688	506,924,401	594,925,287
1908.....	942,936,449	218,705,487	1,161,641,936	661,876,127	499,765,809
1909.....	1,087,453,906	325,456,533	1,412,910,437	682,846,726	730,063,711
1910.....	1,080,159,509	344,435,771	1,424,595,280	708,316,543	716,278,737
1911.....	1,097,232,749	334,607,538	1,431,840,287	786,553,208	645,287,079
1912.....	1,228,766,243	410,241,295	1,639,007,538	775,000,658	864,005,880
1913.....	1,224,484,098	408,778,954	1,633,263,052	926,241,092	707,021,960
1914.....	1,150,137,192	306,350,827	1,456,488,019	840,080,922	616,407,097
1915.....	1,388,009,527	246,498,925	1,634,508,452	681,953,301	952,555,151
1916.....	1,928,000,000	462,000,000	2,390,000,000	784,000,000	1,606,000,000

(a)

(b)

(a) Production by the regular refining plants in 1915; (b) refined copper exported; both figures are from the advance statement, U. S. G. S., of production of copper in 1915.

The following table, listing the largest copper consumers in the United States, compiled by the Boston News Bureau, is of value.

	Monthly lb.	Per annum lb.
American Brass Co.....	25,000,000	300,000,000
Buffalo Brass Co.....	12,000,000	144,000,000
Chase Rolling Mills.....	12,000,000	144,000,000
National Conduit & Cable Co.....	10,000,000	120,000,000
Detroit Copper & Brass Co.....	8,000,000	96,000,000
Scoville Manufacturing Co.....	8,000,000	96,000,000
Roebing Sons Co.....	6,000,000	72,000,000
Standard Underground Cable Co.....	6,000,000	72,000,000
Bridgeport Brass Co.....	6,000,000	72,000,000
Rome Brass & Copper Co.....	6,000,000	72,000,000
American Electrical Works & Phillips Insulating.....	6,000,000	72,000,000
Waclark Manufacturing Co.....	4,000,000	48,000,000
Baltimore Copper Smelting & Rolling Co.....	4,000,000	48,000,000
Seymour Mfg. Co.....	3,500,000	42,000,000
American Steel & Wire Co.....	2,500,000	30,000,000
Michigan Brass Co.....	2,000,000	24,000,000

	Monthly lb.	Per annum lb.
Plume & Atwood.....	1,500,000	18,000,000
Bristol Brass Co.....	1,250,000	15,000,000
Baltimore Tube Works.....	1,000,000	12,000,000
Taunton-New Bedford Copper Co.....	1,000,000	12,000,000
Randolph Clowse.....	1,000,000	12,000,000
C. G. Hussey Co.....	1,000,000	12,000,000
Stamford Rolling Mills.....	1,000,000	12,000,000
Hendricks Brothers.....	750,000	9,000,000
Miscellaneous.....	6,500,000	78,000,000
Total.....	136,000,000	1,632,000,000

From an obscure position, the Buffalo Brass Co. has forged rapidly ahead to a position second only to the American Brass Co. in the amount of copper used.

AMERICAN COPPER IMPORTS (In Pounds)

The following table, showing imports of copper, in various forms, into the United States, is summarized from the official figures of the United States Government. The Government statisticians have seen fit to vary the methods employed in presenting these figures, from time to time, but the present plan of giving contents in fine copper of imported ore and matte is preferable to the old plan of giving actual weight of imported ore and matte:

Year	Copper Contents Ore and Matte	Raw Copper	Old Copper	Total Fine Copper
1890.....	3,448,237	5,189	284,789	3,960,053
1891.....	8,391,554	2,556	134,407	11,472,436
1892.....	7,669,978	22,097	71,485	8,066,647
1893.....	7,256,015	554,348	59,375	11,045,297
1894.....	4,804,614	606,415	160,592	11,445,441
1895.....	5,300,000	7,979,322	1,336,901	14,616,223
1896.....	5,900,000	9,074,379	2,422,554	17,396,933
1897.....	12,000,000	12,646,552	1,780,390	28,923,098
1898.....	19,750,000	5,892,944	1,986,133	73,916,467
1899.....	23,800,000	64,282,583	6,678,145	95,722,340
1900.....	36,380,000	62,404,489	3,354,756	105,176,808
1901.....	64,000,000	71,001,713	2,818,757	137,826,406
1902.....	40,000,000	112,420,253	2,119,031	194,501,757
1903.....	32,000,000	133,472,398	3,235,597	168,707,995
1904.....	38,947,772	142,344,433	4,000,000	181,292,205
1905.....	50,105,300	156,358,243	4,561,142	210,724,685
1906.....	49,034,891	176,558,390	6,487,226	225,843,281
1907.....	59,718,787	192,901,267	.....	252,620,054
1908.....	56,481,343	162,224,144	.....	218,705,487
1909.....	81,087,393	240,713,722	.....	321,801,115
1910.....	85,224,975	259,210,796	.....	344,435,771
1911.....	68,626,778	265,980,760	.....	334,607,538
1912.....	104,871,703	305,369,592	.....	410,240,295
1913.....	108,710,105	300,068,849	.....	408,778,954
1914.....	104,801,324	201,549,503	.....	306,350,827
1915.....	114,331,441	201,367,008	.....	315,698,449
1916.....	174,787,854	287,548,126	.....	462,335,980
1917*.....	111,159,009	249,753,857	21,021,788	382,034,654

* 8 months.

AMERICAN COPPER EXPORTS

The United States Government estimates of exports of copper, including ingot and various forms of refined copper, matte, blister copper and ores, and manufactured products, are as follows: (Pounds avoirdupois.)

Year Ending—	Ore and Matte	Refined	Value
June 30, 1864.....	10,958,100	102,831	\$ 432,570
1865.....	22,519,700	1,572,382	1,544,870
1866.....	21,508,000	123,444	936,211
1867.....	8,773,100	4,637,867	791,901
1868.....	9,261,200	1,350,896	922,409
1869.....	12,141,800	1,134,360	592,698
1870.....	1,919,800	2,214,658	1,042,246
1871.....	5,444,500	581,650	915,431
1872.....	3,556,400	267,868	287,735
1873.....	4,525,200	38,958	259,076
1874.....	1,382,600	503,160	467,208
1875.....	5,130,500	5,123,470	1,815,266
1876.....	1,530,400	14,304,160	3,526,410
1877.....	2,143,200	13,461,553	3,023,394
1878.....	3,294,700	11,297,876	2,488,921
1879.....	2,307,000	17,207,739	2,933,205
1880.....	2,162,300	4,206,258	\$949,218
1881.....	995,800	4,865,407	876,395
1882.....	2,663,600	3,340,531	748,456
1883.....	11,292,300	8,221,363	2,348,004
1884.....	38,614,000	17,044,760	5,595,859
1885.....	43,230,000	44,731,858	10,187,024
Dec. 31, 1886.....	41,752,000	19,553,421	4,380,322
1887.....	50,128,000	12,471,398	4,114,456
1888.....	79,496,000	31,706,527	11,897,240
1889.....	81,850,000	16,813,410	10,209,722
1890.....	43,141,100	10,971,899	5,918,395
1891.....	67,212,000	69,279,024	15,703,543
1892.....	94,304,000	30,515,736	10,162,870
1893.....	83,504,000	138,984,128	13,935,497
1894.....	8,704,000	162,393,000	16,143,094
1895.....	27,648,000	121,328,390	14,938,309
1896.....	41,426,500	259,223,924	31,035,211
1897.....	18,128,000	277,255,742	32,755,053
1898.....	18,686,000	291,955,905	35,545,251
1899.....	7,454,000	246,826,331	43,485,654
1900.....	20,014,000	337,973,751	58,875,439
1901.....	24,602,592	194,249,828	36,071,448
1902.....	40,398,400	354,668,849	46,811,729
1903.....	27,582,840	310,729,524	44,365,155
1904.....	42,396,480	554,550,030	74,816,934
1905.....	84,421,320	534,907,619	86,408,731
1906.....	106,666,560	454,752,018	90,950,403
1907.....	222,075,840	508,929,401	106,875,174
1908.....	141,453,760	661,876,127	89,353,260
1909.....	134,131,200	682,846,726	88,770,074
1910.....	98,076,160	708,316,543	92,081,140
1911.....	129,729,600	786,558,208	98,319,125
1912.....	148,223,040	775,000,658	126,211,104

AMERICAN COPPER EXPORTS—Continued

Year Ending—	Ore and Matte	Refined	Value
Dec. 31, 1913	147,051,520	926,241,092	\$146,377,621
1914	97,504,960	840,080,922	117,533,145
1915	36,169,280	681,953,301	(a) 117,358,062
1916		784,103,644	
1917(b)	4,146,799	774,242,762	249,676,479

(a) Does not include value of ore, matte and regulus exported during last 6 months of 1915. (b) 8 months.

AMERICAN COPPER EXPORTS BY DESTINATIONS

(Pounds Avoirdupois)

Destination	1911	1912	1913	1914	1915	1916
Holland	220,693,649	152,818,177	178,940,289	126,001,150	4,018,841	5,853,306
Germany	190,428,008	252,156,012	307,150,761	176,698,948		
France	135,038,893	131,962,694	160,000,345	150,339,897	236,236,135	336,829,464
Great Britain	108,061,603	95,422,292	133,679,641	198,382,459	201,182,645	184,564,740
Italy	38,216,773	47,251,422	41,568,713	67,415,944	107,101,230	113,764,478
Austria-Hungary	44,200,202	38,558,151	34,648,205	26,989,548		
Canada	6,931,552	30,802,356	35,982,207	24,221,498	24,127,182	45,947,740
Russia	15,601,688	4,961,473	7,907,672	8,731,273	37,430,702	49,688,437
Belgium	5,125,004	7,674,273	7,102,120	5,429,717		
Miscellaneous, Europe	9,254,363	8,960,973	14,357,014	48,634,229	58,018,817	30,700,473
Miscellaneous	1,001,443	5,732,325	4,904,125	9,736,260	15,843,039	16,785,006
Totals	788,553,208	775,900,958	926,241,092	840,080,922	681,953,391	784,103,644

See above table for 1917.

OUR COPPER AND SPELTER EXPORTS

Copper has for years been an important factor in our foreign trade, but neither spelter nor brass was prominent in this respect until after the outbreak of the war.

From Government statistics the *Boston News Bureau* has compiled figures giving a three years' comparison of 11 months' exports of copper, spelter and brass:

	1916*	1915-16	1914-15	1913-14
Copper, lbs.	784,103,644	631,457,750	627,211,836	893,776,295
Value	\$213,276,190	\$138,007,251	\$87,293,720	\$133,423,679
Spelter, lbs.	412,734,000	246,196,999	237,749,016	3,457,619
Value	\$56,750,925	\$40,563,710	\$18,231,791	\$369,667
Brass, lbs.	251,488,064	119,512,499	50,506,918	28,074,291
Value	\$370,760,676	\$132,909,153	\$16,234,267	\$6,842,434
Total Value	640,787,791	311,480,114	121,859,778	140,635,780
Value, total exports	\$5,481,423,589	\$3,814,454,114	\$2,452,033,414	\$2,175,578,565

*Full year.

Imports of copper from other countries have also been increasing, 1915-16, particularly from Peru and Chile, where the rapidly growing operations of Cerro de Pasco, Braden and Chile companies have swelled the shipments to this country. More than 507,550,000 pounds of zinc have been brought into the United States since 1914, up to July, 1917; against 24,264,000 pounds in 1914. Over half of these imports came from Australia.

MICHIGAN MINES COPPER PRODUCTION IN 1915 AND 1916, IN POUNDS

Company	1915			1916		
	Pounds ^a	Cost per lb. Cents	Rec'd per lb. Cents	Pounds	Cost per lb. Cents	Rec'd per lb. Cents
Ahmeek.....	21,800,492	7.96	18.28	24,142,158	11.54	25.720
Allouez.....	10,043,459	9.31	18.166	10,219,290	10.85	25.806
Atlantic.....				c		
Baltic.....	12,028,947	9.50	17.40		10.85	25.280
Calumet & Hecla.....	72,613,320	9.33	18.11	76,762,240	11.63	25.480
Centennial.....	2,347,500	12.45	18.14	2,367,400	13.44	25.090
Champion.....	33,407,599	6.30	17.40	54,747,498	7.80	25.280
Franklin.....	1,314,969			3,116,566	22.24	25.432
Isle Royale.....	9,342,106	14.94	18.36	12,412,111	15.75	25.800
Lake.....				1,489,247	17.17	29.726
La Salle.....	782,493			1,380,352	20.96	25.680
Mass.....	4,638,452	14.37	18.363	4,752,588	15.37	28.276
Mohawk.....	15,882,914	7.48	17.0	13,834,034	8.85	25.280
Osceola.....	19,731,472	10.03	18.19	19,586,501	11.69	25.730
Quincy.....	22,054,813	9.42	18.01	21,065,612	12.41	25.500
South Lake.....	61,637					
Superior.....	3,866,484	12.29	18.125	3,034,656	14.61	24.670
Tamarack.....	3,888,150	17.07	19.10	6,606,620		
Trimountain.....	8,302,896	9.53	17.40	c	11.10	25.280
Victoria.....	1,499,695	15.66		1,661,832	19.00	27.420
White Pine.....	2,824,145	16.64	18.353	4,207,449	12.70	25.260
Winona.....	1,722,638			2,167,255	21.81	28.030
Wolverine.....	b6,541,492	{ 8.43 9.43 }	{ }	d6,641,492	9.54	20.620
	257,694,675			270,194,001	13.96	25.642

a As this table includes mines reporting their output both for the calendar and for the fiscal years, and as some of the companies report the refined copper equivalent of mineral produced and others report refined copper, the totals do not necessarily agree with the total of either mine or smelter output.

b Figures for fiscal year ending June 30, 1916.

c Included in Champion (Copper Range Co.).

d Year ended June 30, 1917.

ORE MILLED AND COPPER PRODUCED IN MICHIGAN

Company	1914		1915		1916	
	Quantity Short	Yield per Ton	Quantity Short	Yield per Ton	Quantity Short	Yield per Ton
	Tons	Lbs.	Tons	Lbs.	Tons	Lbs.
Ahmeek.....	590,519	23.1	948,874	23.0	1,164,010	20.70
Allouez.....	354,467	17.09	534,705	18.78	566,960	18.02
Baltic.....	324,433	21.58	378,443	31.79	369,287	33.65
Calumet & Hecla.....	2,592,462	20.70	3,188,533	22.28	3,166,274	22.53
Centennial.....	138,136	16.56	150,191	15.63	150,617	15.72
Champion.....	614,854	25.71	923,743	36.17	936,656	35.87
Franklin.....	7,324	12.73	122,018		267,286	11.70
Isle Royale.....	474,349	13.9	680,270	13.70	925,419	13.40
Lake.....					70,440	21.14

ORE MILLED AND COPPER PRODUCED IN MICHIGAN—Continued

Company	1914		1915		1916	
	Quantity	Yield	Quantity	Yield	Quantity	Yield
	Short Tons	per Ton Lbs.	Short Tons	per Ton Lbs.	Short Tons	per Ton Lbs.
La Salle.....	45,500	11.88	80,969	9.67	144,829	9.53
Mass.....	209,354	14.07	323,335	14.35	287,900	16.51
Mohawk.....	649,649	17.08	829,789	19.15	664,547	20.82
Oceola.....	1,108,447	13.5	1,361,089	14.50	1,284,681	15.20
Quincy.....			1,269,000	17.38	1,204,026	17.50
South Lake.....			3,993	15.40		
Superior.....	191,628	16.79	212,051	18.23	185,315	16.38
Tamarack.....	57,410	18.7	217,027	17.9		
Trimountain.....	277,251	18.21	349,684	23.75	349,504	24.94
Victoria.....	124,842	11.9	133,984	11.1	146,690	11.34
White Pine.....			114,089	24.76	188,890	22.27
Winona.....	123,339	10.96	102,594	16.79	167,829	13.39
Wolverine.....	a182,127	a18.86	{b403,219 c391,898}	{18.23 17.07}	388,898	17.07

a Figures for fiscal year ending June 30, 1914. b Figures for fiscal year ending June 30, 1915. c Figures for fiscal year ending June 30, 1916.

PRODUCTION, VALUE AND DIVIDENDS OF LAKE COPPER

Year	Gross Product Fine Copper (Pounds)	Gross Value of Production (Dollars)	Total Dividends Paid (Dollars)	Percentage of Dividends to Gross Value	Dividends per Pound of Copper (Cents)
1845.....	24,880	5,000			
1846.....	58,240	10,000			
1847.....	297,120	55,000			
1848.....	1,032,640	200,900			
1849.....	1,505,280	336,000	60,000	17.0	3.98
1850.....	1,281,280	286,000	84,000	29.0	6.55
1851.....	1,744,960	289,500	60,000	12.0	3.43
1852.....	1,774,080	396,000	60,000	15.0	3.38
1853.....	2,905,280	648,500	90,000	14.0	3.09
1854.....	4,074,560	909,500	198,000	21.0	4.85
1855.....	5,809,334	1,586,160	168,000	10.0	2.89
1856.....	8,217,392	2,218,320	380,000	17.0	4.62
1857.....	9,530,830	2,382,500	480,000	20.0	5.03
1858.....	9,159,916	2,129,235	460,000	21.0	5.00
1859.....	8,937,995	1,950,355	360,000	18.0	4.02
1860.....	12,068,375	2,654,960	120,000	5.0	0.99
1861.....	15,182,837	3,487,995	260,000	7.0	1.70
1862.....	13,586,318	3,634,255	440,000	12.0	3.23
1863.....	12,985,444	4,415,600	720,000	16.0	5.54
1864.....	12,491,965	5,870,300	1,150,000	19.0	9.20
1865.....	14,358,592	5,635,515	510,000	9.0	3.55
1866.....	13,750,063	4,629,375	170,000	3.7	1.23
1867.....	17,515,607	4,442,841	110,000	2.4	0.63
1868.....	20,934,124	4,940,424	100,000	2.0	0.47
1869.....	26,625,301	6,230,016	210,000	3.4	0.78
1870.....	24,622,759	5,096,752	700,000	13.0	2.86
1871.....	25,746,448	5,728,485	1,640,000	29.0	6.34

PRODUCTION, VALUE AND DIVIDENDS OF LAKE COPPER—Continued

Year	Gross Product Fine Copper (Pounds)	Gross Value of Production (Dollars)	Total Dividends Paid (Dollars)	Percentage of Dividends to Gross Value	Dividends per Pound of Copper (Cents)
1872.....	24,553,523	7,979,400	3,080,000	38.0	11.54
1873.....	30,291,505	8,726,100	2,330,000	27.0	7.69
1874.....	34,334,389	8,009,356	1,940,000	24.0	5.06
1875.....	36,039,497	8,180,625	1,920,000	23.0	5.32
1876.....	38,270,997	7,998,430	1,870,000	23.0	4.88
1877.....	39,026,671	7,327,880	1,840,000	25.0	4.71
1878.....	41,687,266	6,920,540	1,860,000	27.0	4.46
1879.....	42,671,529	7,327,350	1,818,620	25.0	4.26
1880.....	49,718,337	9,947,673	3,080,000	30.9	6.19
1881.....	54,548,909	9,971,702	2,665,000	26.7	4.88
1882.....	57,155,980	10,522,416	2,850,000	27.1	4.99
1883.....	59,702,404	9,457,853	2,670,000	28.1	4.47
1884.....	69,353,202	9,494,306	1,327,500	12.9	1.91
1885.....	72,147,889	7,942,597	1,970,000	24.8	2.73
1886.....	80,918,460	8,788,476	1,900,000	21.5	2.34
1887.....	76,028,697	8,530,342	1,370,000	16.1	1.80
1888.....	86,472,034	14,510,001	3,260,000	22.4	3.77
1889.....	88,175,675	11,894,942	2,670,000	22.4	3.03
1890.....	101,410,277	15,819,960	3,415,000	21.6	3.36
1891.....	114,222,709	14,574,727	3,540,000	24.3	3.10
1892.....	123,198,460	12,431,624	3,260,000	26.2	2.64
1893.....	112,605,078	12,105,145	3,520,000	29.1	3.12
1894.....	114,308,870	10,852,122	2,380,000	21.9	2.08
1895.....	129,330,749	13,877,109	3,280,000	23.6	2.54
1896.....	142,057,500	15,758,935	3,985,000	25.3	2.80
1897.....	142,702,586	16,530,843	5,431,000	32.8	3.80
1898.....	147,965,738	17,829,871	6,857,250	38.4	4.63
1899.....	146,950,338	26,098,382	12,318,450	47.2	8.39
1900.....	142,151,571	23,691,928	9,811,200	41.3	6.90
1901.....	155,716,848	26,038,857	7,496,900	28.8	4.81
1902.....	170,325,598	20,711,592	3,440,000	16.6	2.02
1903.....	192,299,191	26,383,449	4,980,000	18.8	2.59
1904.....	208,355,935	27,107,107	5,432,300	20.0	2.64
1905.....	230,437,992	36,616,586	9,224,600	25.2	4.02
1906.....	229,632,608	43,044,732	13,911,500	30.9	6.07
1907.....	216,116,747	43,319,940	13,469,950	31.1	6.23
1908.....	222,674,918	30,239,253	4,837,300	16.0	2.17
1909.....	231,870,496	31,256,141	6,309,200	20.2	2.72
1910.....	221,508,205	29,072,951	6,974,000	23.9	3.14
1911.....	218,939,985	27,965,206	5,376,125	19.2	2.45
1912.....	216,609,751	35,617,182	9,601,875	26.9	4.43
1913(a)....	130,844,131	21,057,278	9,536,573	45.3	7.29
1914(a)....	165,706,708	21,857,759	4,663,450	21.3	2.81
1915(a)....	265,283,378	46,421,591	14,601,203	31.4	5.50
1916.....	273,692,525	67,089,454	27,357,349	40.7	10.0
Total..	6,393,554,880	\$946,858,310	\$253,961,345	26.6	3.10

(a) Copper Range Co. owns practically all the stock of the Baltic Mining Co. and Trimountain Mining Co., and 50,000 shares of Champion Copper

Co.; St. Mary's Mineral Land Co. owns the remaining 50,000 shares of Champion stock. Dividends of the operating companies have not been deducted from the totals; this duplicates a portion of the "Total dividends paid."

The average price received for all Lake Superior copper, from 1845 to 1916, inclusive, was 14.375 cents per pound, with average dividends of 3.702 cents per pound, leaving an estimated cost of 10.673 cents for all years. While this may be accepted as an arbitrary figure, the cost might very properly be figured materially higher. By adding \$60,000,000 to the cost of production, for money lost in unproductive ventures, the cost of copper produced would be made almost 11.5 cents per pound. By adding another \$15,000,000 for assessments, on mines that have since repaid in dividends the original assessments, cost of copper would be increased to about 11.85 cents per pound, leaving a net margin of profit, for the entire production, of almost exactly 2 cents per pound, plus the present aggregate values of the mines, which would be about equal to total dividend disbursements to date, or about 3.5 cents per pound.

Omitting the production of mines that have not proven profitable, the average cost of copper produced by dividend-paying Lake Superior mines probably has been about 9.5 cents per pound, for all years.

In the first nine months of this year there was paid out to copper shareholders in the United States approximately \$139,000,000, against \$108,600,000 in the same period of last year, according to the *Boston News Bureau*.

The heaviest distribution was made by the Utah Copper Co., which in the first three quarters of 1917 returned its stockholders \$17,869,390. Anaconda divided among its shareholders \$15,153,125; Kennecott disbursed \$13,054,616.

The principal copper share dividend payers and the amounts distributed throughout the first ten months of the past two years appear in the following tabulation:

	1917		1916	
	Amount per share	Total 9 Months	Amount per Share	Total 9 Months
Allouez.....	\$9.00	\$900,000	\$4.50	\$450,000
Shattuck-Arizona.....	3.75	1,312,500	3.50	1,225,000
Osceola.....	18.00	1,730,700	11.00	1,057,650
Ahmeek.....	12.00	2,400,000	8.50	1,700,000
Granby.....	7.50	1,124,886	5.00	749,924
Isle Royale.....	5.00	750,000	2.00	300,000
North Butte.....	2.25	967,500	1.75	752,500
Anaconda.....	6.50	15,153,125	5.00	11,656,250
East Butte*.....	1.00	411,000	.....	.....
Mohawk.....	20.50	2,050,000	17.00	1,700,000
Inspiration.....	6.25	7,387,294	3.25	3,841,392
United Verde Ex.....	2.10	2,205,000	.50	525,000
Miami.....	7.25	5,416,644	4.25	3,175,362
United Verde.....	13.50	3,850,000	9.00	2,700,000
Shannon*.....	1.00	300,000	.....	.....
Mass Consolidated.....	3.00	291,951	1.00	97,317
Calumet & Arizona.....	9.00	5,556,708	6.00	3,704,472
Greene Consolidated.....	2.00	2,000,000	2.50	2,500,000
Greene-Cananea.....	6.00	2,930,574	6.00	2,930,574
Champion.....	38.40	3,840,000	43.40	4,340,000
Cerro de Pasco.....	4.50	2,999,997	3.00	1,999,998
Copper Range.....	7.50	2,888,901	6.50	2,503,714
Quincy.....	15.00	1,650,000	11.00	1,210,000
Calumet & Hecla.....	75.00	7,500,000	50.00	5,000,000
Utah Consolidated.....	3.00	900,000	2.25	675,000

	1917		1916	
	Amount per Share	Total 9 Months	Amount per Share	Total 9 Months
Kennecott.....	\$4.70	\$13,054,616	\$4.50	\$12,499,101
Centennial.....	1.00	90,000	1.00	90,000
Wolverine.....	7.50	450,000	6.00	360,000
Utah Copper.....	11.00	17,869,390	8.50	13,808,165
Chino.....	7.90	6,524,850	5.75	6,002,385
Ray Consolidated.....	3.20	5,046,972	1.75	2,759,977
Nevada Consolidated.....	3.15	6,298,289	2.25	4,468,780
Phelps-Dodge.....	22.00	9,900,000	20.00	9,000,000
Magma.....	1.60	384,000	1.50	360,000
First National.....	.40	240,000	.25	150,000
Consolidated Arizona.....	.05	83,150		
Old Dominion of Maine.....	7.00	2,053,471	8.50	2,493,497
Old Dominion of New Jersey.....			8.50	1,377,000
United Globe Mine.....			51.00	1,173,000
Total.....		\$138,511,518		\$108,336,058

* Initial.

Some of the companies listed above have already taken action on dividends to be paid in October, November and December; but they have not been included in the compilation as their payment has not actually taken place. In this grouping may be included Anaconda and Calumet & Arizona.

In preparation for meeting the forthcoming heavy taxation on excess profits, it was expected that Chino, Nevada Con., Ray, and Utah Copper would husband their cash resources to a large extent and eliminate what have heretofore been regarded as extra payments; but with the exception of Chino, all paid the same as in the previous period. Their record is as follows. The stock market discounted such a step to a large extent, particularly in Utah and Kennecott.

Company	1917 Per share	1916 Per share
Chino Copper.....	\$9.90	\$8.25
Nevada Con.....	4.15	3.75
Ray Con.....	4.20	2.75
Utah Copper.....	14.50	12.00

On July 25, 1917, each company paid a Red Cross dividend, amounting to 40c., 15c., 20c., and 50c. per share, respectively.

In the following tables it is probable that no data will be available until after the war.

CONSUMPTION OF COPPER IN EUROPE

European consumption of copper according to A. Hirsch & Sohn; in tons of 2,240 pounds.

	1904	1905	1906	1907	1908	1909	1910	1911	1912	1913
Germany.....	138,636	129,169	155,191	149,780	178,005	184,980	206,831	222,027	243,173	268,566
France.....	64,235	61,910	65,927	70,712	80,509	85,688	92,838	106,997	106,769	107,283
England.....	134,327	111,888	121,256	119,582	134,482	110,648	148,187	159,736	147,551	147,494
Austria-Hungary..	26,866	25,830	27,976	30,472	36,972	34,605	35,700	40,000	50,590	41,031
Italy.....	18,162	20,284	25,237	31,984	29,496	25,189	23,788	30,437	34,378	30,891
Russia.....	31,370	28,797	24,532	18,739	20,300	21,705	23,227	31,845	38,818	39,475
Belgium & Holland	10,590	11,980	12,798	11,500	9,560	9,500	14,000	13,000	13,000	13,000
Scandinavia.....	3,500	3,500	7,000	10,200	9,700	9,700	*7,500	*7,500	*7,500	*8,500
Rest of Europe....	1,800	2,500	3,000	2,500	2,500	3,000	*2,500	*2,500	*2,500	*3,000
Total.....	429,986	394,458	455,827	445,469	502,474	485,015	559,571	614,042	644,268	647,170

* Estimated. (No statistics published for 1914, 1915 or 1916, or likely to be until after the war.)

ENGLISH COPPER TRADE (IN LONG TONS)

	Pro- duction	Imports	Gross Supply	Exports	Net Supply	Actual Con- sumption
1880.....	3,662	92,734	96,396	59,482	36,914	.....
1881.....	3,875	86,227	90,102	61,689	28,413	.....
1882.....	3,464	93,875	97,339	55,683	41,656	.....
1883.....	2,620	99,146	101,766	59,350	42,416	.....
1884.....	3,350	109,390	112,740	64,691	48,049	.....
1885.....	2,733	123,549	126,282	62,080	64,202	.....
1886.....	1,471	108,015	109,486	60,511	48,975	.....
1887.....	389	103,089	103,478	69,453	34,025	.....
1888.....	1,456	135,470	136,926	72,066	64,860	3,667
1889.....	905	139,983	140,888	75,627	65,261	66,513
1890.....	935	141,249	142,184	89,747	52,437	84,930
1891.....	900	138,616	139,515	76,056	63,459	72,422
1892.....	495	134,371	134,866	82,542	52,324	54,254
1893.....	425	129,832	130,257	70,986	59,271	67,399
1894.....	445	125,008	125,453	54,689	70,764	62,617
1895.....	580	119,941	120,521	65,990	54,531	62,502
1896.....	580	135,856	136,436	59,334	57,102	61,370
1897.....	518	136,555	137,073	56,542	80,531	86,245
1898.....	640	139,704	140,344	63,256	77,088	81,312
1899.....	637	141,610	142,247	75,271	66,976	61,042
1900.....	765	154,941	155,706	56,997	98,709	105,586
1901.....	532	149,578	150,110	70,396	79,714	83,935
1902.....	482	160,201	160,683	69,156	91,527	97,639
1903.....	536	132,926	133,462	76,305	57,157	54,050
1904.....	493	157,897	158,390	73,447	131,000	127,900
1905.....	700	155,200	155,900	77,800	100,200	103,300
1906.....	700	145,400	146,100	66,300	111,100	107,600
1907.....	700	153,100	153,800	42,800	109,500	106,100
1908.....	700	193,000	193,700	34,400	158,000	127,600
1909.....	650	200,800	201,250	36,600	163,900	108,300
1910.....	460	159,800	160,260	43,000	116,800	146,000
1911.....	400	167,400	167,800	33,500	133,900	159,100
1912.....	400	157,400	157,800	27,400	130,800	144,600
1913.....	300	158,500	158,800	34,700	123,800	140,300

FRENCH COPPER TRADE

The following table is based upon the compilations of the Metallgesellschaft and Metallurgische Gesellschaft A.-G.: (Metric tons.)

Year	Pro- duction	Imports	Gross Supply	Exports	Net Supply	Actual Con- sumption
1892.....	6,400	24,154	30,554	2,118	28,438	25,580
1893.....	6,600	26,060	32,660	2,204	30,456	28,596
1894.....	6,400	26,756	33,156	2,467	30,689	28,854
1895.....	8,245	32,656	40,901	3,163	37,738	32,388
1896.....	6,544	40,136	46,680	3,456	43,224	35,099
1897.....	7,400	48,028	55,428	3,559	51,868	43,100
1898.....	7,800	45,575	53,375	4,044	49,331	39,700
1899.....	6,600	49,515	56,115	6,882	49,233	42,600
1900.....	6,400	51,962	58,362	5,736	52,626	46,500
1901.....	7,000	41,196	48,196	5,122	43,074	34,300

FRENCH COPPER TRADE—Continued

Year	Pro- duction	Imports	Gross Supply	Exports	Net Supply	Actual Con- sumption
1902.....	7,300	49,094	56,394	3,485	52,909	43,900
1903.....	6,900	46,834	53,734	4,658	49,076	42,700
1904.....	6,900	56,526	63,426	5,369	58,057	45,300
1905.....	6,200	56,500	62,700	6,600	56,100	50,200
1906.....	7,100	64,700	71,800	6,100	65,700	58,100
1907.....	7,500	62,800	70,300	4,900	65,400	65,000
1908.....	8,000	74,400	82,400	5,200	77,200	73,900
1909.....	7,500	71,300	78,800	4,600	74,200	73,100
1910.....	12,900	77,112	90,012	4,501	85,511	85,700
1911.....	13,200	84,541	97,741	2,835	94,906	95,700
1912.....	11,900	88,833	100,700	3,092	98,500	94,700
1913.....	11,900	94,863	106,800	4,402	103,600	95,900

Note: 1912 and 1913 figures are from Metallgesellschaft.

BRITISH AND FRENCH VISIBLE SUPPLY OF COPPER

This table, based on the compilations of Messrs. Jas. Lewis & Sons of London gives estimates of the visible supply, consisting of the stocks of refined copper on hand in Great Britain and France on the day named, plus shipments afloat from Chile and Australia to European ports. In long tons.

	1916	1915	1914	1913	1912	1911
Jan. 1.....	20,064	30,309	21,034	40,380	57,283	83,707
Feb. 1.....	17,646	30,002	16,865	38,228	55,570	83,196
Mar. 1.....	16,734	29,252	18,559	36,176	51,507	82,387
April 1.....	12,201	23,883	17,923	32,291	50,175	82,267
May 1.....	16,046	26,314	20,360	30,467	49,771	78,069
June 1.....	15,310	28,917	24,352	29,634	44,618	72,613
July 1.....	15,376	32,868	25,698	28,172	41,623	70,172
Aug. 1.....	13,188	35,063	26,739	28,374	45,026	68,025
Sept. 1.....	10,371	34,064	27,933	26,536	45,666	66,914
Oct. 1.....	10,108	28,933	29,671	22,583	44,238	67,340
Nov. 1.....	11,798	24,835	31,443	21,380	43,330	61,836
Dec. 1.....	*	20,895	30,626	21,514	40,746	58,682

* No data available until after the war.

GERMAN COPPER TRADE

From Metallgesellschaft and Metallurgische Gesellschaft A.-G. (in metric tons).

Year	Pro- duction	Imports	Gross Supply	Exports	Net Supply	Con- sumption
1884.....	18,113	13,819	31,932	6,906	25,026	25,000
1885.....	19,928	13,168	33,096	5,706	27,390	27,250
1886.....	19,314	11,913	31,227	6,510	24,717	25,000
1887.....	20,192	12,427	32,619	5,154	27,465	27,250
1888.....	21,017	8,082	29,099	4,530	24,569	24,500
1889.....	24,160	29,643	53,803	7,135	46,668	46,500
1890.....	24,427	31,408	55,835	8,428	47,407	47,000
1891.....	24,092	34,182	58,274	6,247	52,027	52,000
1892.....	24,781	32,498	57,279	6,598	50,681	50,000

GERMAN COPPER TRADE—Continued

Year	Pro- duction	Imports	Gross Supply	Exports	Net Supply	Con- sumption
1893.....	24,011	38,455	62,466	7,517	54,949	55,000
1894.....	25,722	37,032	62,754	6,609	56,145	56,000
1895.....	25,777	44,365	70,142	6,329	63,813	64,000
1896.....	29,319	56,814	86,133	5,996	80,137	80,000
1897.....	29,408	67,573	96,981	7,183	89,798	90,000
1898.....	30,695	73,291	103,986	6,972	97,014	97,000
1899.....	34,634	70,091	104,725	7,061	97,664	98,000
1900.....	30,929	83,503	114,432	5,505	108,927	109,000
1901.....	31,317	58,620	89,937	5,097	84,840	85,000
1902.....	30,578	76,050	106,628	4,678	101,950	102,000
1903.....	31,214	83,261	114,475	4,333	110,142	110,000
1904.....	30,264	110,231	140,495	4,223	136,272	135,000
1905.....	31,713	102,218	133,935	5,958	127,977	128,000
1906.....	32,275	126,066	158,341	7,243	151,098	151,000
1907.....	31,946	124,116	155,926	6,112	149,814	150,000
1908.....	36,026	157,669	187,435	6,778	180,657	180,000
1909.....	34,412	154,673	185,799	6,745	179,054	179,000
1910.....	38,004	181,551	216,477	7,063	209,414	209,000
1911.....	37,808	191,590	229,042	6,914	222,128	222,544
1912.....	38,900	200,608	240,408	7,854	232,735	231,700
1913.....	41,100	225,392	229,508	7,208	.....	259,300

AUSTRO-HUNGARIAN COPPER TRADE

The following table is based on the figures of the Metallgesellschaft und Metallurgische Gesellschaft A.-G.:

(Metric Tons.)

Year	Pro- duction	Imports	Gross Supply	Exports	Net Supply	Con- sumption
1892.....	1,295	8,644	9,939	342	9,597	.....
1893.....	1,396	11,822	13,218	434	12,784	.....
1894.....	1,726	13,383	15,100	255	14,854	.....
1895.....	1,276	11,747	13,023	151	12,872	.....
1896.....	1,366	13,666	15,032	228	14,804	.....
1897.....	1,426	15,926	17,352	159	17,193	17,000
1898.....	1,343	17,442	18,785	173	18,612	18,300
1899.....	1,479	16,185	17,664	534	17,130	16,500
1900.....	1,200	18,970	20,170	471	19,699	18,700
1901.....	1,150	17,504	18,654	435	18,219	18,200
1902.....	1,350	18,256	19,606	436	19,179	19,200
1903.....	1,400	18,704	20,104	1,226	18,878	18,700
1904.....	1,463	22,532	23,995	747	23,248	23,100
1905.....	1,439	22,535	23,974	1,253	22,721	21,000
1906.....	1,457	24,488	25,945	1,271	24,674	24,200
1907.....	1,066	26,181	27,247	619	26,628	26,500
1908.....	1,338	33,259	34,597	1,125	33,472	33,000
1909.....	1,765	30,606	32,371	1,250	31,121	31,000
1910.....	2,279	32,217	34,496	977	33,519	33,500
1911.....	2,563	37,251	39,814	1,310	38,504	37,400
1912.....	4,026	45,460	49,475	1,332	48,154	47,400
1913.....	4,132	36,451	40,583	1,379	39,200	36,600

RUSSIAN COPPER TRADE

This table is based upon the compilations of the Metallgesellschaft und Metallurgische Gesellschaft A.-G.: (Metric tons.)

Year	Pro- duction	Imports	Gross Supply	Exports	Net Supply	Con- sumption
1892	4,978	6,568	11,546		11,546	11,500
1893	5,100	8,756	13,856		13,856	13,750
1894	5,409	6,666	12,075		12,075	12,250
1895	5,854	8,100	13,954		13,954	14,000
1896	5,832	12,433	18,265		18,265	18,000
1897	6,941	12,507	19,448		19,448	19,500
1898	7,291	14,450	21,741		21,741	22,000
1899	7,533	11,100	18,633		18,633	18,500
1900	8,100	12,300	20,400		20,400	20,500
1901	8,100	10,900	19,000		19,000	19,000
1902	8,800	17,500	26,300		26,300	26,250
1903	10,500	14,450	24,950		24,950	25,000
1904	10,900	20,300	31,200		31,200	31,250
1905	8,900	18,700	27,600		27,600	27,500
1906	10,600	16,000	26,600	400	26,200	26,000
1907	15,000	4,500	19,500	1,500	18,000	18,000
1908	16,800	4,800	21,600	20	21,580	21,000
1909	18,500	3,500	22,000	400	21,600	22,000
1910	22,600	6,500	29,100	500	28,600	28,600
1911	25,600	7,800	33,400	600	32,800	32,800
1912	33,535	7,000	40,535	500	40,035	40,000
1913	35,295	6,100	40,400	200	40,200	40,200

ITALIAN COPPER TRADE

This table is based upon the compilations of the Metallgesellschaft und Metallurgische Gesellschaft A.-G.:

(Metric Tons.)

Year	Pro- duction	Imports	Gross Supply	Exports	Net Supply	Con- sumption
1892	2,564	2,139	4,703	168	4,535	4,500
1893	2,371	3,043	5,414	157	5,257	5,250
1894	2,670	3,706	6,376	32	6,344	6,250
1895	2,375	4,350	6,725	84	6,641	6,750
1896	2,842	4,509	7,351	383	6,968	7,000
1897	2,980	5,032	8,012	222	7,790	7,750
1898	3,230	5,028	8,258	462	7,796	8,000
1899	3,032	5,006	8,038	1,355	6,683	6,500
1900	2,797	6,224	9,021	676	8,345	6,250
1901	3,483	5,982	9,465	100	9,365	9,500
1902	3,863	7,050	10,913	165	10,748	10,500
1903	3,620	6,096	9,716	162	9,554	9,750
1904	3,593	11,492	15,085	180	14,905	15,000
1905	3,578	13,795	17,373	170	17,203	17,250
1906	3,600	15,350	18,950	450	18,500	18,250
1907	4,000	21,000	25,000	300	24,700	25,000
1908	4,000	19,623	23,623	172	23,451	23,000
1909	3,000	14,729	17,729	302	17,427	17,500

ITALIAN COPPER TRADE—Continued

Year	Pro- duction	Imports	Gross Supply	Exports	Net Supply	Con- sumption
1910.....	1,766	21,567	23,333	837	22,496	22,500
1911.....	1,666	28,510	30,176	743	29,433	29,400
1912.....	2,319	33,631	35,331	1,717	34,200	33,600
1913.....	2,400	30,280	32,680	1,465	34,200	39,100

MISCELLANEOUS EUROPEAN COPPER TRADE

This table is based upon the compilations of the Metallgesellschaft und Metallurgische Gesellschaft A.-G. It includes Sweden, Norway, Denmark, Holland, Belgium, the Balkan States and Spain and Portugal, but does not include copper production of the two last named countries:

(Metric Tons.)

Year	Pro- duction	Imports	Gross Supply	Exports	Net Supply	Con- sumption
1892.....	1,400	1,100	2,500	....	2,500	2,500
1893.....	1,600	1,400	3,000	....	3,000	3,000
1894.....	1,600	1,400	3,000	....	3,000	3,000
1895.....	1,500	1,400	2,900	....	2,900	2,900
1896.....	1,700	1,400	3,100	....	3,100	3,100
1897.....	1,700	2,500	4,200	....	4,200	4,200
1898.....	1,500	2,700	4,200	....	4,200	4,200
1899.....	2,300	2,800	5,100	....	5,100	5,000
1900.....	2,500	3,600	6,100	....	6,100	6,000
1901.....	3,100	5,200	8,300	....	8,300	8,500
1902.....	6,200	5,300	11,500	....	11,500	11,250
1903.....	8,000	4,500	12,500	....	11,900	12,000
1904.....	7,000	7,000	14,000	....	14,200	14,000
1905.....	7,700	8,000	15,700	....	15,000	15,000
1906.....	7,100	8,000	15,100	....	15,400	15,500
1907.....	7,500	7,500	15,000	....	15,000	15,000
1908.....	13,200	2,200	15,400	....	15,400	15,000
1909.....	28,000	....	28,000	7,000	21,000	21,800
1910.....	30,200	....	30,200	6,000	24,200	24,000
1911.....	32,200	....	32,200	8,000	24,200	24,500
1912.....	41,600	....	41,600	15,000	26,600	28,000

STATE MINE INSPECTORS, COMMISSIONERS, ETC.

State	Name and Address
Alabama.....	C. H. Nesbit, Chief Mine Inspector, Birmingham.
Alaska.....	Sumner S. Smith, Mine Inspector, Juneau.
Arizona.....	C. H. Bolin, State Mine Inspector, Phoenix. Charles F. Willis, Director, State Bureau of Mines.
Arkansas.....	John H. Page, Commissioner, Bureau of Mines, Manufacturers and Agriculture, Little Rock; John T. Fuller, State Mineralogist; Tom Shaw, State Mine Inspector, Midland.
California.....	F. McN. Hamilton, State Mineralogist, San Francisco.
Colorado.....	Fred Carroll, Commissioner. James Dalrymple, State Inspector of Coal Mines, Denver.
Idaho.....	R. N. Bell, State Mine Inspector, Boise.
Indiana.....	Michael Scollard, Deputy Inspector of Mines, Indianapolis.
Iowa.....	E. M. Gray, President, State Mining Board, Des Moines.
Kansas.....	John Pellegrino, Chief Mine Inspector, Pittsburgh.
Kentucky.....	C. J. Norwood, Chief Inspector of Mines, Lexington.
Maryland.....	John Casey, State Mine Inspector, Frostburg.
Minnesota.....	F. A. Wildes, State Mine Inspector, Hibbing.
Missouri.....	J. P. Hawkins, Secretary, Bureau of Mines and Mines Inspection Jefferson City. George Hill, Chief Mine Inspector, Bovier.
Montana.....	W. B. Orem, State Mine Inspector, Helena.
Nevada.....	A. J. Stinson, State Mine Inspector, Carson City.
New Jersey.....	Aug. Munson, State Mine Inspector, Trenton.
New Mexico.....	W. W. Risdon, State Mine Inspector, Albuquerque
New York.....	W. W. Jones, State Mine Inspector, Albany.
North Dakota.....	Jay W. Bliss, State Engineer, Bismarck.
Ohio.....	James Pritchard, Chief Deputy, Division of Mines, Columbus.
Oklahoma.....	Ed. Boyle, Chief Inspector, McAlester.
Oregon.....	H. M. Parks, Director, Bureau of Mines, Corvallis.
Pennsylvania.....	James Roderick, Chief, Department of Mines, Harrisburg.
South Dakota.....	Otto E. Ellerman, State Mine Inspector, Lead.
Tennessee.....	R. A. Shiflett, Chief Mine Inspector, Nashville.
Texas.....	B. S. Gentry, State Mine Inspector, Rockdale.
Utah.....	J. E. Pettit, State Mine Inspector, Salt Lake City.
Virginia.....	A. G. Lucas, Mine Inspector, Richmond.
Washington.....	James Bagley, State Inspector of Coal Mines, Seattle
West Virginia.....	Earl Henry, Chief, Department of Mines, Charleston.

STATE GEOLOGISTS

Alabama.....	Eugene A. Smith, University.
Arkansas.....	N. F. Drake, Fayetteville.
Connecticut.....	H. E. Gregory, Superintendent, New Haven.
Colorado.....	R. D. George, Director, Boulder.
Florida.....	E. H. Sellards, Tallahassee.
Georgia.....	S. W. McCallie, Atlanta.
Illinois.....	F. W. DeWolf, Director, Urbana.
Indiana.....	Edward Barrett, Indianapolis.
Iowa.....	George F. Kay, Des Moines.
Kansas.....	R. C. Moore, Lawrence.
Kentucky.....	J. B. Hoeing, Frankfort.
Maryland.....	William Bullock Clark, Baltimore.
Michigan.....	R. C. Allen, Lansing.

STATE GEOLOGISTS--(Continued)

State	Name and Address
Minnesota	W. H. Emmons, Minneapolis.
Mississippi	E. N. Lowe, Jackson.
Missouri	H. A. Buehler, Rolla.
Montana	J. P. Rowe, Missoula.
Nebraska	E. H. Barbour, Lincoln.
New Jersey	H. B. Kummel, Trenton.
New Mexico	C. T. Kirk, Albuquerque.
New York	John M. Clarke, Albany.
North Carolina	Joseph Hyde Pratt, Chapel Hill.
North Dakota	A. G. Leonard, Fargo.
Ohio	J. A. Bownocker, Columbus.
Oklahoma	C. W. Shannon, Norman.
Oregon	H. M. Parks, Corvallis.
Pennsylvania	R. R. Hice, Beaver.
Rhode Island	Charles W. Brown, Providence.
South Dakota	Freeman Ward, Vermillion.
Tennessee	A. H. Purdue, Nashville.
Texas	J. A. Udden, Director, Bureau of Economic Geology, Austin.
Vermont	G. H. Perkins, Burlington.
Virginia	Thomas L. Watson, Charlottesville.
Washington	Henry Landes, Seattle.
West Virginia	I. C. White, Morgantown.
Wisconsin	W. O. Hotchkiss, Madison.
Wyoming	L. W. Trumbull, Cheyenne.

MINES OF THE UNITED STATES

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CHAPTER VI

THE MINING COMPANIES AND MINES OF THE UNITED STATES

Those of other countries are in separate chapters. See alphabetical index in front of book.

A description of the active and most of the inactive mining corporations, and active mines of the various States arranged by States and grouped by counties and towns. The arrangement permits ready identification of companies whose exact title is not recalled and enables the reader to tell quickly what companies are operating near each mining center.

The descriptions of foreign mining companies are grouped under the name of each country, arranged alphabetically by countries and by companies.

A complete index in the front of the book makes quick reference possible when the name of the company is known.

UNITED STATES

The companies given under the general heading, operate properties in so many districts that the descriptions cannot be properly given under any one state. References are however given in the appropriate places, to the local holdings.

ALUMINUM COMPANY OF AMERICA.

Offices: Oliver Bldg., Pittsburgh, Pa., and 120 Broadway, New York.

Officers: Arthur V. Davis, pres.; G. R. Gibbons, v. p.-sec.-asst. treas.; R. E. Withers, treas.-asst. sec., Pittsburgh, Pa.; with D. L. Gillespie, Roy A. Hunt, Alvah K. Lawrie, A. W. Mellon and R. B. Mellon, directors.

Inc. 1888 in Pa., as the Pittsburgh Reduction Co.; name changed to present title, Jan. 1, 1907. **Cap.**, authorized, \$20,000,000; shares \$100 par; outstanding, \$19,000,000. No bonded debt. Dividends: 8% per annum, paid quarterly, Feb., etc., 1916; 2% extra in Dec.; 2% in Feb., 1917.

Controls the St. Lawrence River Power Co., the Northern Aluminum Co., the St. Lawrence Transmission Co. and the Tallassee Power Co. On Nov. 1, 1915, acquired control of the Southern Aluminum Co., with its unfinished hydro-electric and aluminum manufacturing plants near Whitney, N. C. This company was controlled by French interests until the outbreak of the European war in 1914. The plants were to have cost upward of

\$10,000,000. The Aluminum Co. of America formed the Tallassee Power Co., capital \$1,000,000 to complete the hydro-electric plant; it was expected to have this finished early in 1917. The aluminum reduction plant will also be completed.

Company owns extensive bauxite deposits in Saline Co., Ark., from which it secures most of its aluminum ore. About 6 tons of ore yields one ton of metal. Equipment at the property consists of crushing and drying machinery. The bauxite is shipped to a refining plant at East St. Louis, Ill., where the impurities are removed. There are also reduction works at Niagara Falls and Massena, N. Y., where there is a wire and cable mill, and at Maryville, Tenn. The company has a general fabricating plant at New Kensington, Pa., also a plant for the manufacture of aluminum bronze powder and aluminum foil.

The Northern Aluminum Co. is a Canadian corporation, which has a reduction plant and wire mill at Shawinigan Falls, Que., and a fabricating plant at Toronto, Ont.

Production: about 80% of the total aluminum product of the U. S., which in 1916 was 139,000,000 lbs. Company sold 86,589,774 lbs. in 1916 and supplied a subsidiary, the U. S. Aluminum Co. with 24,821,061 lbs.

AMALGAMATED COPPER CO.

Company dissolved in 1916. See Vols. XI. and XII.

AMERICAN FINANCE & SECURITIES CO. (THE)

Involuntary petition in bankruptcy filed June 22, 1915. Adjudicated bankrupt, May 15, 1916. Henry J. West, Camden, N. J., trustee. See Mines Handbook, Vol. XII.

AMERICAN METAL CO., LTD. (THE)

61 Broadway, New York City. Officers: Berthold Hochschild, New York, Chairman of the Board; C. M. Loeb, pres.; Otto Sussman, Henry Bruère, Julius Loeb and Harold K. Hochschild, v. p.'s.; Julian Beaty, treas.; Julius Goldman, sec., with Henry V. Putzel, S. Roos and M. Schott, directors.

Inc. 1887 in N. Y. as refiners, exporters, importers and dealers in metals and chemicals. Cap., \$25,000,000, \$100, par, \$7,000,000 issued. No bonded debt. Dividends not reported.

Controls the Consolidated Interstate Callahan Mng. Co., Wallace, Idaho; American Zinc & Chemical Co., Langeloth, Pa.; the Compania Minera de Penoles, of Mapimi, Mex.; Compania de Minerales y Metales of Mexico; Ohio & Colorado Smelting & Refining Co., of Salida, Colo.; Bartlesville Zinc Co., of Bartlesville, Okla.; Compania Metallurgica de Torreon of Mexico and Metallurgical Company of America, of New York. Company is agent for Balbach Smelting & Refining Co., of Newark, N. J.

AMERICAN SMELTING & REFINING CO.

Gen. Offices: 120 Broadway, New York; Corporate office: 15 Exchange Place, Jersey City, N. J.; City of Mexico office: Cio Bancaria de Obras Bldg., Mexico, D. F. Valparaiso office: Casilla 12, Valparaiso, Chile.

General officers: Daniel Guggenheim, pres.; E. L. Newhouse, Edw. Brush, S. W. Eccles, Karl Eilers, Jos. Clendenin, J. K. MacGowan, v. p.'s; Isaac Guggenheim, treas.; Judd Stewart, gen. aud. and asst. to the pres.; F. W. Hills, compt.; L. A. Chapin, asst. treas.; W. E. Merriss, sec.; F. R. Foraker, asst. sec.; R. P. Reese, aud.; John N. Steele, gen. counsel.

Directors: Simon Guggenheim, chairman; Jos. Clendenin, Silas W. Eccles, Karl Eilers, Chas. Earl, Leopold Fredrick, Daniel Guggenheim, Isaac Guggenheim, Murry Guggenheim, S. R. Guggenheim, F. W. Hills, Wm. Loeb, Jr., John K. MacGowan, W. S. McCornick, W. S. Morse, E. L. Newhouse, Walter T. Page, H. A. Prosser, Grant B. Schley, John

N. Steele, Judd Stewart, C. W. Whitley, F. H. Brownell, C. A. H. de Saulles, Roger W. Straus.

Executive Committee: S. R. Guggenheim, chairman; Edward Brush, Jos. Clendenin, S. W. Eccles, Karl Eilers, Chas. Earl, Daniel Guggenheim, Murry Guggenheim, Simon Guggenheim, F. W. Hills, Wm. Loeb, Jr., J. K. MacGowan, W. S. Morse, E. L. Newhouse, H. A. Prosser, Judd Stewart, F. H. Brownell, H. A. Guess.

Finance Committee: Murry Guggenheim, chairman; Edw. Brush, S. R. Guggenheim, Daniel Guggenheim.

Operating officials: Jos. Clendenin, mgr. copper sales dept.; Wm. Loeb, Jr., managing director labor and welfare dept.; E. R. Reets, purch. agt.; F. R. Raiff, traffic mgr.; G. H. Cole, asst. traffic mgr.; E. L. Carpenter, fuel agt.; C. W. Whitley, gen. mgr. Utah dept.; L. G. Eakins, gen. mgr. Colo. dept.; H. A. Guess, managing director mng. dept.; W. M. Drury, mgr. mng. dept.; C. L. Baker, gen. mgr. Mex. dept.; R. T. White, gen. mgr. Chile; Kuno Doerr, gen. mgr. S. W. dept.; F. D. Aller, Chile agt.; Samuel Metzger, mgr. ins. dept.; E. A. Behr, sales agt. lead dept.; H. M. Brush, asst. mgr. copper sales dept.; Roger W. Straus, asst. to chairman of board.

Foreign representatives: Paul Koning, Zurich, Switzerland; Kleinwort, Sons & Co., London, Eng.; W. A. Price and Geo. T. Ewart, fin. agts., Mexico City, Mex.; H. R. Wagner, res. director, Valparaiso, Chile; R. T. White, gen. mgr., Antofagasta, Chile, S. A.

Transfer agt., Ralph M. Leonard, New York; registrar, Chase National Bank, New York.

Inc. April 4, 1899, in New Jersey. Cap., \$115,000,000, with \$65,000,000 common and \$50,000,000 cumulative 7% preferred stock; shares \$100 par. Original capitalization was \$54,600,000, increased to \$100,000,000 and again increased Jan., 1911, by \$15,000,000 common stock authorized to exchange for 6% debenture bonds of American Smelters Securities Co. at any time before Aug., 1918, that bonds may sell at par. Annual meeting, first Wednesday in April. Has about 11,000 shareholders.

The American Smelting & Refining Co. controls the American Smelters Securities Co. through the ownership of the entire common stock issue of \$30,000,000, 80% of pfd. B and 35% of pfd. A. and has guaranteed principal and 5% dividends on the entire stock issue of Series B cum. pfd. stock of the American Smelters Securities Co.

Company's consolidated balance sheet of Dec. 31, 1916, shows total assets of \$217,825,183, which includes property acct., \$141,165,684; investments in securities of other companies, \$827,277; metal stocks, \$27,477,650; working assets, \$4,601,312; current assets, \$42,430,307; in funds, \$323,003; a total increase of \$15,508,782 in assets over 1915. Current assets include cash \$16,941,492; accounts and notes receivable \$20,593,603; secured loans, \$4,119,412 and advances to affiliated companies, \$775,699. Liabilities are given as pfd. capital stock outstanding, \$96,458,800; common stock outstanding, \$54,299,000; debenture-bonds outstanding, \$6,669,000; current liabilities, \$27,468,288; reserve and suspended creditor acct., \$8,957,749; surplus of \$23,442,295. The profit and loss column showed \$32,578,854, of which \$6,000,000 was reserved for enlargement and extension.

Consolidated Income Account:	1916	1915	1914
†Net earnings	\$22,574,527	\$14,472,612	\$10,667,822
Net earnings, mining properties.....	2,725,222	1,984,977	935,193
Other income—net	2,818,082	1,788,142	1,222,514
Gross income	\$28,117,831	\$18,245,731	\$12,825,530

Charges against gross income:			
Administ., research, exam., exp.....	\$1,162,386	\$902,296	\$979,691
Corporate taxes	985,965	280,645	179,859
Interest, amort., discount bonds.....	727,182	820,371	858,064
Deprec., deplet., ore res.....	1,990,047	193,122	.....
Appropriation, bonus, pension.....	1,000,000	795,000	.....
Miscellaneous	100,000	554,429	240,000
Total	\$5,965,582	\$5,192,427	\$2,935,900
Net income	22,152,250	13,053,305	9,031,566
Dividends:			
On preferred stocks	5,993,258	6,001,844	6,017,450
*Balance	\$16,158,992	\$7,051,461	\$3,014,116
On common stock	3,140,576	2,001,080	2,000,000
Balance transferred to surplus.....	\$13,018,415	\$5,050,380	\$1,014,116
Previous surplus	19,560,438	19,510,058	18,495,942
Total surplus	\$32,578,854	\$24,560,438	\$19,510,058
xSpecial appropriations	9,136,559	5,000,000	.....
Profit and loss surplus	\$23,442,295	\$19,560,438	\$18,495,943

† Of smelting and refining plants and industries dependent thereon.

* In 1916 in excess of 30% on common stock outstanding Dec. 31, 1916. Regular quarterly dividends of 6% per annum were declared on Common Stock. In 1915, equal to 14.1 per cent on the company's \$50,000,000 common stock after allowing \$1,646,565 for depreciation; 6.03 per cent was earned on the same amount of stock in 1914, when \$1,540,350 was charged off.

x Special appropriations were \$3,136,559 for property account, and \$6,000,000 for enlargement and extension.

Par value of Securities Co.'s bonds held by Trustees in sinking fund, Dec. 31, 1916 is \$4,110,000; par value held in company's treasury for which Smelting Co.'s common was issued in exchange, \$4,191,000; bonds outstanding, \$6,699,000; or a decrease of \$5,913,500 for the year.

Net increase in cash working capital was \$4,731,611 of which \$3,858,788 was expended for increase in metal stocks. Balance of Dec. 31, 1916, gave \$19,941,492, as cash on hand and subject to check and \$3,000,000 of loans secured by Stock Exchange collateral.

A comparison of the tremendous increase in business being done at end of and at the beginning of the year 1916 is offered by the book value of ore, bullion, and factory products on hand and in transit, on Dec. 31, 1916, less treatment charges accrued but not earned, amounting to \$105,254,065, against \$58,582,143 at the end of 1915 for value of same stock; or an increase of \$46,671,922. This is largely in weight of metal carried in normal business as inventory price at which metals are carried has not been increased.

The total receipts from sales of metals and manufactured products of \$346,602,866, compares with the receipts from same sources in 1915, of \$219,603,470, and in 1914, of \$183,146,077.

Operating Statistics

	1915	1916
No. of men employed, excluding Mexico.....	15,556	21,073
Total wages and salaries, excluding Mexico...	\$11,392,508	\$17,047,944

Average wage per 8-hour day.....	\$2.44	\$2.70
Charge smelted, tons	4,153,092	4,789,474
Bullion refined, tons	579,080	677,460
Coal used, tons	604,204	724,595
Coke used, tons	401,511	454,468
Fuel-oil used, barrels	829,304	1,107,285
Gas used, cubic feet	1,071,593,000	2,130,460,328
Ore mined, tons	1,578,611	1,638,566
Coal mined, tons	235,222	224,807
Coke produced, tons	120,660	140,961

Metal Products

Gold, ounces	2,672,702	2,662,011
Silver, ounces	76,117,453	71,868,451
Platinum and palladium, ounces	693	868
Lead produced, tons	296,986	279,144
Copper produced, pounds	551,798,000	789,438,000
Spelter, pounds	36,154,000	47,807,547
Nickel, pounds	1,120,556	1,224,328
Tin, pounds		3,262,000
Sulphuric acid, pounds	34,124,000	25,842,000
Arsenic, pounds	7,269,000	9,090,000
Copper sulphate, pounds	8,366,000	13,046,000
By-product metals, pounds	2,229,887	5,671,827
Copper and brass manuf. products, pounds....	8,763,480	31,597,489
Test lead and litharge sold, pounds.....	355,229	417,898
Loaded cartridges sold, number	12,898,000	15,338,000
Sheet lead, pipe, etc., sold, pounds	9,638,205	21,713,331
Mixed metals sold, pounds	2,566,255	2,831,617

The business of the company is so varied that it almost defies analysis, save by a certified accountant. It mines gold, silver, copper, lead, zinc ores and coal. It melts its own ores of all these metals, and most of the ore produced by the lesser mines of America. It refines not only these five metals, but manufactures them into copper sheets, rods, tubes, etc., at Baltimore; makes white lead, sheet lead, etc., at Selby; zinc white, etc., at its zinc smelters; sulphuric acid at Perth Amboy, N. J., and Garfield, Utah, and coke at its mines. It refines and sells bismuth, cadmium, arsenic, nickel and platinum, palladium and selenium largely from the slimes of its electrolytic refineries, and makes blue vitriol.

It owns and operates ten mines in Mexico. It owns and operates a number of railways in Mexico under the title of the Mine Lines of Mexico, and the Mexican Union R. R.

Following is the list of metallurgical plants of the company:

Lead Smelting

Plant—	Location	Manager	Supt.	Furnaces	(c) Tons
Globe	Denver, Colo.	L. G. Eakins, g. m.	F. Roesser	7	1,800
Pueblo	Pueblo, Colo.	L. G. Eakins, g. m.	G. A. Marsh	7	1,800
Durango	Durango, Colo.	F. C. Gilbert	M. H. Kaufman	3	550
Ark. Valley	Leadville, Colo.	W. B. McDonald	B. Hogarty	10	1,700
Murray	Murray, Utah	C. W. Whitley, g. m.	W. Norton	8	1,900
Helena	Helena, Mont.	F. M. Smith	R. L. Strobel	4	900
Perth Amboy	Maurer, N. J.	H. H. Alexander, g. m.	G. G. Griswold	4	600
Omaha	Omaha, Neb.	Walter T. Page	W. P. Olds	3	750
El Paso	El Paso, Tex.	Kuno Doerr, g. m.	J. Hegrie	6	1,200
Monterey	Monterey, Mex.	C. L. Baker, g. m.	J. R. Enlow	10	1,600
Chihuahua	Chihuahua, Mex.	C. L. Baker, g. m.		5	900
Selby	Selby, Calif.	F. B. Braden, v. p.	E. N. Englehardt	4	800
Federal	Federal, Ill.	Rudolph Porter	O. Ohnsegg	3	270
Velardeña	Amarco, Mex.	C. L. Baker, g. m.	L. B. Harrison	3	450

Copper Smelting

Perth Amboy.. Maurer, N. J.	H. H. Alexander, g. m. J. F. Austin....	1	300
El Paso	El Paso, Tex. Kuno Doerr, g. m. J. Heggle	{2(a) {3(b)	1,900
Aguas Cal's	Aguas Cal's, Mex. C. L. Baker, g. m. A. McL. Hamilton	8	2,000
Matchuala	Matchuala, Mex. C. L. Baker, g. m. C. A. Grabill....	3	600
Hayden	Hayden, Ariz. Kuno Doerr, g. m. J. J. Ormsbee....	2	900
Tacoma	Tacoma, Wash. H. Y. Walker.....	2	1,500
Garfield	Garfield, Utah. C. W. Whitley, g. m. R. F. McElvany..	4(a)	5,200
Saco	Silverbell, Ariz.	6(b)	
Velardena	Asarco, Mex. C. L. Baker, g. m. L. B. Harrison..	3	750

(a) Blast furnaces. (b) Reverberatory furnaces. (c) Daily capacity.

Zinc Smelters

Blende	Blende, Colo.	C. A. H. DeSaulles, g. m. J. D. Thomas... 8	100
Sand Spgs.	Sand Spgs., Okla.	C. A. H. DeSaulles, g. m. F. P. Lannon... 10	130
Henryette	Henryette, Okla.	C. A. H. DeSaulles, g. m. F. P. Lannon...	

Tin Smelters

		Yearly Cap.	
Perth Amboy.....	Maurer, N. J.	3,000 to 5,000 tons	

Refining Plants

Plant—	Location	Yearly Capacity			Copper Tons
		Gold Oz.	Silver Oz.	Lead Tons	
Omaha	Omaha, Neb.	500,000	36,000,000	180,000	.....
	W. T. Page, mgr.; E. B. Lefferts, supt.				
Perth Amboy.....	Maurer, N. J.	500,000	48,000,000	108,000	120,000
	H. H. Alexander, mgr.; G. Griswold, supt.				
Selby	Selby, Calif.	2,400,000	18,000,000	36,000	.....
	E. B. Braden, v. p.; E. N. Engelhardt, supt.				
Federal	Federal, Ill. ....	.....	.....	60,000	.....
	Rudolph Porter, mgr.; O. Ohnsorg, supt.				
Baltimore	Baltimore, Md.	300,000	30,000,000	.....	240,000
	W. H. Pierce, mgr.; C. N. Sappington, supt.				
Tacoma	Tacoma, Wash. ....	.....	.....	.....	72,000
	H. Y. Walker, mgr.; G. A. Kerr, supt.				

The mining properties of the company are under the general charge of Mr. W. M. Drury, general manager; R. F. Manahan, assistant. The operating mines are as follows:

Silver Lake Mine, L. R. Clapp, supt., Silver Lake, Colo.
 Anganguero Unit, A. W. Edelen, supt., Anganguero, Mich., Mexico.
 Charcas Unit, S. F. Shaw, supt., Charcas, S. L. P., Mexico.
 Dolores Unit, E. E. Reyer, supt., Matchuala, S. L. P., Mexico.
 Federal Lead Co., H. G. Washburn, mgr., Flat River, Mo.
 Sierra Mojada, W. B. Gates, supt., Sierra Mojada, Coa., Mexico.
 Santa Eulalia, W. J. Deavitt, supt., Santa Eulalia, Chi., Mexico.
 Santa Barbara, W. P. Schumacher, supt., Santa Barbara, Chi., Mexico.
 Velardena, R. E. Adams, supt., Velardena, Dgo., Mexico.

American Smelters Securities Co.'s properties are all included in the above; the same applies to the National Metallurgical Co., the Tacoma Smelting Co., the Baltimore Copper S. & R. Co., the Selby Smelting & Lead Co., the Federal Lead Co. and the Garfield Smelting Co.

The Federal Smelter is supplied with ores principally from the Company's mining operations in Southeast Missouri. At present the output of ore is, roughly speaking, 1,500,000 tons per annum, which is concentrated into approximately 75,000 tons of concentrates, containing more or less 60,000 tons of lead.

About \$750,000 has been spent in enlarging the milling and smelting

works, and extending the development of mines of the company in Missouri.

The production of pig lead has been increased from 42,000 tons at the beginning of 1916 to 66,000 tons per annum.

The recent installation of an electrolytic zinc plant at the Murray, Utah, smelter, and construction of a 100-ton sulphuric acid plant, using the chamber process, at Garfield, Utah, show that the company is still in the fore in its metallurgical practice.

During 1916 the sulphuric acid plant, with a capacity of over 50,000 tons per annum, was completed, and plans have been made to duplicate this plant as soon as market can be found for increased product.

The plant at Chihuahua is largely supplied with ores from the Company's Mines in the Santa Eulalia and Sierra Mojada Districts of Mexico.

The Velardena Smelters are supplied largely from the Company's Velardena Mines.

Matehuala Smelter handles principally the ore from the Company's Dolores Mines, which are in the same district.

None of the Mexican smelters were operated during 1916.

In October, 1917, it is reported that the smelters at Aguas Calientes, Matehuala, and Monterey, are in operation and several mining units reopened. Company will operate its own trains between Laredo, Tex., and Monterey for transportation of coke, supplies, and bullion. Mexican Government has promised unusual vigilance for protection of railroad.

Company during 1916 entered the mining and smelting business in Chile and bought the Caldera smelter including many mines, imperfectly developed, and the stock of the Carrizal smelter.

A developed mining property in Mexico adjoining the company's mines at Parral was also secured.

The tin plant production is now about 600 tons monthly, and an addition to the plant, now under construction, will increase the production of pig tin to 18,000 tons per annum, in 1917.

With the completion of construction now covered by appropriation, and which should be in operation soon after the middle of 1917, the company will have a capacity for producing 1,800,000,000 lbs. of electrolytic copper annually.

The semi-annual report for 6 months ended June 30, 1917, states that the combined income of the company and its subsidiaries from smelting, refining and mining properties, together with miscellaneous earnings, amounted to \$18,757,900, after deducting various general expense items. This is an increase of \$5,528,841 over similar earnings for the corresponding six months of the preceding year. Against the gross income, as given, various charges amounting to \$8,555,780 reduce the net income to \$10,202,120 as compared with \$11,145,694 reported for the same period of last year.

The charge for depreciation and depletion of ore reserves is \$2,396,174 as against \$1,019,489 for the first half of last year, the new figure being obtained by a more scientific method of estimation, based on a percentage of appraised valuation of the property of the company. Administrative expenses were \$529,027, a slight increase; research and examination expenses were \$86,052, a small decrease. Interest on outstanding American Smelter Securities Co. debenture bonds amounted to \$25,450 and that on the American Smelting and Refining Co. first-mortgage bonds was \$377,483. Miscellaneous profit and loss charges were \$752,033 and an appropriation of \$500,000 was made for an employees' life-insurance fund, the plan of which insurance will be more fully outlined in the next annual report of the company. There was also a charge for corporate taxes, including accrued income tax and estimated excess profits tax, amounting to \$3,-

889,561. Since the law fixing the amount had not been passed, the board of directors were unable to determine whether the estimate would prove too large or too small.

After the payment of the regular dividends, and a special Red Cross dividend of 1% on the common stock, or a total dividend disbursement of \$5,037,049 during the 6 months as compared with \$4,502,734 for the same period of last year, there was carried to the credit of the surplus account a balance of \$5,165,071. This gives a total profit-and-loss surplus of \$28,607,366 on June 30, 1917, as compared with \$26,203,398 on June 30, 1916, or a net increase of \$2,403,968.

The expenditures for increasing the facilities and capacity of various properties, together with the purchase of new properties, amounted to \$3,794,647, which amount has been charged to a reserve account of \$6,000,000 established for the purpose from the earnings of the year 1916. The property account has been decreased by the amount charged to depreciation and depletion of ore reserves and by certain small miscellaneous credits, making a total decrease of \$2,409,140 since Dec. 31, 1916, which leaves a total property account of \$138,756,545 on June 30, 1917. The investments in securities of other companies amounted to \$1,744,174, or an increase of \$916,897 over the previous six months, representing investments in mining properties in the United States and also in Chile, as well as coal properties and plants for the manufacture of chemicals, details of which will be given in the next annual report of the company.

"For the first time in 3 years or more the company is receiving a net income from its Mexican properties. All the mines and smelters in Mexico are now operating, except those at or near Chihuahua and those at Velardeña. Work is carried on under many difficulties and as yet only to a limited extent. The government of Mexico is anxious for the company to succeed and laborers are more than willing to work. However, on account of the high cost of living, they are suffering to even a greater extent, comparatively, than the inhabitants of the United States. It is estimated that in Mexico the price of necessities is at present six times greater than during the period preceding the revolution. To meet this situation the company is importing and selling such necessities to the laborers at cost, or lower, and has largely increased the wages paid. Transportation is the greatest difficulty, to overcome which the company has purchased the necessary cars and locomotives and, under the permission of the Mexican government, is managing its own railroad transportation. As the business of the company in Mexico promotes the general welfare of the country, by the payment of freight and taxes to the government and the employment of the people, the board of directors has felt that all difficulties should be overcome without regard to temporary profits. It is considered that, as long as the high prices of metals continue, the company will be amply repaid."—(E. & M. Journal).

The American Smelting & Refining Co. is the largest general smelting and metallurgical enterprise in the world. The company continues to expand and prosper, mainly because of its superior metallurgical and business ability, backed by large and modern works and adequate capital.

American Sm. Securities Co. United States & Mexico

Office: 120 Broadway, New York.

Inc. March 25, 1905, in New Jersey, and name changed to present title, May, 1905. Cap., \$77,000,000 shares \$100 par, in \$17,000,000 Series A cumulative 6% preferred stock; outstanding Dec. 31, 1916, \$16,649,800; \$30,000,000 Series B cumulative 5% preferred stock, and \$30,000,000 common stock

Series A has preference as to dividends, and both preference series have equal rights as to assets, both having priority rights to assets and dividends over common stock.

Is controlled by American Smelting & Refining Co., through the ownership of the entire issue of common stock, and the American Smelting & Refining Co. guarantees the Series B. preferred stock.

Financial statement is consolidated with that of A. S. & R. Co., which see.

Owens in fee mines in different districts in Mexico, and copper and lead smelting and refining plants in the United States. It also owns all or a controlling part of the stock of a large number of subsidiary companies.

The A. S. & R. Co. owns all the common stock of the American Smelters Securities Co. The bonds of the latter company have been redeemed. The 5% cumulative-preferred stock, series B, of the Securities Co. is guaranteed by the Smelting Co., both as to interest and principal, and is, therefore, an obligation of the Smelting Co., prior to its preferred stock. After mature deliberation, the directors decided that it would be to the interest of the Smelting Co. to acquire the Series B preferred stock of the Securities Co. by offering its 1st mtge. 5% bonds in exchange for the series B, 5% preferred stock of the Securities Co., par for par. Accordingly, the Smelting Co. made such an offer to holders of preferred stock, series B, of the Securities Co., the plan to be declared operative in case an amount of the series B preferred stock, in the judgment of the Smelting Co., sufficient to justify it in making the exchange, shall be deposited. This offer remained open until March 14, 1917.

AMERICAN, ZINC, LEAD & SMELTING CO.

General offices: 55 Congress St., Boston, Mass. Sales office: 120 Broadway, New York City. Operating office: 1012 Pierce Bldg., St. Louis, Mo. Corporate office: 85 Exchange St., Portland, Maine.

Officers: C. W. Baker, pres.; L. A. Coolidge, C. A. Hight, P. E. Coyle, W. F. Rossman (in charge of smelters), and J. N. Houser (in charge of mines), v. p.'s; F. W. Batchelder, sec.; S. E. Farwell, treas.; M. A. Donovan, asst. sec.-treas.; William A. Ogg, comptroller; H. L. Smith, gen. aud.; H. I. Young, mgr. Missouri mines.

Directors are E. P. Brown, E. A. Clark, Galen L. Stone, Charles Hayden, N. B. MacKelvie, C. W. Baker, W. H. Coolidge, J. N. Lovell, F. Lothrop Ames, L. A. Coolidge, B. P. Bole, C. A. Hight, F. H. Goff, and H. S. Kimball. Transfer agents: F. W. Batchelder, 55 Congress St., Boston, Mass., and Guaranty Trust Co., New York. Registrars: First National Bank, Boston, Mass., and Bankers Trust Co., New York.

Inc. Jan. 26, 1899, in Maine. **Cap.**, \$500,000; shares \$25 par; increased on April 22, 1899, to \$2,500,000; on October 16, 1906, decreased to \$1,250,000; on December 18, 1906, increased to \$3,750,000; on April 10, 1912, increased to \$7,500,000; outstanding December 31, 1915, \$4,828,000. At the annual meeting in April, 1916, the authorized capital stock consisting of \$7,500,000, divided into 300,000 shares of the par value of \$25, was classified as follows: 100,000 of the authorized shares unissued and in the treasury at that date were classified as pfd. stock, and the remaining 200,000 shares were classified as common stock, so that the present authorized capital consists of 100,000 shares of pfd. stock and 200,000 shares of common stock. Stock is listed on Boston and New York Stock Exchanges. Annual meeting, second Wednesday in April.

Balance sheet of American Zinc and subsidiaries for year ended Dec. 31, 1916 shows assets totaling \$20,591,841, including property accounts, \$12,-

310,404, investments \$1,637,616, insurance-fund investments \$41,953, advances to subsidiaries \$300,000, current \$6,230,781, and deferred charges \$71,087. Liabilities include \$7,242,000 pfd. and com. stock, \$2,000,000 first-mortgage 5%, 10-year gold bonds, \$4,561,911 depreciation and reserve funds, \$1,841,661 current, and \$4,904,316 surplus. Excess of current assets over liabilities was \$4,389,120 at end of 1916.

Profits from sales of zinc and lead ores, spelter, sulphuric acid, royalties, etc., totaled \$9,307,968 in 1916. Adding surplus from 1915 there was available \$15,163,609. Of this, \$4,976,490 was paid in dividends, \$2,006,000 transferred to depreciation and reserve funds, and \$3,282,644 applied to purchase of the Granby properties. The surplus carried forward to 1917 was \$4,904,316.

Dividends: have been \$2 in 1899, \$1 in 1900, \$1.25 in 1907, \$1.50 in 1910, \$2 in 1911 and 1912 and \$1 in 1913. In June, 1916, a stock dividend was declared, each share of com. stock issued received one-half share of pfd. stock, equivalent at par to \$12.50. The pfd. stock is entitled to cumulative dividends of \$6 per annum. In the event of any liquidation or dissolution of the company, holders of the pfd. stock are entitled to be paid \$100 per share and accrued dividends. During 1916, \$3 per share was paid upon the pfd. and in 1917 \$1.50 quarterly on the pfd. stock.

The Amer. Zinc, Lead & Sm. Co. is an operating and holding company, owning the following: Amer. Zinc Co. of Tenn., Amer. Zinc Co. of Ill., Amer. Ballast Co., Amer. Pipe Line Co., Amer. Zinc Ore Separating Co., and 649,774 shares of 925,000 shares issued of the Wisconsin Zinc Co. These companies are listed under their own title but are described below.

In 1916 company purchased all the assets of the Granby Mining & Smelting Co., consisting of about 30,000 acres of mineral lands in the Joplin district, Missouri, 10,000 acres of coal lands in Illinois, a zinc smelter at East St. Louis, Ill., a zinc smelter at Neodesha, Kan., and a lead smelter at Granby, Mo. All of the above are described below.

Property: in the Joplin district, Mo., the company owns 32,160 acres of mineral land. The principal operations are at the Davey mines on the 655-acre Davey property, the Vogey mine on a 40-acre tract in the Porto Rico district, the Klondike, Mascot, and Golden Rule mines near Granby, Mo., a 600-ton custom mill near Granby, Mo., and the B. & H. Mine near Joplin. There are 4 mines in the Davey group, 2 worked out and 2 producing.

The ore, sulphides of lead and zinc, occurs in bands between the barren zones of flint that comprise the Grand Falls chert. It is from this formation that the term "sheet-ground mines" is derived, and in it the ore is generally uniform in character and covers large areas. In the Davey mines, 124 acres have been mined out in one continuous chamber. Ore faces are from 14 to 20' in height.

Development is by means of 6 vertical 2-compartment shafts, all in the ore formation. Two shafts are used for mining purposes, and 4 for ventilation. The ore level is at 250' depth. The ore is very low grade, zinc concentrates recovered representing 1.79% and the lead concentrates 0.67% of rock treated. Ore output has been approximately 50,000 tons ore per acre, from 15% to 20% ore being left as pillars. Timbering is not necessary. The blanket formation permits of development, in wide areas, average yearly advance on all faces in the mine is 125'.

There are 2 mills on the property, No. 3 mill of 1,200 tons ore and No. 4 mill of 1,000 tons ore daily capacity.

The Vogey mine is similar to the Davey. Operations have been irregular, depending on price of zinc and lead concentrates. Zinc concentrates

recovered represent 1.76% and lead concentrates 0.20% of rock hoisted. There is a mill on the property, with daily capacity of 1,000 tons.

The Klondike, Mascot, and Golden Rule mines are in sheet ground formation. Recovery in zinc concentrates represents from 2 to 4% of rock hoisted. The Klondike is developed by 3 shafts and equipped with 1,000-ton mill. The Mascot is developed by 3 shafts, and equipped with 350-ton mill. The Golden Rule is developed by 1 shaft and equipped with 300-ton mill. The B. & H. mine, near Joplin, is developed by 1 shaft and equipped with 250-ton mill. All mills are operated by electric power, with the exception of the B. & H., which has a steam plant.

There are also many mines being operated under lease on a royalty basis on the company's lands in the Granby district. An extensive drilling campaign is being carried on to determine values and possibilities on holdings in the district.

The company owns 3 smelting plants in the gas belt at Caney, Dearing, and Neodesha, Kan. At Caney there are 6,080, at Dearing, 4,480, and at Neodesha, 3,760 retorts. Combined yearly capacity is 150,000 tons of concentrates. The company also leases from the Owen Zinc Co. at Caney, Kan., two blocks of furnaces and in 1916 added one furnace block, making a total of 1920 retorts. The life of these smelters depends upon the fuel-supply of natural gas, now obtained from the Oklahoma-Kansas field. The Caney and Dearing smelters were closed down Sept., 1917.

The company also owns a small lead smelter with a yearly capacity of 10,000 tons of ore at Granby, Mo.

Subsidiary Companies

American Zinc Co. of Tennessee

O. C. Burrell, mgr., Mascot, Tenn.

Inc. Feb. 24, 1911, in Maine. Cap., \$10,000; shares \$1 par, all owned and issued by A. Z. L. & S. Co.

Principal mining operations of the Tennessee Co. are at Mascot, Knox Co., where the company owns 2,400 acres land, and in Jefferson Co., adjoining Knox Co. on the east, where company owns 400 acres of land.

Orebodies of the Mascot mines occur in the Knox dolomite, dip 15° to 30° south and strike north of east, in lenses of varying sizes and in well-defined brecciated areas which lie in certain recognized zones or bedding planes. The ore is a light colored sphalerite. The zinc formation may be followed for many miles from Knoxville, in an easterly direction. In 1910 the company obtained an option on the Holston property, started drilling and proved up a large tonnage of pay ore. A 3-compartment shaft, mine No. 1, was sunk in 1911 and the orebody developed in 1912. The main orebody is developed on the 280' level, and, as exposed, is 1,300' long, 700' to 880' wide, and 30' to 40' thick. Limits of the orebody have not been reached by development to date. In 1913 a 4-compartment shaft, mine No. 2, was sunk 2,000' east of No. 1 and a second orebody developed, with length of 1,500', thickness of 40' to 125', width of 300' and limits not yet reached. Average grade of ore as shown by drill records is 5% to 5½% zinc. Greatest depth of workings, 800', is at mine No. 2. A tramway connect No. 2 mine with No. 1 mill. Development has shown the ore to be continuous between No. 1 and No. 2 orebodies. Further drilling 3,000' east of eastern limits of mine No. 2 has indicated a third orebody; this will not be developed until some future time.

Mining methods at the Mascot mines are described by H. A. Coy and H. B. Henegar in the Sept., 1917, *Bulletin of American Institute of Mining Engineers*. Costs total 70c per ton.

From the east to west the ore development as now shown is 7,900' in length. There has been blocked out 4,000,000 to 5,000,000 tons of ore which will average 4% zinc.

In May, 1913, mill No. 1, with 1,000 tons daily capacity, was completed. Additions to this mill were finished in July, 1915, bringing its daily capacity up to 2,200 tons. It is now treating over 2,400 tons daily. On the Roseberry property adjoining the Holston on the west, Mascot No. 3 mill has been completed having a daily capacity of 700 tons. Mill equipment at Mascot consists of crushers, rolls, jigs and tables, followed by flotation treatment of slime and fine sand. Mascot No. 1 mill is being enlarged by addition of 55 tables, jigs, etc.

Power is obtained from the Tennessee Power Co.

Mascot concentrates average about 60% zinc and are very high grade, in fact, the lowest in lead and iron of any produced in quantity in the U. S., the spelter produced therefrom commands a substantial premium per pound over Prime Western quotations.

The company has developed the town of Mascot, owning 350 houses, a company store, and hotel.

Mossy Creek mine at Jefferson City was opened during 1916, and ore is being shipped to Mascot No. 1 mill for treatment.

A modern plant was built near No. 1 mill during 1916 to prepare agricultural limestone, asphalt-filler and fertilizer, from tailings from the Mascot concentrating mills.

American Zinc Co. of Wisconsin

A. M. Plumb, mgr., Platterville, Wis.

Inc. June 27, 1908, in Maine. Cap., \$1,000,000, shares \$1 par, issued 925,000 shares, owned by A. Z. L. & S. Co., 649,774 shares. Property: in S. W. part of the State in the Wisconsin district. The ore deposits exist in the forms of flats and pitches, the flats being horizontal deposits along the bedding planes of the rocks, while the pitches are dipping crevices. The chief deposits lie in the lower part of the Galena limestone at a depth of 100' to 200' and vary in length from 1,000' to 5,000', in width from 30' to 300', and in height from 12' to 60'. The ores consist of the sulphides of zinc, lead and iron, the latter in the form of marcasite.

The principal operations in the Wisconsin field are as follows:

Champion property, 434 acres, on which there has been developed an orebody 1,500' long, 800' wide, and 40' high. A mill of 500 tons daily capacity is in operation.

Winskell mine, operated on leased land, 10% of gross output going to the land owners. A mill of 450 tons daily capacity is in operation. Total production to end of 1914 was 31,089 tons zinc concentrates, averaging 36.51% zinc, and 1,073 tons lead concentrates, averaging 76.28% lead.

The life of the Champion property, with its surrounding leases, as estimated at present, is from 5 to 10 years.

Longhorn property, operated on leased land at 10% royalty, has ore reserves of 175,000 tons high grade ore. The 350-ton mill is in operation.

The Thompson mine, operated on leased land at 10% royalty, has ore reserves of 200,000 tons high grade ore; equipped with 350-ton mill.

Company owns a number of other leases in the district on which valuable ore reserves have been proved by drilling. The Copeland property will be developed by shaft and equipped with mill in the near future.

The life of the Champion property, with its surrounding leases, as estimated at present, is from 5 to 10 years.

The policy of the company is to maintain a drilling campaign for

new orebodies, with the purpose of keeping 5 to 10 years' production in sight.

The low grade of concentrates in the Wisconsin district necessitates treatment by means of partial roast and magnetic separation. The company has a plant for this purpose, equipped with a 7-hearth roaster of the Skinner type near the Champion property. This plant has 200 tons daily capacity, producing a finished concentrate assaying 58 to 60% zinc.

American Zinc Co. of Illinois

Inc. Aug. 15, 1911, in Maine. Cap., \$10,000, shares \$1 par, all issued and owned by the Am. Z. L. & Sm. Co.

Property: at Hillsboro, Ill., consists of 600 acres, on which has been built a modern smelter plant of 4,800 retorts furnace capacity, capable of distilling 48,000 tons of concentrates per year; 3 Hegeler muffle kilns, pottery, machine-shop, warehouse, ore storage bins and sulphuric acid plant producing 45,000 tons of 60° acid annually; also a zinc-oxide plant of 24 furnaces, with auxiliary buildings.

East St. Louis property consists of 143 acres, on which is a modern smelter plant of 5,600 retorts capacity, capable of treating 54,000 tons of concentrates annually; Hegeler and De Spirlet roasting kiln, pottery, sulphuric acid plant, oxide plant of 8 furnaces, with auxiliary buildings. Sulphuric acid plant produces 50,000 tons 60° sulphuric acid annually.

American Ballast Co.

Mascot, Tenn. Inc. Nov. 9, 1911. Cap., \$2,000, shares \$1 par, 5 shares issued and owned by Am. Z. L. & Sm. Co. The company disposes of mill tailings of the Mascot mill of the Amer. Zinc Co. of Tenn. Table and flotation tailings are sold for fertilizing purposes, other tailings are sold for railroad ballast, road construction, etc.

American Pipe Line Co.

Inc. June 16, 1910, in West Va. Cap., \$50,000, shares \$100 par, all issued and owned by A. Z. L. & Sm. Co. Property consists of gas lands, and leases, gas wells and oil wells, located in the southeast corner of Kansas, near the Caney and Dearing smelters, the gas rights on 181,000 acres in Osage Co., Okla., and a system of trunk pipe-lines in Kansas and Oklahoma with the necessary feeders. There are over 60 miles of main pipe-line, 12" diam., now laid and connected up with smelters.

American Zinc Ore Separating Co.

Inc. Oct 13, 1908, in Maine. Cap., \$25,000, shares \$5 par, all issued and owned by A. Z. L. & Sm. Co. This company owns certain patents for the separating of zinc ores by the Huff electrostatic methods. Its business is to lease machines constructed under these patents on a royalty basis. Companies using Huff process are as follows:

Zinc: U. S. Sm., Ref. & Mng. Co., Midvale, Utah; Carnegie Lead & Zinc Co., Cananea, Mex.; Kittimac Mng. Co., Silverton, Colo.; Mary Murphy G. Mng. Co., Romley, Colo.; Sunnyside Mines Co., Eureka, Colo.; Pinos Altos Mng. Co., Pinos Altos, N. M. Copper: Tilt Cove Mng. Co., St. Johns, Nfld.; Det Metallurgiske Akt., Bergen, Norway. Graphite: Flaketon Graphite Co., Flaketown, Ala.; Jennings G. Co., Alabama G. Co., Ashland, Ala.; National G. Co., Toronto, Can. Misc.: Carborundum Co., Niagara Falls, N. Y.; Soc. Francaise des Metaux, Australia. Testing Plants: University of Illinois, Urbana, Ills., and Canadian Dept. of Mines, Ottawa, Can.

Granby Mining & Smelting Co. of Missouri

Granby, Newton Co., Mo. Inc. in 1864. In June, 1916, net quick assets exceeded \$2,750,000, of which nearly \$1,000,000 was in cash; current liabilities, less than \$300,000. Reported in June that company had declared a dividend of \$2,000,000 in the form of 10-year, 5% bonds, secured by mortgage of its real estate, and the company subject to this mortgage, had been taken over by the Granby Co. of Maine, to be then taken over by the American Zinc, Lead & Smelting Co. Purchase price, \$8,000,000. The \$2,000,000 bond issue has been taken as part payment; and it is proposed to furnish \$2,000,000 additional by an issue of 40,000 shares of common stock of the American Z. L. & Sm. Co., to be offered stockholders at \$50, stock to be underwritten without commission; remaining \$4,000,000 to be paid for out of earnings. Value and earning capacities of properties based on a 5-ct. spelter market.

Property: owns in fee simple about 30,000 acres of land in the zinc district of southwestern Missouri. For nearly 50 years its revenue has come from royalties paid by lessees operating on these lands. Within the past 3 years it has itself developed a large tonnage of rich ore near Granby. Company has been a dividend payer almost from its inception, and has, out of earnings, acquired 10,000 acres of coal land in Illinois; built a new coal zinc smelter and sulphuric acid plant in East St. Louis; bought and improved a gas zinc smelter at Neodesha, Kansas, and acquired a small lead smelter at Granby.

All the sulphuric acid output has been sold up to and through 1920
GENERAL DEVELOPMENT CO.

Offices: 61 Broadway, New York.

Officers: Adolph Lewisohn, pres.; J. Parke Channing, v. p.-cons. engr.; Theo. L. Herrmann, sec.; Sam A. Lewisohn, treas.; preceding officers, Samuel Untermyer, Herman Sielcken, D. M. Hyman, W. T. Rosen, A. S. Rossin, J. H. Susmann, E. H. Westlake, Arthur Lehman, B. Hochschild, F. W. Estabrook and S. S. Rosenstamm, directors.

Inc. 1906, in Delaware. **Cap.,** \$2,000,000, increased to \$2,500,000, increased 1909 to \$2,600,000, and again increased, 1913, to \$3,000,000; shares \$25 par, nonassessable; 120,000 shares issued. Equitable Trust Co. of New York, registrar. Dividends paid 1908, 1½%; 90% in 1909, 15% in 1910; 1½% in 1913; 6% in 1915; 23% in 1916; 25% to Sept., 1917, a total of 170%. Balance sheet of Dec. 31, 1916 shows a surplus of \$2,043,397.

Company is a securities holding corporation, which owns nearly one share of Miami stock for each issued share of its own, and also owns a large block of dividend paying Kerr Lake stock, and of New Cornelia Copper. It also controls, through stock ownership the Colorado Gold Dredging Co., San Cayetano Mines, Ltd., and Naumkeag Copper Co. The increase of capitalization, 1913, was to finance the merger of the Silver Mines Exploration Co., the corporation which developed and promoted the Kerr Lake and Wettlaufer-Lorrain companies of Cobalt, Ont. Company has extensive stock interests in New Planet Copper Co., Bagdad Copper Co., with other mining interests in the United States, Canada and Mexico.

The General Development Co. is a parent corporation, examining, developing and financing mining properties which, when they have reached the self-supporting producing age, are turned over to operating companies. It is a powerful factor in the copper industry, and with the wide experience and astute guidance of Mr. Adolph Lewisohn, combined with the technical skill and great ability of J. Parke Channing, its consulting engineer, promises to become increasingly important.

Company's most recent venture is the Jerome Copper Co., organized to explore and develop the Hooker-Ewing group, south of Jerome and the Mayer-Belford group near Mayer, Ariz. Described under Jerome Copper Co. in Arizona section of this volume.

GOLD FIELDS AMERICAN DEVELOPMENT CO., LTD.

Offices: 233 Broadway, New York, and 8 Old Jewry, London, E. C., England.

Officers: S. Christopherson, chairman; E. S. Birkenruth, Lord Bourne, Lord Harris, J. C. Prinsep, and H. L. Sapte, directors. Advisory committee in America: J. McDougall, Alfred de Ropp, and H. H. Webb.

Inc. March 10, 1911, in England. **Cap.**, £2,500,000; shares 10s. par; 2,000,000 issued, 1,000,000 being fully paid and 1,000,000 with 10s. called.

Company acquired from Consolidated Gold Fields of South Africa, Ltd. (which see) latter's interests in America, including shares in Natomas Consolidated, Oroville Dredging, Sierra Pacific Electric, Mississippi River Power Co., Yuba Consolidated Gold Fields, Granville Mining, Vera Cruz Mexican Oil, Trans-continental Consolidated Oil, International Petroleum Co., Foreign Mines Development, La Grange Mining, American Trona Corp., and others. The mining companies named herein will be found described under their respective titles.

GUGGENHEIM EXPLORATION CO.

Dissolution completed in 1916. See previous volumes for past operations, also American Smelting & Refining Co., Braden Copper Co., Chile Copper Corporation, and Kennecott Copper Corporation.

INTERNATIONAL AGRICULTURAL CORPORATION

Office: 61 Broadway, New York City.

Officers: S. B. Fleming, pres.; Albert French, v. p.; J. J. Watson, Jr., v. p.-treas.; F. F. Ward, v. p.-asst. sec.; J. R. Floyd, sec.-asst. treas.; with G. B. Case, T. W. Lamont, W. Schmidtman, E. R. Stettinius, D. E. Pomeroy, F. M. Weld, and A. H. Wiggin, directors.

Inc. June 14, 1909, in New York. **Cap.**, authorized 7% cumulative preferred \$8,000,000, and \$18,000,000 common. Issued \$13,055,500 pfd., \$7,308,500 com., and \$10,725,000 in bonds.

Assets total \$33,709,437, including \$21,384,935 for real estate and plant. Gross profits in 1916 amounted to \$2,944,237, which was \$745,000 ahead of that for 1915. The net profit was \$1,034,054. In 1913 there was a loss of \$161,493. In 4 years, \$1,480,815 was written off for rock depletion and general depreciation, while \$1,062,576 was spent on new plant.

Company has 18 large acidulating and fertilizer plants, mostly in the South, a large number of distributing plants, and holds 50% interest in some German potash mines.

Property: 42,226 acres of phosphate lands in Florida; also extensive areas in Tennessee. In 17,000 acres explored, reserves are estimated at 41,500,000 tons. In all properties there is supposed to be nearly 100,000,000 tons. To make this rock soluble, sulphuric acid, bought from the Tennessee Copper Co., is mixed with it.

INTERNATIONAL METALS SELLING CO.

Is a subsidiary of the U. S. Smelting, Refining & Mining Co. and managed by Vogelstein & Co., 42 Broadway, New York.

INTERNATIONAL SMELTING CO.

Office: 42 Broadway, New York.

Officers: Cornelius F. Kelly, pres.; Wm. D. Thornton, 1st v. p.; L. D. Ricketts, 2nd v. p.; Albert H. Melin, treas.; with C. E. Mills, Benj. B. Thayer, and John D. Ryan, directors. David B. Hennessy, sec. J. B. Whitehill, ore purchasing agent.

Inc. in Montana. Cap., \$15,000,000. Stock entirely owned by Anaconda Copper Mining Co. Company is a reorganization of the International Sm. & Ref. Co.

Company operates smelters at Tooele, Utah and Miami, Ariz., the Raritan Copper Works at Perth Amboy, N. J., and the smelter of the International Lead Refining Co., at East Chicago, Ind.

Miami Smelter

The Miami smelting plant, Miami, Ariz., C. E. Mills, gen. mgr.; L. R. Wallace, supt., built primarily to smelt the concentrates produced by the mills of the Inspiration Cons. Copper Co. and the Miami Copper Co., is equipped to handle custom ores. The plant is situated about a mile E. of Miami and 6 miles W. of Globe, on the Inspiration Co.'s Industrial Ry., connecting with the Arizona Eastern R. R. at Miami.

The smelter is essentially a reverberatory plant, which on account of the high copper content of the concentrates treated has been built to minimize losses in the handling of material from one department to another, and the prevention of dust losses, as far as possible.

Material from both Miami and Inspiration mills is largely flotation concentrate hauled to the smelting plant in 60-ton steel cars especially designed to handle sticky fine material of this nature.

Bins: Concentrates are first bedded in three 3,000-ton V-bottom bins with the necessary limestone, pyrite, first-class ore and secondaries to give a proper smelting mixture. First-class ore goes to receiving bins with capacity of 1,350 tons.

Crushing and Sampling Plant: 22'x40', 5-stories high, contains: 1 18"x30" Blake crusher; 1 set 54"x16" rolls; 3 sets 42"x16" rolls; 1 16" Snyder sampler; 3 27" Snyder samplers; 2 24"x8" rolls.

Steel storage bins of 1,500 tons capacity are provided for the storage of crushed ore and fluxing material.

Roaster and Dryer Plant: 67'x97' and 93' high, contains 5 Wedge roasting furnaces, 22'6" in diam., each having 5 regular hearths and a dryer hearth. Oil burners operating in combustion chambers supply the heat for drying. No roasting is permitted, as the sulphur content of the concentrates is so low that it is necessary to add pyrite to keep matte down to a proper grade.

Each furnace is fed from a 190-ton storage bin directly over it. The gases pass directly to a header flue, and then into Cottrell treaters located above the charge floor. The Cottrell treaters in this plant practically prevent the loss of any flue dust.

Reverberatory Plant: the reverberatory building, 134'x176', contains 3 reverberatory furnaces with hearth areas of 21'x120'. The furnaces are oil fired and discharge their gases through Stirling boilers, according to the usual practice. There are seven 712-h. p. waste heat Stirling boilers.

Converter Plant: is 58'x380'x49' to the top of crane rail. Two 40-ton magnet switch controlled electric traveling cranes are provided.

The plant contains 5 converter stands of 12' electrically operated Great Falls type converters; 2 straight line casting machines with 5'6"x16'6" tilting furnaces, 1 skullbreaker, etc. Silica bins filled by belt conveyors discharge into weighing hoppers, which measure out a pre-determined charge, delivering it directly into the mouth of the converter through pivoted spout.

The gases from the converters are passed through Cottrell treaters, before being discharged into the chimney, which give a high recovery of the precious metal values contained in the gases.

Power Plant: at the smelting works is operated by the Inspiration Co., the smelting plant selling its steam to, and purchasing its power from the Inspiration company. The power plant buildings are of steel and reinforced concrete construction throughout. The main units consist of three 6,000-k. w. Turbo-Generators and 3 cross-compound, 15,000 cu. ft. blowing engines, switchboard, etc. Modern auxiliary apparatus is provided for condensing, automatically measuring steam and feed water, recording temperatures, pressures, etc. The boiler house contains six 712-h. p. oil fired Stirling boilers equipped with superheater and economizer.

The plant operates at very high efficiency.

Shops, Offices, Etc.: a steel shop building, equipped with traveling crane, is divided into four departments, viz., machine, blacksmith, boiler, electrical and carpenter shops, all well equipped with modern tools.

The warehouse building and general office and laboratory buildings are of reinforced concrete throughout and there are 8 reinforced concrete cottages at the smelting plant for its staff. Water for the plant is obtained from the Inspiration Co.'s water main.

On account of the high copper contents of the concentrates which the plant receives, it has a production capacity of 16,000,000 lbs. of copper per month, with spare reverberatory furnace and converter stand.

During 1916 the plant treated 295,075 tons of concentrates and 37,891 tons of custom ores, a total of 332,966 tons. This yielded 181,518,396 lbs. of copper, 257,543 oz. of silver and 2,882 oz. of gold.

Tooele Smelter

Tooele Smelter: Wm. Wraith, gen. mgr., Kearns Blk., Salt Lake City, Utah. The smelter is $6\frac{1}{2}$ miles from Tooele Junction on the main line of the Los Angeles & Salt Lake Railroad, where connection is made with the Tooele Valley railroad, and plants and yards cover one-half square mile.

Crushing and sampling 5-story building, 2 complete sections using the Brunton system of sampling, contains 8 Blake type crushers, 9 to 12"x15 to 24" in size and 8 rolls, 12 to 15" wide and 26", 42" and 48" diameter. Each sampling section contains 4 Brunton sample cutters. In the copper plant ore is crushed to $\frac{3}{8}$ ", conveyed from sample mill to roaster storage bins (5,000 tons capacity) by belt conveyor, thence to roaster feed hoppers by belt conveyor.

Copper Department: The McDougall roaster building contains 2 sections, each 64x162' and holding 32 furnaces. These furnaces are 16' in diameter, 18' high and have 6 hearths. Roaster gases pass through a 120x140' hopper bottomed brick dust chamber 30' high above hoppers, containing two 4' banks of wires; thence through brick flue 255' long to stack. The brick stack is 350' high and 25' inside diameter at the top. The reverberatory plant receives the calcine by electric tram system. It contains 5 coal-fired furnaces, Anaconda type, 1 with 19'x90' hearth, 4 with 19'x102' hearths. Each furnace is equipped with 750-h. p. waste-heat Stirling boiler. Gases go through a brick flue 1,360' long to stack.

The converter plant has 5 electric-driven stands for 96x150" shells and a 60-ton crane. Converter shells are lined with magnesite brick. Copper is cast in steel moulds by 30-ton crane. Slag is cast in beds and broken up and sent to the lead blast furnaces. Gases from plant go through a steel flue to a 50x126' brick bag house containing 960 31x1'6" woolen bags. From the bag house the gas is discharged through a 150' stack 15' in diameter at the top.

The power house contains 2 Corliss engines direct-connected to 250-k. w. 500-v.d.c. generators; 2 vertical triple-expansion engines direct-connected to 750-kva. 2,200-v. generators; 2 converter blowing engines, 15 lbs. air; 1 steam-driven 90-lb. air compressor; 1 electric-driven 90-lb. air compressor; 2 No. 10 Roots blowers, direct-connected to tandem compound Corliss engines; one 750-k. w. Westinghouse-Parsons turbo-generator; and 2 Leblanc condensers and necessary auxiliaries. Condensing water is cooled in natural draft cooling tower. In addition to the waste-heat boilers, there are 3 hand-fired 350-h. p. Stirling boilers.

Lead Department: The lead plant contains blast furnaces, sinter plant and charge bins. There are 26 double steel bins with a capacity of 10,000 tons of ore and concentrate, receiving material from the crushing plant by belt conveyor. Fine concentrates and ores already sampled can be dumped direct. Charges for blast furnaces and sinter machines are weighed in scale hoppers and dropped into charge cars, going direct to furnaces, but sinter charges go by car to a hopper-feeding belt conveyor delivering to sintering machines.

The sinter plant contains 10 Dwight-Lloyd machines, 42x264", rated capacity 100 tons per day per machine. Sinter from machines goes to blast-furnace charge bins by standard railway cars.

The blast-furnace plant is a steel and concrete building with two 45x180" and two 60x180" furnaces whose daily capacity averages 250 tons of charge. Gases pass to brick bag house containing 1,440 bags, lead to dressing plant and the lead-copper matte to the converter plant. A slag settling furnace is being erected. The dressing plant has four 30-ton kettles and uses a Howard press.

Tooele Valley railway has 7 miles of main line; 1 locomotive, 6-wheel switching type, 57 tons weight; 1 locomotive Mogul type, 60½ tons weight; 2 locomotives, Consolidation type, 96 tons; 30 steel hopper-bottom ore cars; 3 flat cars and 4 passenger coaches.

This plant has a fully-equipped assay office and laboratory, shops, weather observation department, emergency hospital, offices, etc.

Industrial equipment consists of four 18-ton and four 12-ton electric locomotives, with necessary slag trucks, matte trucks, calcine and coal cars. All buildings are of steel and concrete construction.

The plant was enlarged during 1916.

The smelting practice of copper ores largely follows Anaconda methods. The sulphide fines are roasted with a certain amount of silicious ore added upon the fifth hearth of the roasters to heat the ore and keep the temperature at the right point. The ore is roasted down to .7% sulphur corresponding to a matte fall of 15 to 18 tons per day. The reverberatory slag, carrying 40 to 42% silica, is tapped at the back of the furnace and the matte, carrying 20 to 30% copper, conveyed in ladles to the converters. The converters, when operated only on day shift, are kept hot over night by filling them with cinders from the reverberatory furnaces. Silica is applied to the converter in lump ore, 2 boats to each 8-ton charge. The bag-house dust from the smelter fumes is removed by reversing the fan and direction of current, drawing the dust into the chamber beneath.

The completion of the Utah Metal Mining Co.'s 11,000' tunnel in 1913, gives direct connection with the Bingham mines. In 1916 the plant treated 442,756 tons copper ore, 421,197 tons lead ore. **Production:** 20,041,089 lbs. fine copper, 117,976,091 lbs. lead, 5,549,777 oz. silver, and 40,009 oz. gold.

Raritan Copper Works

The Raritan Copper Works: E. C. Clark, supt., Perth Amboy, N. J., is on New York harbor. Completed 1899, and since enlarged repeatedly,

it is one of the largest and most modern electrolytic copper refineries in the world:

The smelting department consists of one 200-ton, one 150-ton and one 100-ton furnaces for casting anodes, and two 225-ton, one 150-ton and two 100-ton furnaces for casting wire bars, ingots and cakes.

The electrolytic refinery includes 2 tank houses with their respective power houses; power consumption being about 7,000 k. w. The department has special shears for trimming cathode sheets and Morrow loop machines for attaching copper lugs to the cathode starting-sheets.

The tank house No. 1 has 1,800 tanks and a capacity of 22,000,000 lbs. per month. The general arrangement and method of operation is very similar to that in No. 2 tank room. This room is 210x582'.

No. 1 power house, which furnishes power for No. 1 tank room, contains four 1,000-k. w. Nordberg triple-expansion Corliss engines and Allis-Chalmers barometric condensers. The engines are direct-connected to 1,000-k. w. electric generators, 2 being furnished by the General Electric Co. and 2 by the Crocker-Wheeler Co.

No. 2 tank house has 3 bays running lengthwise, with two 10-ton 3-motor Whiting cranes in each bay, equipped with special devices for handling an entire tankful of anodes or cathodes at 1 load. There are 3 electric circuits running lengthwise, 1 in each bay, each circuit of 396 tanks being handled from the power house by an electric generator. Current is 7,500 amperes, giving a current density of 20 amperes per sq. ft. The main conductor has a cross-sectional area of 12 $\frac{3}{4}$ ". There are 1,188 depositing tanks arranged in 108 nests of 11 cells each, with electrode arrangement on the Walker system.

In 1916 the plant treated 233,956 tons copper bullion, and 4,531,771 oz. silver bullion. Production: 462,666,262 lbs. fine copper; 18,606,866 oz. silver, and 167,024 oz. gold.

International Lead Refining Co.

Wm. Wraith, gen. mgr.; G. P. Hulst, supt.; has an extensive plant located at 151st St. and McCook Ave., East Chicago, Ind., with 64 acres of ground. Construction work started April 20, 1912, and plant was in operation Oct. 3, 1912. Plant comprises main refinery building, all steel and concrete, with 3 standard-gauge tracks entering the building. There are 2 crane runways running the full length of the building, with 3 traveling cranes. A men's change house, of brick, is equipped with toilets, shower baths, steel lockers, and 1 room equipped as a dining room. Bag house is constructed of brick and concrete, divided into 4 compartments of 144 bags, 30'x18".

Equipment: consists of one 12,000-ton battery Parks process, two 300-ton softeners, four 60-ton desilverizing kettles, one 300-ton refining furnace, and one 200-ton molding furnace. The bullion comes in on a high track, is charged into furnace with charging machine and flows by gravity through the plant. Lead is hand-molded and trucked into cars. Sampling is done in two 40-ton kettles and bullion pumped into softeners with centrifugal pump. Residues are worked up in three 30-ton reverberatory furnaces. There are two 40-ton blast furnaces, 1 for antimonial slag, and 1 for by-products and ores; 8 retort furnaces for treating zinc skim and two 5-ton cupels for treating high-grade retort metal.

Common lead is double refined by crystallization in kettles in the corroding lead plant. Refining plant is in complete operation. All furnace gases except softeners and retorts are drawn through a sheet flue 700' long and passed through the bag house.

Power is supplied by the Northern Indiana Gas & Electric Co. Two waste-heat boilers supply steam for compressors and refinery. High-pressure air is supplied by centrifugal air compressor and air for blast furnaces is supplied by a Connersville blower. A 50,000-gal. tank elevated 50', and 100,000-gal. sump tank, waste running back into sump tank and pumped into the 50,000-gal. tank, the elevated tank being connected with the East Chicago Water Co.'s mains. Oil storage capacity, two 12,000-gal. oil tanks.

The International is not burdened by old smelteries acquired at exorbitant prices, but has new and up-to-date plants, capable of handling ore as cheap, if not cheaper, than any of its competitors and is a big factor in the mining world. It is in strong and competent hands, both technical and financial, and its profitable operation is assured.

In 1916 the plant treated 58,769 tons of lead bullion from Tooele, and 6,148 tons foreign ore. **Production:** 108,009,116 lbs. of common and corroding lead; 15,682,151 lbs. of antimonial lead; 4,468,775 oz. of silver, and 20,580 oz. of gold.

INTERNATIONAL SMELTING AND REFINING CO.

Properties and assets; purchased 1914 by Anaconda Copper Mng. Co. for \$10,392,709. Company dissolved and properties transferred to International Smelting Co., and described thereunder.

METALLURGICAL COMPANY OF AMERICA.

Office: 61 Broadway, New York.

Officers: C. M. Loeb, pres. and gen. mgr.; B. Hochschild, v. p.; Otto Sussman, treas.; preceding with Julian B. Beaty and Edw. Randolph, directors; Julius Goldman, sec.

Inc. May 19, 1904, in New Jersey. **Cap.**, \$100,000; shares \$100 par; issued for the purpose of exploiting mining and smelting enterprises. Annual meeting second Tuesday in April, at Jersey City, N. J.

MINERALS SEPARATION NORTH AMERICAN CORPORATION

Offices: 61 Broadway, New York, and 220 Battery St., San Francisco, Cal. E. H. Nutter, chief engineer.

Officers: John Ballot, pres.; Dr. S. Gregory, v. p.; Frank Altschul, treas.; Chester B. Allen, sec.

Inc. 1917. **Cap.**, 500,000 shares of no par value, placed in a 5-year voting trust. Certificates for 250,000 shares were distributed to shareholders of Mineral Separation, Ltd., the British parent company, as an initial dividend.

Company owns United States, Canadian and Mexican flotation patents of Minerals Separation, Ltd. Ore treated under license during 1916 totaled 14,000,000 tons, compared with 4,500,000 tons in 1915. Of the 1916 total, 12,000,000 tons were treated in United States, which should yield \$700,000 in royalties. Infringers are estimated to have treated 13,500,000 tons in 1916.

While large profits are in sight for Minerals Separation, they will be accompanied by considerable litigation over patents, and the end of the legal tangle is not yet in sight. Flotation of copper, gold, lead, silver, zinc, or other ores is in use or being tried everywhere. At present there are several hundred users of one or more of the many modifications of flotation. The economic value of the process for base-metal ores is enormous. Though it is not universally applicable it is certain that many flotation plants were failures because of inexperience and a few because the ores were not amenable to the process. In some cases it has been found that flotation works well for a while, then recoveries drop almost to level of other concentration systems. It is quite evident that

while flotation is not a cure for all treatment troubles, it is an invaluable adjunct to almost every concentration plant.

It is the modifications of flotation, which Minerals Separation terms infringements, that have caused the recent litigation. Company claims it has over 200 infringers. If these various new systems were allowed to be used unchallenged, Minerals Separation would lose large sums due as royalty for its patents. At the present time about 27,000,000 tons of ore is treated annually by flotation largely in conjunction with other classification and gravity-concentration processes, though a few mills use flotation solely.

Several large copper companies made contracts with Minerals Separation for royalties on a tonnage sliding-scale basis, about 4 to 12c per ton of ore treated. Among these are Anaconda, Arizona Copper, Braden, Calumet & Arizona, Greene-Cananea and Inspiration.

Minerals Separation v. James Hyde (really the Butte & Superior Mng. Co.), also v. Miami Copper, have been the principal suits over flotation patents. In *M. S. v. B. & S.* the District Court, at Butte, Mont., sustained U. S. patent 835,120 as to 10 of complainant's claims, finding that defendant had infringed them. The Ninth Circuit Court of Appeals reversed this decision. In a writ of certiorari to review this decision, the U. S. Supreme Court adjudged in Dec., 1916, that the patent was valid as to 7 claims. The critical amount of oil used is claimed by M. S. to be a fraction of 1% to the amount of ore. The *M. S. v. B. & S.* suit had not reached finality in Sept., 1917.

In *M. S. v. Miami*, the U. S. District Court at Wilmington, Delaware, Sept., 1916, sustained the plaintiff, declaring infringement of claims 1 and 12 of patent 835,120, and all of patent 962,678, but did not uphold claim 9 of patent 835,120, or any of patent 1,099,699. This suit was next taken to the Third Circuit Court of Appeals, which decided in May, 1917, that Miami had infringed patents 835,120 and 962,678. In Sept., 1917, the Miami Co. decided not to appeal this decision. Miami, like many other companies, uses the Callow pneumatic system for mixing ore pulp and oils for flotation of minerals.

To evade the patents, which specifically cover the use of 1% or less of oil to the tonnage of ore treated, many large metal mining companies are using over 1% of oil, with surprisingly good results; they therefore maintain they need not pay royalty, claiming that over 1% is not an infringement. To stop this practise Minerals Separation brought the matter to Court, and on Aug. 27, Judge Bourquin of the U. S. Circuit Court in Montana, gave judgment in favor of the Minerals Separation against Butte & Superior. The case hinged on the use of more than 1% of oil. B. & S. formerly used less than this quantity, but in recent years added over 1% in their operations, considering that this would relieve the company of infringement liability.

The above review is apropos in The Mines Handbook, inasmuch as hundreds of the companies listed herein are using flotation in some form, and their future profits depend largely on their use of flotation methods.

MINES EXPLORATION SYNDICATE

Office: Makeever Bros., mgrs., 170 Broadway, New York. Operating dept., 1553 Harvard Ave., Salt Lake City, Utah. Walter Neal, engineer.

Organized Aug., 1916, "to investigate and develop worthy mining properties." Over 200 mines were examined but only 3 taken over for development to April, 1917.

Property: Lookout mines in Montana, the Herb Lake (Rex) mines in Northern Manitoba, Can., and the Candelaria mines in Jalisco, Mex.

The Lookout group of 3 claims in Montana (location not stated) is said to show a series of veins carrying gold-silver-copper values. Average values are given as \$14.52 to \$26.41 per ton based on 60c silver and 25c copper. About 500' of work is reported done on 3 tunnels, a road built and necessary buildings put up.

The Rex mine on Herb Lake, Manitoba, Canada, is developed by a 60' shaft and vein is reported by Makeever's engineer to average 48" in width. Average assay is given as \$48.60 gold. Engineer estimates ore extracted in shaft sinking and now on dump will total \$5,054 and also assumes that a stope of such ore 100' long by 100' high will pay for the mine, development, mill, equipment, operation and metallurgical loss. A 30-ton mill to be installed.

The Candelaria mine at Jalisco, Mex., is an old mine credited with past production of rich ore. Workings will be cleaned out but no equipment installed until Mexican conditions are more stable.

NEW JERSEY ZINC CO.

Offices: 810 Broad St., Newark, N. J.; 55 Wall St., New York.

Officers: Edgar Palmer, pres.; A. P. Cobb, v. p.; J. E. Hayes, v. p.; A. B. Schultz, sec.; H. S. Wardner, treas. Directors: Edgar Palmer, C. W. Cox, August Heckscher, T. D. Jones, E. S. Marston, J. J. Riker, E. M. Squier, W. P. Hardenbergh and A. B. Schultz. G. F. Wolff, comptroller; H. G. Clopper, gen. sales mgr.; E. V. Peters, asst. gen. sales mgr.; A. H. Peck, sales mgr.; H. Hardenbergh, gen. purch. agt.; W. J. Lee, purch. agt.

Inc. Oct. 30, 1880, in New Jersey as the New Jersey Zinc & Iron Co. Name changed 1897 to present title and capital increased from \$3,000,000 to \$10,000,000. Stock increased to \$35,000,000 by payment of stock dividend of 250% July 7, 1915. **Cap.**, 350,000 shares; \$100 par; all outstanding. Transfer office: 55 Wall St., New York. Registrar: Farmers Loan & Trust Co., N. Y.

Bonded debt: the unretired balance of bonds authorized Oct. 1, 1901, due Oct. 1, 1926, First Gold, 4%. Original authorized issue, \$10,000,000, of which \$4,000,000 were issued, the balance to be issued only for the purchase of new property, stock of new corporations, the erection of new plants, etc. Of the \$6,000,000 of unissued bonds, \$3,000,000 had been retired up to Jan. 1, 1916, leaving a present authorized amount \$7,000,000. The mortgage provides for the cancellation of \$200,000 of unissued bonds yearly on Oct. 1, beginning 1902, the authorized amount of bonds to be reduced accordingly, and after all such unissued bonds have been canceled, the company is required to pay to the trustee, annually, on Oct. 1, \$200,000 as a sinking fund for the purchase or redemption of outstanding bonds at not exceeding par and interest.

Net income in 1916 was \$34,028,239, of which \$26,600,000 was paid in dividends, \$460,000 for interest and reserve, \$900,000 for profit sharing and \$6,068,239 surplus.

Dividends: regular quarterly, at rate of 20% per annum have been paid from 1906 to July, 1915, and quarterly at rate of 2½% in Aug. and Nov., 1915. On Feb. 10, 1916, and regularly since, quarterly at rate of 16% per annum.

Extra distributions: 10% in 1907, 5% in 1909, 10% each in 1910 and 1911, 10% each 3 times in 1912, 10% each 3 times in 1913, 10% each twice in 1914, 5% each twice in 1914, 2%, 10% and 30% in 1915, 250% stock dividend in July, 1915, 10% each 4 times and 5% 4 times in 1916, 10% in Jan., and 4% each Mar., April and June, 1917.

Comparison of the first three quarters of 1917 and 1916 is as follows:

	1917			1916		
	First	Second	Third	First	Second	Third
Income.....	\$6,735,444	\$6,497,692	\$5,593,984	\$8,561,385	\$8,850,292	\$8,304,511
Interest.....	115,000	115,000	115,000	115,000	115,000	115,000
Balance.....	\$6,620,444	\$6,382,692	\$5,478,984	\$8,346,385	\$8,735,292	\$8,189,511
Federal taxes..	613,705	581,855	2,126,317	.....	.....	.....
Net income....	\$6,006,739	\$5,800,837	\$3,352,667	.....	.....	.....
Dividends....	4,200,000	4,200,000	2,800,000	6,650,000	6,650,000	6,650,000
Surplus.....	\$1,806,739	\$1,600,837	\$552,667	\$1,796,385	\$2,085,292	\$1,539,511

Property: the famous zinc mines at Franklin, New Jersey. The different original holdings were consolidated as a result of litigation and to effect better mine operations. It was upon the economies due to a single control of the great orebody and to the discovery by J. P. Wetherill of a process for treating the manganese-zinc ores that the fortunes of the company were built. For geology of mine see Lindgren's "Ore Deposits," p. 709; also U. S. G. S. Geologic Folio, No. 161.

Company owns the New Jersey Zinc Co. (of Pa.), with operating plants at Palmerton and Freemansburgh, Pa.; operating mines near Benton, Wis. (Mineral Point Zinc Co.); many other producing properties and reduction works, including the Empire Zinc Co. of Mo., not operating any property at present, and the Empire Zinc Co. of Colo.

The Franklin mine in New Jersey produces the high-grade ore from which the Horsehead brand of spelter is made. The reserves are unofficially reported to be in blocked out ore, sufficient for a thirty-year supply at the present rate. Custom ores are also bought for treatment. The products include oxide of zinc, spelter, sheet zinc, zinc dust, spiegeleisen, sulphuric acid, and lithopone.

Production: no reports are published, but it is known that the company has a yearly smelting capacity of 160,000,000 to 170,000,000 lbs. of spelter, and the 1917 production is estimated at 250,000,000 lbs. of zinc, besides other products.

During 1917 the following papers were published in the Engineering and Mining Journal: "Hoist Record at Palmer Shaft," by H. H. Hodgkinson. This shaft is 1,510' deep at an angle of 47°, and has 4 compartments. Two 22x48" duplex, direct acting hoists are used, with ore loading pockets at 800 and 1,150'. On July 14, 1916, one engine hoisted 3,079 tons in 10 hours. This shaft has produced 76,018 tons in one month. In the issue of Sept. 8, the company's Franklin laboratory was described by D. Jenkins. A paper prepared for the A. I. M. E. by W. R. Ingalls, in issue of Sept. 15, discusses "Zinc Burning as a Metallurgical Process," covering in part work of New Jersey Zinc. In Sept. Bulletin of the A. I. M. E., G. C. Stone discusses "Oxide of Zinc," as made by the New Jersey company. In the Oct. Bull. of the A. I. M. E. "Zinc Mining at Franklin, N. J.," was the title of a 106-page article by C. M. Haight and B. F. Tillson. Company publishes a monthly organ entitled "Zinc."

PHELPS DODGE CORPORATION

Office: 99 John St., New York.

Officers: Walter Douglas, pres.; Cleveland H. Dodge, Arthur Curtiss James, Jas. McLean, v. p.'s; preceding, with Dr. James Douglas, chm.; Geo. B. Agnew, Francis L. Hine, Wm. Church Osborn and E. Hayward Ferry,

directors; Geo. Notman, sec.-treas.; A. T. Thomson, ast. to pres. and comptroller; S. W. French, gen. mgr.; A. V. Dye, asst. gen. mgr.; J. Millard Jones, British agent.

Phelps Dodge Corporation assumed all the assets and liabilities on April 1, 1917, of Phelps, Dodge & Co., Inc. and continued the business of the former company with the same Board of Directors and official staff. It is proposed to dissolve Phelps, Dodge & Co., Inc., and to distribute stock of the new corporation, share for share, to stockholders of the old corporation.

Phelps, Dodge & Co., Inc. was the holding company for its subsidiary companies. Under the new plan the name of the Copper Queen Cons. Mining Co. was changed to the Phelps Dodge Corporation, its capital stock increased and the properties of the Detroit Copper Mining Co., the Burro Mountain Copper Co. and the Stag Cañon Fuel Co. were transferred to it, also the stocks of the Moctezuma Copper Co., Bunker Hill Mines Co. and the Phelps Dodge Mercantile Co., together with the remaining assets of Phelps, Dodge & Co., Inc. This gives direct ownership and operation by a single company. The former companies are known as branches with the exception of the Moctezuma Copper Co. and the Bunker Hill Mines Co.

Phelps, Dodge & Co., Inc. was organized as the successor of the firm of Phelps, Dodge & Co., which had a history of nearly a century, its founder, Wm. Earle Dodge, having been one of the great pioneer merchants of America and a noted philanthropist.

Inc. Aug., 1885, in New York. **Cap.**, \$2,000,000; shares \$10; increased to \$50,000,000 in March, 1917; \$45,000,000 of which is now outstanding having been exchanged share for share for stock of Phelps, Dodge & Co., incorporated. Dec. 14, 1908, in New York with capital stock: authorized, \$50,000,000; outstanding, \$45,000,000; shares \$100. The capital stock was issued for the purchase of the entire stock of the Copper Queen Consolidated Mining Co., at \$135 for each \$10 share, \$27,000,000; Moctezuma Copper Co., at \$307 9/13 for each \$100 share, \$3,000,000; Detroit Copper Mining Co. of Arizona, at \$150 for each \$25 share, \$6,000,000; Stag Cañon Fuel Co., at 800 for each \$100 share, \$4,000,000; held for future issue \$5,000,000; total, \$50,000,000. Stock listed on New York Stock Exchange. Annual meeting, first Tuesday after first Monday in April, at 99 John St., New York. Books close 10 days before and reopen day after annual meeting. Stock transferred at office of the company. Farmers' Loan & Trust Co., New York, registrar.

Comparative General Balance Sheet:

Assets—	Property & Equip.	Deferred	Cash	Other Current	Total
1916.....	\$39,268,558	\$2,763,213	\$7,746,519	\$15,735,612	\$66,513,903
1915.....	38,550,942 (a)	2,130,583	5,889,305	11,375,526	57,946,356
1914.....	49,392,281	264,076	4,891,697	4,687,999	59,236,053
Liabilities—	Capital Stock	Current	Surplus	Total	
1916.....	\$45,000,000	\$5,826,777	\$15,687,126 (b)	\$66,513,903	
1915.....	45,000,000	4,608,492	8,337,864 (b)	57,946,356	
1914.....	45,000,000	7,224,944	7,011,109	59,236,053	

(a) After deducting \$6,853,466 for depletion of ore and coal and \$4,850,-854 for depreciation. (b) Balance Dec. 31, 1915, \$8,337,863; earnings for 1916, \$24,030,904; deduct ore depletion and plant depreciation, \$2,056,642; and dividends, \$14,625,000.

Earnings: \$6,025,740 in 1909; \$9,099,910 in 1910; \$7,283,509 in 1911; \$10,411,535 in 1912; \$9,581,494 in 1913; \$6,891,651 in 1914; \$10,981,512 in 1915; \$24,030,904 in 1916.

Dividends: company pays a regular quarterly dividend of \$2.50 per share and also extra dividends; these were \$2 each per share in 1909, 1910, 1911; \$5 in 1912; \$6.50 in 1913; \$4 in 1914; \$10 in 1915; \$22.50 in 1916; \$20 to Oct., 1917. Total dividends to July, 1917, \$66,596,527.

Company controls through personal holdings of its officers, the Old Dominion Co., Old Dominion Copper Mining & Smelting Co., United Globe Mines and Commercial Mining Co. Members of the old firm also control the El Paso & Southwestern railway, a road that, while built originally as an outlet for the Copper Queen mine, has expanded steadily and bids fair to develop eventually into a transcontinental trunk line. The same interests are very large shareholders in the Rock Island and Great Northern railways.

The company controls, some of the richest and most productive copper mines in existence, all able to make copper at unusually low costs, as is evidenced by the great increase in dividends of subsidiaries in 1910 over 1909, in a year when decreased dividends were the rule with a great majority of the large copper producers of the world.

Production: comparative statement of total production, of company's branches, years ending Dec. 31—

	Tons of Ore			Co. Ore Smelted	Copper Lbs.	Silver Oz.	* Gold Oz.	Lead Lbs.
	Extr'd	Milled	Smelted					
1916.....	2,305,072	1,422,468	1,389,192	1,200,090	152,283,729	1,642,055	28,873	10,404,341
1915.....	1,583,364	800,600	1,129,766	1,016,746	140,478,003	1,655,669	31,696	9,525,584
1914.....	1,777,243	1,046,728	917,204	855,594	131,662,324	1,769,626	28,518	8,936,074
1913.....	1,978,892	1,122,372	1,035,367	866,520	155,665,712	1,870,162	31,141	5,701,628
1912.....	1,893,244		1,051,315	953,741	148,678,889	1,689,152	27,687	
1911.....	1,841,210	1,017,352	930,331	822,647	134,149,627	1,794,895	27,154	

Company also took over the metals selling agency of the old firm, and in addition to marketing the product of its own mines, acts as sales agent for the Calumet & Arizona and other producers.

Comparative Statement of Copper Sales:

	Total	Own Comp.	Outside Product on Comm.	Domestic Trade	Foreign Trade	Aver. Price Cts.
1916....	247,303,587	173,710,400	(a) 73,593,187	176,468,527	70,835,000	24.48
1915....	194,925,668	139,351,785	55,573,883	97,122,436	97,803,232	16.079
1914....	188,687,378	134,553,404	54,133,974	80,978,884	107,708,494	13.57
1913....	201,489,796	151,080,018	50,409,778	83,552,432	117,937,364	15.37
1912....	192,297,374	139,759,515	52,537,859	98,267,037	94,030,387	15.51
1911....	180,301,965	131,327,002	48,974,963	69,483,782	110,818,183	12.36
1910....	194,138,698	139,297,409	54,841,289	100,819,254	93,319,444	12.826

(a) includes 34,742,080 lbs. from ores purchased.

Phelps, Dodge & Co., Inc., is one of the few new companies in the copper mining industry that is undercapitalized rather than overcapitalized, and this is but a detail in a general business policy that, while thoroughly progressive and abreast with the times, retains the fundamentally sound and conservative policies developed by the old firm in nearly a century of honorable and markedly successful business life.

Branches and Subsidiaries

- Copper Queen Branch
- Morenci Branch
- Burro Mountain Branch
- Stag Cañon Branch
- Moctezuma Copper Co.
- Bunker Hill Mines Co.
- Phelps Dodge Mercantile Co.

Besides these principal branches the corporation owns a prospect at Fierro, Grant Co., New Mexico, known as the Hanover mine. It owns another prospect in the Old Hat district in the Catalina Mountains north of Tucson, Pima Co., Ariz., near the Dailey mine. Also has an option on the Burro Mountain holdings of the Azure Mining Co.

The Stag Cañon Branch produced 1,439,904 tons of coal in 1916, of which 618,725 tons were used for coking, 662,605 were sold to railroads and 153,845 tons were commercial sales. T. H. O'Brien is general manager and J. B. Morrow, supt. of Coke dept.

The Phelps Dodge Mercantile Co.'s gross sales and transfer during 1916 amounted to \$8,406,635, an increase of \$2,196,178 over 1915. Combined inventories of merchandise increased \$408,926, or approximately 40%. There were 569 employees at the different establishments. W. H. Brophy is general manager.

COPPER QUEEN BRANCH

Operating and works office: Douglas, Cochise Co., Ariz. **Mine office:** Bisbee, Ariz.

Officers: G. H. Dowell, mgr.; Gerald Sherman, supt. mining dept.; F. Rutherford, smelter supt.; C. C. Barclay, purch. agt.; Joseph P. Hodgson, formerly mine supt., has been transferred to the consulting staff of the corporation in the mining department.

The Copper Queen Consolidated Mining Co., retaining its charter, has changed its name to Phelps Dodge Corporation. Its properties in Bisbee and Douglas, Ariz. are now known as the Copper Queen Branch of that corporation. The company was operated for many years as a close corporation, without making its figures public, but is said to have paid, 1888 to 1907, inclusive, dividends aggregating \$30,000,000 or upwards. Dividends: \$3,000,000 in 1908; \$4,025,000 in 1909; \$6,300,000 in 1910; \$5,200,000 in 1911; \$5,707,351 in 1912; \$5,700,000 in 1913; \$4,500,000 in 1914; \$7,000,000 in 1915.

Property: comprises the Copper Queen and other mines at Bisbee, a large smelting plant at Douglas, on the Mexican border, 30 miles from the mines. Mineral lands in the Warren, or Bisbee district, comprise 176 patented claims, 2,298 acres.

The Copper Queen, one of the best known copper mines of the world, was opened 1880, on an outcrop of oxidized copper ore in massive limestone, opposite the Copper Queen hotel in Bisbee. The original orebody, now represented by a large cave, averaged 23% copper. The ore was smelted in a 30" water-jacket furnace, with English coke, brought via San Francisco. This orebody was exhausted in 3 or 4 years and the mine experienced many vicissitudes, until additional orebodies were developed, by following seams and stringers of ore leading to further large and rich deposits.

Geology: the ore-bearing formation of the Copper Queen and other mines of the Bisbee district, consists of thickly bedded limestone beds, dipping to the southward and cut by intrusive porphyritic dikes. Until 1902, the principal orebodies were found at the base of the carboniferous limestone beds, which are broken by igneous intrusive rocks, that evidently have a strong genetic bearing upon deposition. The ore deposits occur as pockets, lenses, chimneys, bunches, shoots, veins, stringers and seams, the larger bodies being connected, in most cases, by small veins, or mere knife-blade seams. The limestone and its included orebodies have a general gentle dip to the southeast, necessitating deeper shafts as distance is made toward the southeast. Extensive bodies of high-grade ore have been found, since 1902, in the deeper levels driven in the older limestones (Cambrian),

and developments prove these underlying orebodies to be persistent to great depth. The mines show beautiful caves, lined with calcite crystals and stalactites and wonderfully fine crusts of azurite, malachite and cuprite; some of these caves are of considerable size. Many of the shafts are bottomed in sulphide ores of high-grade, consequently the depth of the orebodies, while already proven great, is conjectural. New orebodies are developed yearly and the ultimate lateral limits of payable ore are unknown.

"In the Copper Queen mine, the majority of the ore has occurred in a zone encircling the west boundary of the porphyry intrusion of Sacramento Hill. It has a width varying from 800 to 1,200', and a thickness of about 400'. It reaches the surface in the older part of the mine to the N. W., but dips to the S. E., where it is reached at 1,400' below the Czar collar, in its farthest extension at present developed on Copper Queen ground. There is one major extension from the N. W. end of the zone toward the west along the Czar fault, and others of minor importance.

"Individual orebodies are scattered through the zone in an eccentric manner, only matched by their own irregularities of form and size. Their most general characteristics are the softness of the ore and their great horizontal rather than vertical extent. It has been estimated that the average vertical thickness of ore in the Czar and Lowell divisions is between 30 and 35'. It is calculated by assuming it to be uniformly distributed over its horizontally projected area.

"In this zone, and for some distance above it, the ground has been subjected to intense alteration and intense but irregular oxidation. It has resulted in an enormous quantity of earthy or clayey material, which may be either ore or waste, which, when wet, is both heavy and tenacious. Below alteration, the ground is fairly hard, and the limestones contain primary ores differing from those heretofore considered typical of the camp, and which have not yet been thoroughly exploited."

The development of the Copper Queen mine has 7 shafts, all connected on the even numbered levels. The entire output is concentrated at and hoisted from the 1,700' Sacramento shaft. The mines are opened ahead for several years, development averaging about 1 mile monthly of new workings, or at the rate of 1 linear foot of new work for 10 tons of ore extracted, which figure is proven by past experience to maintain practically constant ore reserves, while avoiding excessive advance openings that require useless maintenance cost. The stopes are filled throughout and the mines are timbered with square sets, mainly Washington fir, an average of 30' in timber, board measure, being required for each ton of ore won in the oxidized zone.

The underground haulage plant is very extensive, with 21 miles of tracks, covering every second level from the 4th to the 16th, inclusive, ore from the intermediate levels being dropped through chutes, and all ore hauled to the Sacramento shaft for hoisting. The haulage system includes Goodman electric locomotives and side-dumping ore cars. Chutes have been installed throughout the mine for loading the cars, which discharge into large storage bins at the Sacramento shaft, through which all ore is hoisted. The system is fully described by Mr. Gerald F. G. Sherman, *supt.*, in *Trans. A. I. M. E.*, Sept., 1915, p. 1837. In order to complete the underground traction system, it was necessary to open many lateral drifts and crosscuts, which were located in solid ground, wherever possible, as the electric tram lines are the arteries of the mine.

The Uncle Sam mine has an old shaft, and a new shaft, sunk 1908, of 224' depth. This mine is connected with the Czar, Holbrook and Sacramento shafts, and has a large orebody, discovered 1913, that compares favorably with the bonanza deposits of the adjoining Shattuck mine.

The White Tail Deer mine lies across the range on the edge of the mesa near Don Luis, being reached by wagon road through a detour of several miles. It has been worked 1916-1917, developing a good grade of ore and may become an important producer.

The 4-compartment Sacramento shaft, 1,700' deep, concreted, handles the entire output of the mines. There are loading bins on the even-numbered levels from 400 to 1,600', reached by the electric haulage lines from all other workings of the mine. The shaft was sunk in rock for practically its entire depth, insuring as great a degree of immunity from drawing as is possible in this district. The Sacramento shows some rich ore, discovered 1913, on the 1,500' level near the Hoatson claim line. Exploratory work, in the porphyry stock of Sacramento Hill, which is the geological keystone of the Bisbee ore deposits, has shown up a large tonnage of concentrating ore.

The hoist at the Sacramento is a powerful Nordberg tandem-compound engine, having 7' drums with 5' face, operated by steam, with 6 auxiliary engines, actuated by oil, under 150 lbs. pressure. Hoisting is done in 3-ton skips, and the hoist can raise a skip each minute, giving the shaft a capacity of fully 4,000 tons daily.

The Sacramento shaft has, perhaps, the most elaborate and ingenious system for mixing and loading ores to be found at any copper mine. This is fully described by Sherman in the paper already noted. The ventilation of the whole property with its 6 downcast and one upcast (Lowell) shafts is well described by Chas. A. Mitke., in Bull. A. I. M. E., Sept., 1915, p. 1941.

The central power plant near the Sacramento shaft, includes a boiler house, having four 400-h. p. Stirling water-tube boilers, furnishing steam direct to the hoists at the nearby Sacramento and Gardner shafts, the hoists at the other shafts being operated by compressed air. Equipment of the engine house includes three 500-k. w. Curtis turbo-generators, 3 Ingersoll-Rand air compressors, of about 100 drills aggregate capacity, a 70-drill Nordberg air compressor, the largest in the Southwest, and a 7,000 cu. ft. Nordberg compressor. Fuel is Texas and California petroleum, with large tanks for oil storage. All of the shafts, and the principal mine buildings, are reached by spurs of the El Paso & Southwestern railway.

During the past few years churn drilling has developed in Sacramento Hill, a large tonnage of concentrating ore known as the East and West orebodies. The West orebody, because of its nearness to the surface will be mined by steam shovel. A 90-ton test mill was built in 1914, the best saving being effected by combined hydraulic and flotation methods. Tests, on a working scale demonstrated that 1.3% of copper will make ore, and it is probable that 1% material can be worked. Based on the results of this experimental work a 3,000-ton concentrator will be built on the flat west of Douglas.

New work in 1916 was 80,853', which does not include 46,925' of churn drilling on the Sacramento Hill. Results show that more ore was found than was extracted, and the estimated reserves stand within a few thousand tons of their maximum. New ore has been found in the old Copper King claim and in the Gardner division.

Douglas Smelter

The Douglas smelter, known as the Douglas Reduction Works, is at Douglas, Ariz., 28 miles from the mine and one-half mile from the Mexican border. This plant treats 3,000 tons daily, handling the output of the Copper Queen mines, that of the Burro Mountain branch and that of the Moctezuma Copper Co., as well as doing a general custom-smelting busi-

ness. The works occupy a site of 320 acres and are served by a very complete standard-gauge railroad system, reaching every building. The plant was blown in March, 1904, since which time there has been almost continuous enlargement, the works costing fully \$4,000,000, smelting about 3,000 tons daily, there being no concentrator to eliminate part of the tonnage from the final furnace charges. The plant is incidentally described by J. Moore Samuel, in Bull. A. I. M. E., June, 1916, p. 1079, in a paper on Dust Losses.

Water for the works is secured from artesian wells, of about 300' average depth, the water rising nearly to the surface, with 1 well, of about 1,000' depth, flowing 200 gals. per minute. A large reservoir and cooling tower have been built in connection with the water supply.

The ore-bedding system consists of 5 pits, each 40x800' in size, and 11' deep, having an aggregate storage capacity of 90,000 tons. Ore, received from the mine in side-dumping steel cars, is discharged into the pits, which are lined with white tufa rock. The pits are filled with the different grades of ore required to constitute a normal furnace mixture, and the ores mixed by a mechanical plow. Ore is removed, as required by the furnaces, with steam shovels, running on permanent tracks laid upon the floor of the pits.

The blast furnace building, 150x900' in size, of steel frame, also covers the converter department. Three 60-ton traveling cranes, 60' span, run the entire length of the building. There are ten 400-ton blast furnaces, each 44x240" with forty 4" tuyeres, and 16' in height from the tuyeres to the charging floor. The 10 furnaces are set 15' apart, in a single row, with a 10x20' settler between each pair, the lower half lined with chrome brick and the upper half with ordinary brick. Ore is charged on either side, alternately, charging being done from trains of twenty 2,500-lb. cars, hauled by 13-ton electric locomotives. Slags flow from the settlers into 18-ton slag cars, hauled by electric locomotives. The slag dump is 1,700' long, and is kept trim by a special leveling machine, operated by electric power. The blast furnaces consume 350 to 400 tons of coke daily.

The dust chamber is of steel frame with brick and tile walls, roofed with reinforced concrete supported by steel trusses and has a bottom of tiled hoppers.

Molten matte is taken from the blast furnace to the converters by 60-ton electric traveling cranes, each having two 15-ton auxiliary hoists. The converter department has 7 stands, operated hydraulically, with 10 shells, of the Great Falls type, basic lined. Copper is poured in a Walker casting machine, and product is blister copper of about 99% tenor, with considerable gold and silver values. The converter plant has a flue, taking the gases from the 7 stands to a dust flue 11' in diameter at the hoods and 13' at the dust chamber.

The 260' steel stack of the blast furnace building is 30' in diameter at the base and 25' at the top.

The calcining and reverberatory plant is 100x850' in size, of steel frame. Ore is brought in over an elevated railway track on steel trestles, 400' in length, and dumped into concrete storage bins, and drawn, from the bins to the roasters by belt conveyors. There are three 100' reverberatory furnaces and sixteen 75-ton McDougal calciners. A slag tunnel, 30' wide, 15' deep and 276' long, has electric cars, connecting with the slag tracks. The tunnel is lined with 4' concrete walls, with a 2' separating wall in the center. The reverberatory furnaces are next to the old building, succeeded by the slag tunnel, on top of which there is a battery of four 400-h. p. water-tube boilers, followed by a dust chamber; the McDougal roasters occupy the northern end of the building. The reverberatory department has a separate

300' stack, of 22' inside diameter, built of special hollow bricks, with walls 42" thick at the bottom and 12" at the top, requiring 1,250,000 brick and standing on a base of 60' diameter requiring 1,100 cu. yds. of concrete.

The power house, of steel and brick, was enlarged to transmit electric energy 72 miles to El Tigre mine, in northern Mexico. The power plant has about 20 units, of various sizes and types, aggregating more than 6,000 h. p. Equipment includes 4 Nordberg cross-compound blowing engines, each direct-connected to a 400-k. w. 250-volt direct-current generator; Nos. 9 and 10 Connersville blowers, set staggering; a cross-compound 2-stage condensing air compressor, with piston capacity of 2,000 cu. ft. of free air per minute, at 100 lbs. pressure, for running the pneumatic tamping devices, operating charging doors of the blast furnaces and pumping water; 3 triplex motor-driven pumps, delivering water into compression tanks, at 350 lbs. pressure per square inch, with automatic regulation; four 400-k. w. 250-volt direct-current generators, supplying power for cranes, slag locomotives and electric lights; two 750-k. w. turbo-generators and a number of minor engines and dynamos. The power plant is equipped with a complete set of gauges and meters, keeping exact record of the distribution of power to every department and subdepartment.

The steel boiler house has six 500-h. p. and four 1,000'-h. p. Stirling water-tube boilers, with a Green fuel economizer, and a Foster superheater with capacity of 90,000 lbs. of steam per hour. The stack of the boiler house is of brick, 177' high and 13' in diameter at the base. Boilers are arranged to burn either coal or petroleum, but latter is used exclusively, consumption of California and Texas petroleum, at the mine and works, amounting to about 500,000 gals. monthly. Oil for fuel is at present cheaper in first cost, easier and cleaner to handle, and effects a great saving in the wages of 3 daily shifts of stokers, formerly required at every boiler plant.

A limestone quarry, at Lee station, 7 miles east of Douglas, has a large crusher and storage bins, the smelter requiring 400 to 500 tons of limestone daily, for flux. A saw mill is operated, in the forests of the Chiricahua mountains, though the bulk of the timber and lumber requirements of the mine and works are met by the importation of timber from the Pacific coast.

Production:	Tons Mined	Lbs. Copper	Oz. Silver	Oz. Gold	Lbs. Lead
1916.....	951,978	102,685,722	1,096,136	24,030	9,421,562
1915.....	783,211	88,551,180	943,368	18,974	9,388,418
1914.....	732,829	86,066,143	1,036,672	15,769	8,889,175
1913.....	867,481	97,181,725	919,138	16,213	5,701,628
1912.....	786,368	88,280,908	1,027,130	18,023	2,953,685
1911.....	619,132	74,489,728	1,227,453	16,895	5,658,930
1910.....	596,193	76,428,908	608,096	12,430	696,118
1909.....	.....	84,802,147	601,828	8,674	487,601
1908.....	.....	82,533,145	530,492	8,352	132,677
1907.....	.....	66,916,972	338,723	4,197	.....
1906.....	.....	79,536,416	332,723	7,573	.....

Smelter production, including custom ores:

	Tons Treated	Oz. Gold	Oz. Silver	Lbs. Copper
1916.....	1,304,523	32,832	1,794,854	171,893,880
1915.....	1,063,329	29,840	1,388,149	125,144,027
1914.....	835,016	26,259	1,405,301	119,957,017

Ore received in 1916 was 1,318,387 tons as compared with 1,064,671 for 1915. Stocks of ore on hand Jan. 1, 1917 was 102,591 tons as compared with 87,531 on Jan. 1, 1916.

There were employed, during the year, 3,671 men in all departments.

MORENCI BRANCH
(formerly known as Detroit Copper Co.)

Mine and works office: Morenci, Ariz.

Staff officers: M. H. McLean, mgr.; W. G. McBride, asst. mgr.; F. W. McLean, mine supt.; G. E. Hunt, mill supt.; V. P. Hastings, smelter supt.; J. A. McDougall, supt. of power; G. M. Robison, chief eng.

Property: is extensive, including the Ryerson, Arizona Central, Copper Mountain, Yankee, W. Yankee, Montezuma and Santa Rosa mines, at and near Morenci.

Geology: The mines of this company work varied types of copper deposits, all dependent upon and co-extensive with a big intrusive body of quartz porphyry and its dikes. The ores are chalcocite, chalcopyrite and pyrite with various oxidized products occurring either in altered limestones, or as fissure veins in the impregnated rocks adjacent to them, or in large masses of altered, impregnated, shattered porphyry. The geologic relations are fully treated in a monograph by Waldemar Lindgren, Prof. Paper 43, U. S. Geo. Surv.; see also Weed, "Copper Mines of the World," page 287.

Ores are mainly sulphide with slight gold-silver values and high silica and alumina contents. The oxidized and limestone ores are still produced in small quantities, but 98.8% of the ores mined consists of small particles of chalcocite, associated with chalcopyrite and pyrite, in a leached and whitened, decomposed porphyry, averaging 2.39% copper. The high-grade ore from fissure veins carries 6 to 18% copper.

Development: is very extensive, with numerous shafts and long cross-country connections. The workings have thus far been shallow, 400' being for many years the greatest depth. In 1912, development on the 600 and 700' levels of the Yankee mine, north of the Yankee fault, opened up 194,939 tons of 2.36% ore and similar deep exploration in the Arizona Central mine upset previous ideas that ores would not go deeper. Total amount of development work in 1914 was 26,375'; in 1915, 14,709'; in 1916, 20,513'.

About 90% of the output is now mined by the slicing system, costing about 21% of the square set and fill cost, which is necessarily still used in some parts of the mine. Block caving is still cheaper, uses but little timber and costs but 54.8% of the square set and fill method, but like the gopher and fill method, which is slightly cheaper, can only be used where favorable conditions prevail.

The New England mine has 2 shafts, deepest 750', and a 2,000' tunnel. The Clifton mine has 7 shafts, of 70 to 315' depth, with tunnels of 220', 450', 700', 800', 1,000' and 1,700'.

The Copper King mine is as yet but slightly developed, but has been claimed to show about 40,000 tons of ore. An aerial tram from the Copper King mine was completed 1909.

Equipment: includes power house, of steel frame on concrete foundations, with one steam-driven blowing engine, 9,000 cu. ft. per min., one gas-driven blowing engine, 6,000 cu. ft. per min., one motor-driven No. 10 Connersville blower and one No. 9 Connersville blower driven by a 200-h. p. gas engine, two steam-driven air compressors, one of 4,000 cu. ft. capacity, the other of 1,300 cu. ft., one 600-k.w. turbo generator delivering 2,300 v., 2 phase, 60-cycle current, four 250-k. w. and one 100-k. w. belted generators driven by gas engines, delivering 230 v., 2 phase, 60-cycle current, running in parallel with turbo generators through transformers. Two 1,000-h. p. Diesel engines will be installed 1917.

The concentrator, designed by H. Kenyon Burch, has proved remarkably successful, running 95% of the time. It consists of two 650-ton units, is 166x240' in size, and cost about \$1,000,000. Equipment includes Chilean

mills, 6 sets of 16x42" rolls, 28 revolving screens, 80 Frue vanners, 40 Wilfey tables, and Deister tables, the mill putting about 7 tons into 1.

A flotation plant was completed in Sept., 1915. The mill power plant has 3 gas engines of 200-h. p. and 2 of 175-h. p. each, in conjunction with electric motors driven from the smelter power house.

In 1916 the mill handled 451,347 tons of ore, of an average grade of 2.39%, producing 59,035 tons of gravity concentrates, averaging 11.85%; 2950 tons of flotation concentrates, averaging 19.43%; and 1,161 tons of concentrate slimes of 11.06% copper: the saving was 71.25% with a ratio of concentration of 7.098.

The concentrator uses about 500 gallons of new water per ton of ore treated, the balance being obtained by reclamation of water from the tailings in a series of concrete tanks with Dorr mechanism. The water is purchased from the Morenci Water company, which has a pumping plant about 6 miles distant on Eagle river, and which supplies the town and practically all of the mines of the district. The tailings are conducted from a slag lined launder along the walls of Chase Creek canyon to a point below bunkers 14,000' away where it is stored in impounding reservoirs in the small cañons which empty into Morenci cañon.

The smelter has one 44x396" blast furnace, and 3 stands of small basic lined converters. Flue dust is mixed with concentrate slime tailings before being recharged into the furnace. About 85% of the total charge of new metal bearing material in 1916 was concentrates, or similar very fine material with only 15% coarse ore. The smelter has 2,000-ton ore bins, surmounted by a steel railroad trestle.

In 1915, 77,870 tons of ore, concentrates and flux were smelted with a saving of 94%, and in 1916, 140,938 tons, with a saving of 95.21%.

A 36" gauge railway connects the mines and smelters with the Arizona & New Mexico railroad, at Guthrie. A tunnel through Longfellow hill, completed 1909, gives direct rail connection with the mill.

The company operates an excellent hotel, and maintains a library and club room for its 1,241 employees.

Production: in 1915 was 376,604 tons of ore, averaging 2.83% copper, producing 15,333,976 lbs. of copper; in 1916 production was 470,583 tons of ore averaging 2.43% copper, from which 17,541,258 lbs. of fine copper were produced.

MOCTEZUMA COPPER CO.

Mine office: Nacozari, Sonora, Mex.

Officers: J. S. Williams, Jr., gen. mgr.; H. T. Hamilton, asst. gen. mgr.; C. I. Schultz, gen. supt.

Inc. 1896, in West Virginia. **Cap.**, \$3,000,000; issued, \$2,600,000. Is controlled through entire stock ownership by Phelps Dodge Corporation, and holds direct title to lands through Moctezuma Copper Co., S. A.

Inc. Feb. 4, 1896, in Mexico. **Cap.**, 500,000 pesos. **Dividends:** were 77% or \$2,262,000, 1902-07; none in 1908; \$998,000 in 1909; \$468,000 in 1910; \$754,000 in 1911; \$2,118,569 in 1912; \$1,950,000 in 1913; \$1,170,000 in 1914.

Property: about 2,500 acres of mineral land in the Moctezuma and Arizpe districts of Sonora, including the Pilares de Nacozari mine 6 miles east of Nacozari. Company also owns the Juarez and Nicolas ranches of about 35,000 acres, which carry considerable valuable timber.

The Pilares mine lies in a high and precipitous country near the divide of the Yaqui and Oposura rivers. The ore deposit is an oval shaped brecciated mass of latite having a major axis of 2,000' and a minor axis of 1,000', formed by two parallel systems of faults, one coursing nearly N. & S. and the other nearly E. & W. The N. & S. faults dip about 80°

to the east. There were two flows of latite; the first while cooling was interrupted by the second causing the partly cooled mass to break up into the bombs and fragments which are barren of mineral and which are cemented together by the second and mineral bearing flow. The latite gives way to andesite and this to monzonite with depth. A "caliche" dike from 4' to 10' wide runs through the entire west side of the mine. The ore occurs mainly on the border of the breccia "pipe," but lesser bodies are found inside it as well. The ore carries chalcopyrite with pyrite and some bornite, chalcocite and some covellite, the ore being mostly of concentrating grade, averaged about 3.25% copper as mined, in 1916. There is a "chimney" outcrop with carbonate ore, but croppings are mainly brown, a dull red-stained porphyry, carrying hematite. The leached zone is about 20' in depth only, with payable ore coming in at depth of about 60'.

In addition to the Pilares mine, the company owns a number of other properties that have been operated for several years past by lessees, including the Churunibabi, Bella Union, Fortuna, San Francisco, El Vaquero, El Promontorio, and San Pedro. The Bella Union has high-grade ore, including oxides and native copper, shipments assaying up to 30% in copper tenor, with small gold and silver values. The Churunibabi property, yielding \$100,000 worth of silver ore to the lessees, from a rich gold-silver-copper orebody struck July, 1913, has been operated by the company for the past few years. During the year the main tunnel was driven 828' to connect with the Estrella shaft.

La Caridad mine shipped 343 tons of 15% copper and has about 8,000 tons of 1½% to 2% ore broken. Ore is enargite.

El Promontorio mine shipped 1,500 tons of ore averaging 22% copper, .14 oz. gold and 2.56 oz. silver per ton. In the lowest tunnel a 40' winze has a streak, 3" to 15", averaging 35% copper.

Development at Pilares mine include 4 shafts; three 3-compartment main working shafts, the Guadalupe 700', Pilares 1,200' and Esperanza 1,200' deep. The Guadalupe shaft is an underground shaft running from the 500' level to the 1,200' level. The Pilares and the Esperanza shafts are on the extreme ends of the ore body and run from the surface, 100' level, to the 1,300' level. Sinking to the 1,400' level is in progress. The Margarita shaft, on the claim of that name has been sunk and timbered to an inclined depth of about 400'. The ore body, which in 1916 was 3' wide and assayed 8% copper with some zinc, will be explored to a depth of 500' at which depth it will be connected by a drift with the 100' level of the Pilares orebody. A new shaft is contemplated 280' south of the Pilares shaft, drifts on all levels having been run to proposed site. Churn drilling on the site on the 1,200' level is in progress to determine extent of orebody as it is desired to sink new shaft in country rock outside of orebody.

The mile long Porvenir tunnel taps the deposit 600' below surface; 25-ton narrow gauge railway cars run from Nacozari into the tunnel direct to the mine ore chutes. The tunnel has storage bins in a 25x100' chamber to which ore is milled down from the upper workings, no ore being hoisted, all ore as broken being sent in chutes to the tunnel.

The mine employs 2 methods of ore extraction, the room-and-pillar with waste filling as work progresses, and shrinkage stoping with waste filling after all the ore has been extracted.

The mine has some enormous stopes, No. 4 stope, on the 3d level, having been 85' high, 125' wide and 150' long. New stope on the 600' level covers nearly 2 acres. The ground stands very well and the systems

of extraction used give minimum timber requirements at a cost of only a few cents per ton of ore mined. Costs are about 3 pesos per metric ton for ore loaded on the tram cars. No water is hoisted above the Porvenir tunnel level and very little water is raised from the workings below. The mine is well ventilated and is equipped with electric lights.

The Pilares orebody is one of the largest in the world and is comparable, in many respects, with that of the Rio Tinto. The orebody shows no decrease in value at 1,200' depth. **Ore reserves:** estimated Jan. 1, 1916, 3,220,000 tons; for Jan. 1, 1917, a decrease is reported due to inadequacy of hoisting facilities on lower levels. Such exploration as has been done the management reported as having been distinctly encouraging and much ore encountered.

During 1916, 23,252' of development work was accomplished of which 9,837' was drifting and 154' was shaft sinking. Of the total footage 37% was in ore.

An 80' steel head frame is being erected and a new hoist installed at the Esperanza shaft.

Equipment: includes electric hoists and 2 25-drill I-R air compressors, and two blacksmith shops, one at Pilares and one at Esperanza. There is an emergency steam plant at the mine having 2 boilers held in reserve in case of accident, but electricity is used throughout.

The power plant, at Nacozari, built in 1908, has four 435-h. p. Stirling water-tube boilers, equipped with Green fuel economizers, Foster superheaters and Rooney stokers, burning New Mexican coal, having a 196' reinforced concrete stack. The plant has three 1,000-k. w. Curtis turbo-generators giving a 6,600-volt current, and an auxiliary 50-k. w. steam turbine-generator set is used as an exciter. Current is transmitted at 6,600 volts to the mine and mill and at the mine is stepped down to 230 volts for the pumps, while the hoists and electric locomotives use a 250-volt direct current. Two 5-cylinder Nordberg-Carels Diesel engines will be installed this year.

The mine is connected with the mill by a 6-mile 30" gauge railway. Rolling stock includes four 60-ton locomotives and twenty 30-ton Ingoldsby steel side-dumping cars.

The 2,000-ton concentrator, designed and built by H. Kenyon Burch, at a cost of about \$1,000,000, is one of the most complete and efficient in existence. The crushing plant receives ore from the mine in 6,000-ton bins, whence it is fed by 2 automatic ore feeders, of special design, to grizzlies, with bars set 2½" apart, oversize, going to a No. 8 gyratory crusher, and undersize to a belt-conveyor, meeting material from the crusher, and going by belt conveyor to two 4x10" manganese trommels, with 1¼" perforations. Undersize from the trommels goes to belt conveyors and oversize from the trommel goes to No. 5 gyratory crushers, breaking the material to 1" cubes, which joins the material from the trommels and is sent by belt conveyors to 4,000-ton storage bins.

Each 1,000-ton unit of the mill is equipped with 6 coarse and 12 fine jigs, 3 sets of rolls, Swain classifiers, Callow screens, 44 Wilfey tables and 72 Johnson vanners. From the storage bins the ore is fed by a portable ore feeder to a belt conveyor, passing over an automatic weighing machine and sampler, delivering it to an 18-mm. trommel. This trommel screens the ore, the coarse pieces going to bull jigs and undersize to 11-mm. trommels; the latter feed oversize to coarse jigs and undersize to 7-mm. trommels. These trommels in turn feed oversize to intermediate jigs and undersize to 4-mm. trommels, whose oversize goes in its turn to 2-mm. trommels; oversize from latter goes to fine jigs. The undersize from the

2-mm. trommels goes to 22-mesh Callow screens and thence to Wilfley tables handling oversize and undersize.

Slimes from the Wilfleys go to the vanner settling tanks and middlings from the Wilfleys go to the Chilean mills by elevators. Tailings from the bull jigs, coarse jigs and intermediate jigs go to either of 3 sets of 42x16" rolls, then by elevator to the mixing-box at the head of the trommels. Tailings from the fine jigs go to dewatering machines, and overflow from dewatering machines goes to vanner settling tanks, dewatered material going to the jig tailings bin and thence to Chilean mills, crushing to pass a 2½-mm. screen and thence to Callow screens of 22-mesh. Product is a concentrate of about 12% copper tenor, about 85% of the assay value being saved.

An aerial tramway carries tailings from the concentrator to a dump on the hillside, far above the river level.

Water is pumped from a well sunk at the side of the river by 1 triplex and 3 Worthington pumps, of 500 gals. capacity per minute, to 500,000-gal. tanks at the mill. Wash water from the concentrates is settled and re-used. A large dam 3 miles east of Nacozari, 90' in height, stores water sufficient for 2 years steady operation of the mill.

Flotation experiments are being carried on, Rork-Kraut and Callow machines being used.

The company built and owns the town of Nacozari, and a town at the Pilares mine. At Nacozari the company maintains both English and Spanish schools for the children of employes, and a well-equipped hospital and a free library, and amusement hall.

Forces normally are 1,300 men at the mine and mill, of which the great majority are Mexicans, with a few Japanese, no American labor being employed at the mine aside from shift-bosses and timbermen. Mining is performed under contract at 7 to 11 pesos per foot, and the larger part of the tramping is done by contract also, the mine proper employing about 200 miners, 300 muckers, 80 carmen and 75 contractors.

In 1916 the mill treated 715,070 tons of 3.27% copper ore; concentrates averaged 12.78% copper; extraction 80.5%; ratio of concentration, 4.967; 697 gal. fresh water used per ton of ore milled. Operations at the property were practically continuous for the entire year; although American bosses were absent 14% of the time.

Production:	Lbs. Copper		Oz.	Oz.
	Net		Gold	Silver
1916.....	97,789,310		1,310	471,867
1915.....	22,889,885		599	331,836
1914.....	29,591,658		1,006	435,482
1913.....	36,598,132		.....	.....

The Moctezuma is one of the world's really great copper mines and the management is of the best.

BUNKER HILL MINES CO.

Mine office: Tombstone, Ariz.

Officer: Dr. E. Grebe, supt.

Inc. to take over and operate the property of the old Tombstone Cons. Mines Co. at Tombstone, discovered in 1878 and at one time one of the largest producers of gold-silver-lead ore in the Southwest. At a depth of 560' the volume of water became so great all attempts to handle it were unsuccessful and operations were discontinued until Phelps Dodge Corp. acquired possession.

Development: in 1916 was carried out principally on the claims tribu-

tary to the following shafts: Flora Morrison, Grand Central, Telephone, Bunker Hill, Silver Plume, Oregon, Lucky Cuss, Tribute, West Side, Toughnut, Silver Thread and Tranquility. New work totaled 8,177' in 1916. Results from prospecting in the old workings and in new ground have not yet shown orebodies of great size or commercial importance.

The old cyanide plant of the Tombstone Cons. was converted into an experimental plant for the testing of Tombstone ores and was put into operation in June, 1915. Results up to 1917 were inconclusive.

Power is supplied by a central power plant from which compressed air is conveyed by pipes to the different mines. About 300 men are employed.

Production:

	Ore Tons	Gold Oz.	Silver Oz.	Lead Lbs.	Copper Lbs.	Manganese Lbs.
1916.....	23,226	3,950	343,453	983,983	131,546	1,061,409
1915.....	10,746	1,373	109,783	269,303	23,760	1,171,599

Manganese Dioxide, 1,892,032 lbs.

During the year, 36,913 tons of ore were treated, 20,426 by cyaniding, containing an average of .10 oz. gold, 6.37 oz. silver, 2.03% lead, and 16,487 tons by concentration, containing an average of .015 oz. gold, 9.90 oz. silver and 24.3% manganese.

BURRO MOUNTAIN BRANCH

Mine office: Tyrone, Grant Co., N. M. E. M. Sawyer, mgr.

Property: 60 claims, 1,000 acres, bought 1906, from Southwestern Copper Co. The Savanna Copper Co.'s holdings of 2,600 acres were added in 1915, bringing the total acreage up to 4,464 acres. Property shows 36 porphyry dikes, carrying 5 orebodies of disseminated ore having 2% to 5% copper.

The old mine, 15 claims, known as the St. Louis, is said to have produced upwards of \$1,000,000 worth of ore, under former ownership, shipping ores ranging 15 to 25% in copper tenor.

Geology: property contains a number of large orebodies of disseminated chalcocite, so-called porphyry ore, that are genetically dependant upon intrusions of monzonite, in pre-Cambrian granite, both rocks being shattered and faulted. The largest orebody is entirely in porphyry, the next largest in a brecciated zone, associated with dikes of aplite and dark felsite (phases of the porphyry), cutting through granite. Actual stoping and milling operations began in March, 1916. The East orebody is mined by milling the ore into 55° chutes going down to the 4,700' Niagara tunnel, where it is loaded directly into standard gauge railway cars. The Breccia orebody is mined through No. 3 shaft, hoisted in 2-ton skips, dumped on an inclined belt conveyor, and discharged on a horizontal conveyor loading by tripping device into railway cars. Company has 5 Star churn drills, one electrically-driven, now at work.

The Burro Mtn. and Chemung mines have been united by the Niagara haulage tunnel, starting at the Tyrone terminus of the Burro Mountain branch of the A. T. & S. Fé railroad; this tunnel, 8x9', was driven to Leopold, a distance of about 1 mile, and serves the double purpose of drainage and haulage. While driving this tunnel the so-called Bison orebody was found.

The old concentrator, built 1905, and twice remodeled, has been dismantled. A standard-gauge 18-mile spur was built in 1913, at a cost of \$350,000, from the main line of the Santa Fé railroad to the mine and mill. A central power plant equipped with 3 1,000-h. p. Diesel engines,

was built at Tyrone, near the collar of No. 2 shaft. Labor is almost exclusively Mexican, only the bosses being Americans. The new 1,000-ton concentrator, with flotation equipment, at Tyrone, went into operation April 12, 1916. It consists of two units and is located 3 miles from the portal of the haulage tunnel. It is an all-steel-concrete structure covering 500 sq. ft. There are 5 floors, all equipped with the Kahn ventilation system. With the two units, which can be later raised to four, the estimated cost of the plant was about \$1,000,000. J. T. Hall is supt.

Lands include a town site, improved with waterworks, electric lights and substantial buildings and numerous dwellings.

In 1914-15 work consisted mainly in completing the development, by underground work and churn drilling operations, of orebodies already known. At the end of 1914, thirteen holes, with an aggregate of 11,571', had been drilled. This work continued throughout 1915 and 1916, the holes being rather widely scattered and no effort made to define ore limits, so that estimates of tonnage are not yet possible. The orebodies on the Mohawk and Thistle claims have been considerably extended as a result of churn drilling during the year. An unusual feature is the prospecting of the Mangas Valley where several holes passed through as much as 1,000' of recent Valley gravel before reaching bed rock.

Production: mine production for year 1916 was 257,501 tons with average of 2.12% copper, of which 12,353 tons were from the ore dumps. Ore milled was 253,782 tons of 2.117% copper from which was produced 26,362 tons of concentrates assaying 13.937% copper. Ratio of concentration was 9.627:1; saving, 68.39%. Tons milled per day were 1,189. Gross production of metals was 7,510,674 lbs. copper, 20,762 oz. silver from concentrates, precipitates and slag with 1,076,724 lbs. from lease ore, making a total of 8,587,398 lbs. of copper and 20,762 oz. of silver. Production of mill is for 213 days.

REPUBLIC IRON & STEEL CO.

Offices: 15 Exchange Place, Jersey City, N. J.; 17 Battery Place, New York; Youngstown, Ohio and Birmingham, Ala.

Officers: J. A. Topping, chairman; T. J. Bray, pres.; H. L. Rownd and J. W. Deetrick, v. p's.; R. Jones, Jr., sec.; H. M. Hurd, treas. and F. J. Webb, mgr.

Cap., \$30,000,000 com., \$25,000,000 pfd.; shares \$100 par; \$27,191,000 com. and \$25,000,000 pfd. outstanding. Funded debt outstanding, \$16,346,000 ten to thirty-year sinking fund mortgage gold 5s.

Dividends: 1¼% quarterly on pfd. and 1½% on com. stock.

Property: includes 5 iron mines in Michigan, 6 in Minnesota and 5 in Alabama; which yielded a total of 1,693,450 tons in season of 1916. Some of these are as follows:

Mine	Range	Mining System	Ore	Iron Content, %	Production 1916, Tons	Total Tons
Franklin	Mesabi	Slicing	Bessemer	51.84	54,002	2,095,739
Kinney	"	Steam shovel	Non-Bessemer	48.00	466,576	3,859,132
Pettit	"	Slicing	"	48.49	178,917	1,436,316
Schley	"	"	"	48.01	73,093	691,708
Cambria	Marquette	Stoping and snubbing	B. and non-B.	52.38	195,612	2,905,732

UNITED COPPER CO.

Dead. Fully described Vol. XI, Copper Handbook.

The preferred stockholders' protective committee of the United Copper Co. stated Aug., 1915, that it had been unable to obtain any offer from the

holders of the company's pledged assets which justifies the committee in continuing its efforts either to formulate a reorganization plan or redeem the pledged assets; that \$750,000 would have to be provided to redeem assets, which would require a cash assessment of about \$20 per share, which it is believed could not be raised under existing conditions. Committee also stated that it had considered possibility of instituting proceedings to recover wasted assets, but decided that there were no reasonable prospects of obtaining substantial results in such proceedings. Preferred stockholders were notified that stock deposited with the committee would be returned on presentation of certificates of deposit to the Central Trust Co. of New York.

The \$10,500,000 cash which was turned over to the United Copper Co. at the time that corporation sold its principal physical assets to the Rede Metals Mining Co., controlled by the former Butte Coalition Mining Co., was made the subject of an investigation by the receivers of the United Company in 1914.

When F. A. Heinze was on trial in the United States Court in New York several years ago it was charged that for a time preferred dividends were paid from capital account, while two of the common dividends were not from earnings but from money borrowed from Heinze and his associates.

Explanation is yet to be made as to what became of the cash and assets of the United Copper Co. treasury, both before and after the Assets Realization Co. became entangled with it.

In May, 1917, the U. S. Supreme Court dismissed suit brought by several United Copper shareholders for recovery of \$15,000,000 damages from Amalgamated Copper Co., upholding refusal of the United company's directors to bring action.

U. S. SMELTING, REFINING & MINING CO.

General office: 55 Congress St., Boston, Mass. **Corporate office:** 85 Exchange Place, Portland, Maine. **Selling office:** United States Smelting Co., Inc., 120 Broadway, New York. F. Y. Robertson, mgr. metal sales.

Officers: W. C. Sharp, pres.; C. G. Rice, v. p.; Frederick Lyon, v. p. in charge of operations; S. J. Jennings, v. p. in charge of exploration and mining investment; C. W. Van Law, 2nd v. p. in charge of operations; F. W. Batchelder, sec.-treas.; John Laurie, comptroller; C. F. Moore, cons. engr.; O. J. Egleston, engr.; G. W. Cushing, traffic engr. Executive committee: W. G. Sharp (chairman), B. P. Clark, C. G. Rice, J. J. Storrow, D. G. Wing and S. W. Winslow. Directors: (Term expires 1917), Frederic Ayer, E. B. Bayley, A. W. Preston, D. A. Ritchie and S. W. Winslow, Jr. (Term expires 1918), R. S. Bradley, Frederick Lyon, J. J. Storrow and S. W. Winslow. (Term expires 1919), S. L. Bartlett, R. J. Edwards, J. J. Phelan and C. G. Rice. (Term expires 1920), C. F. Brooker, B. P. Clark, C. A. Hight, S. J. Jennings, R. T. Paine, 2d, and W. G. Sharp. H. P. Swedtser, clerk.

Inc. Jan., 1906, in Maine. Cap., \$75,000,000; shares \$50 par, in \$37,500,000 of 7% preferred cumulative stock and \$37,500,000 common stock; issued \$24,317,775 preferred and \$17,555,887 common stock, Dec. 31, 1916. National Shawmut Bank, Boston, and Guaranty Trust Co., New York, registrars: Old Colony Trust Co., Boston, and Bankers Trust Co., New York, transfer agents. Annual meeting in May. Listed on Boston and New York Exchanges. Company had 8,846 pfd., and 2019 com. holders at end of 1916.

Dividends: rate is 7% on preferred stock, payable in quarterly dividends of 1½; first dividend paid April 15, 1906. Dividends on the common stock are given in the table below. In 1916 the total was \$3.75 per share. In 1917, to Oct. 15, \$5 per share.

Financial Statement:

	Net	Deprec.	Pfd.	Bal. for	Earned	Paid
	Earnings	& Reserve	Dividend	Common	Common	Com
1916....	\$9,737,664	\$1,839,200	\$1,702,225	\$6,196,239	40.93%	\$3.75
1915....	7,579,184	986,859	1,702,225	4,890,100	27.85%	0.75
1914....	2,932,519	666,878	1,702,222	563,421	3.21%	1.50
1913....	4,555,122	969,536	1,702,145	1,883,441	10.73%	3.00
1912....	5,497,965	1,265,000	1,702,120	2,530,845	14.41%	2.25
1911....	3,961,103	1,120,690	1,702,120	1,157,954	6.71%	2.00
1910....	3,551,387	1,067,069	1,701,701	781,765	4.45%	2.00
1909....	3,956,608	810,248	1,700,963	1,429,487	8.14%	2.00
1908....	3,359,222	311,632	1,700,801	1,808,737	7.46%	2.00

\$600,000 was written off 1915 earnings, and balance was written off during 1916 to pay off the cost of the three zinc smelters acquired in 1915, amounting to \$953,597.

The working capital of the company has been increased to \$13,700,000, and the company had at the end of the year cash on hand, \$5,105,678, as against current liabilities of \$6,595,399. Total assets and liabilities stood at \$83,932,051, against \$65,444,732 a year ago. The balance sheet as of Dec. 31, last shows:

Assets: capital assets, \$62,950,368; improvements, options and other deferred charges, \$1,229,412; ores, matte and by-products at cost, \$2,049,975; supplies, fuel and timber at cost, \$2,240,395; metals in transit, in process and on hand (at less than market value), \$6,561,728; notes receivable, \$666,624; accounts receivable, \$3,127,851; cash, \$5,105,678; total, \$83,932,051.

Liabilities: common stock, \$17,555,887; preferred stocks, \$24,317,775; capital stock of subsidiary companies not held by U. S. Sm., Ref. & Mng. Co., \$2,079,257; 10-year 6% gold convertible notes due Feb. 1, 1926, \$12,000,000; bonds of sub companies not owned, \$517,500; current liabilities, \$6,595,399; depreciation and reserve funds, \$7,466,608; undivided surplus, applicable to stocks of subsidiary companies not held by U. S. Sm., Ref. & Mng. Co., \$442,169; profit and loss surplus, \$12,957,455; total, \$83,932,051.

Net earnings for 8 months in 1917 were \$4,311,082, after paying for depreciation and interest, but not Federal taxes.

Company is a securities-holding corporation only, owning shares in the following subsidiaries:

CAPITALIZATION

	Par	Auth. Shares	Issued Shares	Owned by U. S. S. R. & M. Co.	Outstanding
United States Smelting Co.	\$100		10,000	10,000	None *1
Centennial-Eureka Min. Co.	25	200,000	100,000	99,964	26 *2 (See *1)
Mammoth Cop. Min. Co....	25	100,000	60,000	60,000	None
Gold Road Mines Co.....	5	400,000	314,911	314,911	None
The Needles Min. & Smel. Co.....	5	1,000,000	674,887	674,887	None
United States Stores Co....	10	500	500	500	None
(Succ. to Bingham Mercantile Co.)					
Cia de Real del Monte y Pachuca.....	None	2,554	2,554	2,534	20
U. S. Smel., Ref. & Min. Exp. Co.....	\$50	1,000	900	900	None
U. S. Metals Ref. Co.....	100 (Pfd.)	20,000	15,500	10,433	5,067
U. S. Metals Ref. Co.....	100 (Com.)	20,000	15,500	10,450	5,050

	Par	Owned by			Outstanding
		Auth. Shares	Issued Shares	U. S. S. R. & M. Co.	
Richmond-Eureka Min. Co.	10	360,000	309,397½	182,213	126,884½
Niagara Min. Co.	1	1,000,000	650,005	568,770	40,013
Carbon Emery Stores Co.	5	30,000	27,000	27,000	None
San Pete Valley Coal Co.	10	2,000	2,000	1,877	123
The Utah Co.	50	100,000	100,000	100,000	None

The Utah is a holding company owning the following shares and bonds:

Owned by The Utah Company				
	Par	Authorized	Issued	Outstanding
Utah Railway Co.	\$100	35,000	30,652	30,652 None
Castle Valley Coal Co.	5	1,500,000	923,800	475,839 390.051
Consolidated Fuel Co.	1	2,000,000	1,500,000	1,498,000 None *3
Black Hawk Coal Co.	10	30,000	25,200	25,200 None
Panther Coal Co.	5	100,000	91,000	45,500 None *4
Owned by The Utah Company				
Title of Security		Authorized	Issued	Outstanding
Castle Valley Coal Co., First & Ref. Mtge. 15-yr. 6% S. F. Conv. Gold Bonds		\$1,000,000	\$1,000,000	\$624,000 *5
Black Hawk Coal Co., First Mtge. 6% Gold Bonds		200,000	200,000	None *6
Consolidated Fuel Co., Joint First Mtge. 6% Serial Gold Bonds		600,000	450,000	None
Utah Railway Co., Utah Ry. Co. 5% Gold Coupon Notes, due 1922		5,000,000	3,500,000	3,500,000

*1 U. S. S. Co. owns 10 shares of the Centennial-Eureka Mng. Co.'s stock and 1690 shares of the Niagara stock. It also owns 81 shares of the Pfd. stock and 41 shares of the Com. stock of the U. S. Sm., Ref. & Mng. Co.

*2 The Centennial-Eureka owns 54,824 shares of the capital stock of the Bullion Beck and Champion Mng. Co., of which there are 63,787 shares issued.

*3 2,000 shares of the Consolidated Fuel Co. are owned by the U. S. Sm. Ref. & Mng. Co.

*4 45,500 shares of the Panther Coal Co. are owned by the U. S. Sm. Ref. & Mng. Co.

*5 \$246,550 of the Castle Valley bonds are owned by the U. S. Sm. Ref. & Mng. Co.

*6 \$200,000 of the Black Hawk bonds are owned by the U. S. Sm. Ref. & Mng. Co.

*7 Held in treasury for subscription by U. S. S. R. & M. Co.—33,728 shares. Held for exchange of old Niagara Mng. & Sm. Co. stock, 5,804 shares.

June 1, 1916, the only outstanding obligation of the company was \$12,000,000 6% convertible gold notes, dated Feb. 1, 1916, and due Feb. 1, 1926; also \$517,500, bonds of subsidiary companies not owned in the consolidation.

The subsidiary companies are described hereunder:

Needles Mining and Smelting Co.

Custom lead and zinc concentrator. Address: Needles, Cal.

Mammoth Copper Mining Co.

Custom copper smelter. Address: Kennett, Cal.

Goldroad Mines Co.

Officers of Mammoth, Gold Road, and Needles companies: A. P. Anderson, gen. mgr.; G. W. Metcalfe, mgr.; R. E. Hanley, mine supt.; J. H. Kervin, smelter supt. and D. G. Stuart, cashier, all of Mammoth company; D. R. Muir, mgr. of Gold Road and Needles.

United States Smelting Co.

Custom lead and copper smelters and custom lead and zinc concentrating mills at Midvale, Utah. Address: Salt Lake City, Utah. Custom zinc smelters at Iola, Altoona, La Harpe, Kansas and Checotah, Oklahoma. Address: 413 Republic Bldg., Kansas City, Mo.

Officers of U. S. Smelting, Centennial-Eureka and Richmond-Eureka:

G. W. Heintz, gen. mgr.; C. E. Allen, mgr. of mines; L. D. Anderson, supt. Midvale smelter; J. F. Barnard, supt. Bingham mines; W. H. Eardley, mgr. zinc properties; A. P. Mayberry, supt. Centennial-Eureka; Ambrose Nord, cashier.

United States Metals Refining Co.

Custom copper smelter and electrolytic copper refinery at Chrome, N. J., Electrolytic lead refinery at Grasselli, Ind. Address: 120 Broadway, New York City, N. Y.

Officers: F. Y. Robertson, v. p. and gen. mgr.; R. W. Deacon, supt. copper refinery at Chrome; William Thum, supt. lead refinery at East Chicago; F. F. Colcord, cashier, New York.

Cia. de Real del Monte

Mines and mills at Pachuca and Real del Monte. Address: Pachuca, Hidalgo, Mexico.

Officers: S. M. Cancino, pres.; D. S. Calland, director.

U. S. Smelting, Refining & Mining Exploration Co.

For examination and purchase of metal mines. Address: 55 Congress St., Boston, Mass.; 120 Broadway, New York, N. Y.; 1504 Hobart Bldg., San Francisco, Cal.; Newhouse Bldg., Salt Lake City, Utah; 906 Mills Bldg., El Paso, Texas; Edificio La Mutua 411, Mexico, D. F.

Officers: C. W. Van Law, v. p. and gen. mgr.; A. P. Anderson, Pacific Coast mgr.; E. N. Funston, Colorado mgr.; D. D. Muir, Jr., inter-mountain mgr.

U. S. Fuel Co.

Coal mines in Utah and Wyoming.

Officers: A. B. Apperson, v. p. and gen. mgr.; R. M. McGraw, gen. supt.

U. S. Stores Co.

J. H. Horlick, mgr.

Production:*

	Zinc Lbs.	Copper Lbs.	Lead Lbs.	Silver Oz.	Gold Oz.
1916.....	64,584,001	28,888,093	103,855,451	11,647,205	129,273
1915.....	34,105,471	26,923,674	87,102,179	12,071,863	196,481
1914.....		17,946,659	64,443,260	9,936,237	124,719
1913.....		20,239,973	58,116,504	13,089,708	148,372
1912.....		21,152,620	56,385,769	12,059,829	140,183
1911.....		22,199,141	49,022,791	10,285,150	118,703
1910.....		28,430,423	51,450,985	10,776,465	113,246
1909.....		36,672,605	41,627,995	9,637,119	128,393
1908.....		32,803,603	27,304,347	8,340,566	128,208

Average prices received:

	Copper Per Lb.	Lead Per Lb.	Silver Per Oz.	Zinc Per Lb.
1916.....	\$0.27297	\$0.06676	\$0.65386	\$0.12327
1915.....	0.18183	0.04546	0.49965	0.14964
1914.....	0.13404	0.03827	0.55564	
1913.....	0.15433	0.04396	0.60503	
1912.....	0.16237	0.04529	0.61291	

The total amount of ore from the Centennial-Eureka, Mammoth, Gold Road, Tennessee, and Bingham mines, also mines in Mexico was 1,022,306 tons, of which the values of the metal-contents were in the proportion of 39% copper, 8% lead, 15% zinc, 28% silver, and 10% gold. The Real del Monte mills were operated at 33% of their capacity, due to lack of supplies. The coal output was 756,931 tons.

Profits for 8 months in 1917 have been at the rate of \$18 per share on common stock. Owing to strikes and other troubles, resulting in decreased outputs, 1917 profits will be about \$3,000,000 less than in 1916, unless the Mexican properties come to the rescue. In July, Real del Monte made a profit of \$60,000; in August, \$160,000; and \$250,000 is expected monthly from then on, unless silver drops much lower.

Development at company's silver mines in Mexico in 1916 were exceptionally rich. Ore developed on the 1,400' level was reported to have a net value of \$15,000,000; while a reasonable extension of the orebodies would give a net valuation of \$75,000,000. Recent work continues to open rich ore. The company's operations have not been as seriously curtailed as those of other companies, and with peace in Mexico, these properties will break all records for silver production. Lack of supplies has been the main cause of intermittent operation of late, but in July, 1917, 57,000 tons of silver ore was treated. It is proposed to increase the capacity to 100,000 tons monthly.

Company is ably managed and in the hands of experienced, yet courageous, executive officials, so that an even more prosperous future is assured.

United States Smelting Co.

Office: 55 Congress St., Boston, Mass. **Operating office:** 920 Newhouse Bldg., Salt Lake City, Utah. **Works office:** Midvale, Salt Lake Co., Utah.

Officers: Wm. G. Sharp, pres.; C. G. Rice, v. p.; F. W. Batchelder, sec.-treas.; preceding with S. W. Winslow, B. Preston Clark; and J. J. Storrow, directors; Geo. W. Heintz, gen. mgr.; L. D. Anderson, smelter supt.

Is controlled, through ownership of entire capital stock issue, by the U. S. Sm., Ref. & Mng. Co.

Inc. Sept. 2, 1902, in Maine. **Cap.**, \$1,000,000; shares \$100 par; all outstanding.

The company owns the following property: (1) The Old Jordan, Telegraph & Galena mines, including 99 patented and 15 unpatented claims at Bingham, Utah. (2) The Midvale Smelter, at Midvale, Utah. (3) Three zinc smelters, in Kansas, with a total capacity of 70 tons spelter per day, purchased in 1915 to handle the output of the company's subsidiaries and to obtain the great profit between the price of ore and spelter; also a zinc smelter at Checotah, Oklahoma. (4) Lease on Ritz zinc mine in Oklahoma. (5) Lime quarry at Topcliffe, Utah. (6) This company also owns 10 shares of Centennial-Eureka Mng. Co., 1,690 shares Niagara Mining Co., 81 preferred and 41 common stock of the U. S. Sm., Ref. & Mining Co. stock.

The Bingham mining property includes very valuable mines producing silver-lead, copper, gold and zinc ores, in part complex. They have been operated since 1870, and by this company since 1899. The orebodies occur in limestone, which precludes the economic blocking out of large ore reserves, but the company states that 2 or 3 years supply is developed, the unexplored territory is large and the outlook promising. Ore is developed faster than it is extracted. The geology of the district is fully described in U. S. Geol. Survey Prof. Paper No. 38, 1905.

In 1914 the mines produced 194,898 tons of ore of an average value at the mine of \$7,198, at a mining cost of \$2.86. Production in 1915 amounted to 94,166 tons of lead and 34,313 tons of copper.

In 1916 the output was 109,586 tons of lead and 46,017 tons of copper ore. Pneumatic haulage apparatus is a success. The Niagara tunnel handles the whole output, so the 3-mile aerial tram was reerected at the Stowell mine in California.

Midvale Smelter

Midvale smelter, at Midvale, Utah, comprises a lead smelter, and lead and zinc concentrating mill, which treat not only the company's ores, but do a general custom business. The smelter has seven blast furnaces with a smelting capacity of 481,000 tons per year. It is equipped with modern blast and roasting furnaces, charging apparatus and bag houses which eliminate smelter fumes, and recover arsenic and cadmium.

All ore is received at the sampling plant, which contains 2 mills, one for oxidized and one for sulphide ores. The former is equipped with one 10"x20" Blake crusher, one No. 2 style D Gates crusher, one set 14"x27" Davis rolls, one set 14"x26" Colorado Iron Works rolls, two 42" Snyder samplers, two 27" Snyder samplers, giving final sample of 1 part in 720, 50-h. p. a. c. induction motor.

The sampling mill for sulphide ores, which is also used for a crushing plant, contains: one 10"x20" Blake crusher, two 36"x16" Allis Chalmers class B rolls, three 27" Snyder samplers, giving final sample of 1 part in 360, one 50-h. p. a. c. induction motor.

The **Lead Smelter**: of 1,750 tons daily capacity, contains: seven 250-ton blast furnaces, having 5 water jackets each side and one at each end; ten 3½" tuyeres each side. Each furnace is 48"x160" at tuyeres and measures 7', 11"x13', 4" at charge floor. The crucible is elliptical with I beam binders. The forehearth is 4', 5x9' and is 3" to 6" deep.

The matte pans are 5' dia. x 9" with anchors for embedding in the cast matte for handling by monorail crane. The slag is handled in Stearns-Rogers slag cars of 28 cu. ft. capacity which are emptied by tapping through hole 8" from bottom. The molten lead is drawn off from side of crucible into pots, wheeled to remelting plant, dumped into 4 remelting kettles of 9' dia. and 30 tons capacity.

Skimmings are handled by a Howard dross press. Most of the lead is drawn through iron siphon pipes and cast into anodes on a continuously revolving casting table carrying 10 moulds, but a small amount is cast into pigs. The anode plates are sent to Grasselli works of U. S. Metals Ref. Co. for electrolytic refining. The blast furnace building is ventilated by hoods, over forehearth and slag pots, with No. 12 Sirocco fan to baghouse, containing 768 cotton bags 12"x23' long.

Ore handling. Ore is bedded by means of 18" belt conveyor from oxide sample mill and Robins automatic reversing tripper. 3 Brownhoist electric scale charge larries make up charges and deliver into 6' gauge charge cars which dump directly into tops of blast furnaces.

The roasting department contains 26 converter roasters (worked during one 8-hr. shift only), each converter roaster consists of a 6'x6x3' high cast iron shell with 3' hood, bottom of grate bars, through which 9-oz. blast is blown for about 4 hours. Solid sintered cake is discharged by ram car, and carried by half gantry crane to a 24"x36" Farrel crusher which delivers the broken product to an inclined skip hoist discharging into R. R. cars. There are also 4 Wedge furnaces, each 21' dia. with 7 hearths; the feed is brought by belt conveyors; the product handled by pan and belt conveyors. Sulphur in product is still further eliminated in D. & L. plant. The plant also contains 6 Dwight-Lloyd sintering machines for which the feed is mixed in bins and on conveyor belts, and the product is discharged into R. R. cars.

The fumes pass into a brick baghouse 60'x283' in ground section and 58' high, with 8 separate compartments, 5 for roaster fumes, each compartment or bay having 416 woolen bags 18" dia.x32'-6" long; 3 handle part of the blast furnace fumes, each having 420 woolen bags. All bays have steel

hoppers under thimble floor provided with 9" screw conveyors for discharging dust into cars.

All Dwight-Lloyd roaster fumes pass into a 8½' balloon flue, leading into two 10' dia. cooling flues, where fumes from the ZnO furnace are added to neutralize SO₂.

Wedge furnace and converter roaster fumes pass into 8½' balloon flues and through a 122" fan run by 50-h. p. motor into two 10' cooling flues above. Slack lime is added to neutralize SO₂. All roaster fumes pass through 13'-6" Sturtevant fan run by 150-h. p. motor to roaster section of baghouse. From baghouse two No. 20 Sirocco fans run by 150-h. p. motor force gases into 16'-6"x245' steel stack, at same time drawing in fresh air for diluting gases. Gases issuing from stack must contain less than .75% by volume of SO₂ by Court decree. Part of the blast furnace fumes pass through rectangular brick flue with hopper bottoms to 15' Sturtevant fan run by 100-h. p. motor and then into blast furnace section of baghouse. Each of 3 blast furnace bays has a separate stack 6' dia.x100'. The blast furnace fumes not handled in this baghouse pass through a balloon flue 15' dia.x160' to a No. 14 Sirocco fan (run by 50-h. p. motor) into a brick chamber which is connected by air operated valves to a 5-compartment baghouse lined with asbestos sheet. This baghouse has 1,200 12"x34' cotton bags. Dust is collected in cars in tunnel under baghouse hoppers. Blast furnace fumes are neutralized with slaked lime before they enter baghouse.

Roaster dust is briquetted in Chrisholm-Boyd-White machine. Blast furnace dust averaging 40 to 50% arsenic is taken to arsenic plant.

The crude product carries 97 to 99% arsenious trioxide, which is removed through the doors, and sent, in buggies, over a monorail crane to the refining furnace, where charged direct into a 30x66" steel hopper in the top of the refining furnace. Access to the interior of the refining furnace is through three 9x15" doors on each side and a temperature of about 700° F. is maintained. The capacity of the refining furnace being 15 tons daily, and output of crude arsenic being only about 2 tons daily, from each Brunton furnace, the refining furnace is worked only part time. The product of the refining furnace is crystalline arsenious trioxide of 99.87% average tenor, which is sent to a 3' buhr-mill, ground and packed for shipment. The grinding is done in a small room, tightly closed, and connected with an exhaust fan discharging into a small baghouse, so that no arsenic may escape into the air. Workmen about the arsenic plant wear a one-piece suit of overalls, with a hood, furnished by the company, and also wear respirators, when entering the chambers, or otherwise coming in contact with the arsenic. All employes of the arsenic plant are required to take a bath and make a complete change of clothing when going off shift.

Residue from Brunton furnaces is ground in 3'x3'-6" pebble mill, treated with sulphuric acid, roasted in a reverberatory type roaster, ground again, agitated with water in a pachuca tank, filtered, the filtrate going into 8 electrolytic tanks having lead anodes and aluminum cathodes on which cadmium is recovered.

The Power Plant contains 4 250 h. p. batteries of water tube Stirling boilers (2 of which are in continuous operation) generating steam at 140 lbs. pressure; 2 batteries with American stokers and 2 with Roney stoker. Steam is used to operate 3 Nordberg tandem compound Corliss engines 12"x24"x36" each, direct connected to 175 cu. ft. Connersville blower, and 1 10"x18"x36" Nordberg cross compound Corliss engine tandem connected to 12"x12"x36" compressor for supplying air for forges, air hammers, air lift pumps, hoists and various pneumatic machinery. Main power plant includes

one 500-k. w. Curtis steam turbine, one 200-kva. synchronous motor generator set for D. C. current at 500 volts, one 150-k. w. D. C. generator, one 150-k. w. A. C. generator, both connected to 12"x24"x36" tandem compound engine by belt, one 200-k. w. D. C. generator connected to 16"x32"x36" tandem compound engines.

Electric current is supplied by the Utah Power & Light Co. at 44,000 volts stepped down to 480 volts in three 300-kva. single phase transformers and one 400-kva. 3 phase transformer. Current for electrostatic zinc mill and 150-ton concentrator is stepped up to 1,440 volts in 200-kva. auto transformer, and again stepped down at mill to 480 volts in 200-kva. auto transformer.

The **Concentrating Mill** has a capacity of 210,000 tons of ore per year. It treats the low-grade silver-lead ores of the Bingham mines, producing lead concentrates sent to the smelter, and a middling product containing zinc and iron sulphides, which is treated in the Huff electrostatic mill. The wet concentrating plant has two units, one of 150, the other of 450 tons daily capacity.

The 450-ton concentrator has the following equipment: one 16x20 Allis Chalmers-Blake crusher, three 36x16 Allis Chalmers style B rolls, 10 trommels, seven 3-compartment single Harz jigs, twenty 8' and 9' Callow tanks, two shovel wheels, six 16" Bucket elevators, two 5'x14' Denver Eng. Wks. tube mill, eleven 20" to 60" double cone classifiers, eight Deister slime tables, 11 Overstrom tables, 24 Wilfley tables, one 4-compartment concentrates bin, misc. settling tanks and centrifugal pumps, one 100-h. p., one 75-h. p., two 50-h. p., one 35-h. p., one 30-h. p., one 25-h. p. motors.

Concentration $2\frac{1}{2}$ to 1; extraction is 85 to 90% silver-gold-lead, 40% zinc, 80% copper.

The 150-ton plant at the concentrator contains one 9x15" Hodge Blake crusher, four 30x12" Allis Chalmers rolls, 7 trommels, four 3-compartment single Harz jigs, six 8' Callow tanks, one shovel wheel, one 24" Akins classifier, four 12" and 16" bucket elevators, nine 20" 60 60" double cone classifiers, 12 Wilfley tables, 4 Deister slime tables, one 2-compartment concentrates bin, misc. settling tank and centrifugal pumps, one 75 h. p. motor, two 35-h. p. motors. Ratio of concentration is 1 $\frac{1}{2}$ into 1. Extraction averages 85 to 90% gold, silver, lead, 50% zinc, 80% copper.

The 75-ton electrostatic zinc mill contains 1 zinc middlings receiving bin, one 60"x30" Ruggles-Cole dryer, 2 banks of Newaygo screens—16, 40, 60, 100 mesh; 9 Huff roughing machines, 12 Huff finishing machines, 6 combined roughing and finishing toboggan machines, one 35-h. p., one 50-h. p., one 10-h. p., three 5-h. p. induction motors; one baghouse, with No. 70 A. Blower Co. fan for collecting dust from mill, with 64 12" dia.x16' cotton bags. Product 40% to 50% zinc and iron pyrites.

During 1916 a magnetic separator commenced treating pyrite, heretofore unprofitable; and in 1917 a Weatherby separator was installed for this work. Flotation is being tried on tailings. A thaw house was erected to aid unloading ore from cars. This also increased mill capacity.

Other Plants

The U. S. Smelting also owns and operates zinc smelters at Altoona, Iola and LaHarpe, Kansas, and operates under a lease the Ravenswood mine near Reeds, Mo. All smelters are equipped for either oxide or sulphide ores.

Altoona Zinc Plant: Altoona, Kansas. Local supt., I. A. Palmer. The property includes 30 acres, and has a capacity of 39,000 tons of ore per year. It contains 6 blocks, 12 furnaces, 3,960 retorts, the total capacity per day is 108 tons, producing approximately 30 tons spelter per day.

Iola Zinc Plant: Iola, Kansas. Local supt., A. R. Campbell. The plant has 34 acres land and a capacity of 34,000 tons of ore per year. It consists of 5 blocks, 10 furnaces, with 3,440 retorts. Total capacity per day 95 tons, producing approximately 25 tons spelter per day.

LaHarpe Zinc Plant: LaHarpe, Kansas. Local supt., A. R. Campbell. The plant has 19 acres and treats 18,000 tons of ore per year. The smelter has 3 blocks, 6 furnaces, 1,924 retorts. The total capacity per day is 52 tons, or approximately 15 tons of spelter.

All three smelters use natural gas as fuel, having 14,481 acres of gas land in fee or under lease. The total capacity per day is 225, or 7,650 tons per month, which is approximately 70 per day, or 2,100 tons per month of spelter.

Checotah Zinc Plant: Oklahoma: using natural gas, was purchased by cash and partly by transfer of the plant at Iola. The sum of \$850,000 was written off these plants, now standing at \$486,030. The cost of the 3 plants bought in 1915 has been written off.

Ravenswood Mine: Local supt., T. J. Rightly, Reeds, Jasper Co., Missouri. Mine production 218,000 tons per annum. The zinc mill has a capacity of 218,000 tons per annum. The mine was unwatered and production begun at the end of 1915.

In 1916 the company purchased the Marbury leases consisting of 60 acres lying between the Blue Goose and Beaver mines in the Cardin camp, and has started the development of the property by sinking two shafts to the ore deposit. The consideration given for the property is said to have been \$125,000. There were 20 drill holes put down and of these 18 were said to have struck good ore from 280 to 312'. The company moved its Ravenswood mill to the newly acquired lease. This mine is known as the Ritz.

U. S. Smelting, Refining & Mining Exploration Co.

Office: 120 Broadway, New York. **Operating office:** 508 Dooly Bldg., Salt Lake City, Utah.

Inc. in Maine. Subsidiary of the U. S. Sm., Ref. & Mng. Co., which owns the 900 shares issued of a total of 1,000 shares capital stock.

Officials: C. W. Van Law, v. p.-gen. mgr.; A. P. Anderson, Pacific Coast mgr.; E. N. Funston, Colorado mgr.; D. D. Muir, Jr., Inter-Mountain mgr.; C. F. Moore, cons. engr.; F. B. Weeks, field eng.

Company was organized for the purpose of exploring and developing new properties, which, when acquired, would be turned over to operating subsidiaries of the U. S. Sm., Ref. & Mining Co.

Leadville Unit. Leadville, Colo. H. S. Lee, mgr.; E. H. Hamilton, supt.

This unit unwatered the 407' Harvard shaft on Fryer Hill, and is sinking the several hundred feet through quartzite to the second contact. Thorough exploration and a geological study of the entire territory controlled by this unit is in progress. Property is equipped with hoist, compressor, etc.

In July, 1917, control was secured in the Sunnyside and Gold Prince mines near Silverton, Colo. Reserves were estimated at 850,000 tons. On 8 levels of the Sunnyside there are over 12,000' of openings. Veins are 6' wide in andesite and the ore contains 0.1 oz. gold, 6 oz. silver, 5½% lead, ½% copper and 9% zinc. A 500-ton mill is being erected at Eureka, nearby.

Arizona Unit. The Durham property in the Tortillita Mountains, 50 miles N. E. of Red Rock, Ariz., was explored by churn drills. The land adjoins that of the Tortillita Copper Co.

UNITED STATES STEEL CORPORATION

Through its subsidiaries this company controls about 140 iron mines in Alabama, Michigan, Minnesota and Wisconsin. The most important are described under their respective heads. In the season of 1916 there was mined a total of 33,355,169 tons of ore, which yielded 17,412,049 tons of pig iron.

WESTERN PRECIPITATION CO.

Office and laboratory: Walter A. Schmidt, gen. mgr., 1016 W. 9th St., Los Angeles, Cal. **Eastern office:** L. Webb, Widener Bldg. Philadelphia, Pa.

Company is well known and controls the Cottrell patents for electric precipitation of smelter dust and fumes. Installations are working at many important smelters, such as at Anaconda, Bunker Hill & Sullivan, International, Trail, Midvale, Garfield, Selby, Mammoth, Northport, Leadville, and several smelters in Japan; also at cement plants in Eastern and Western United States, and in foreign countries. Operations in the East are controlled by the Research Corporation, 63 Wall Street, New York.

YUKON GOLD CO.

Office: 120 Broadway, New York. Controlled by the Yukon Alaska Trust, inc. 1916 to take over the residuary assets of the dissolved Guggenheim Exploration Co.

Officers: Wm. Loeb, Jr., pres.; C. K. Lipman; v. p. and sec.; O. B. Perry, cons. engr. and gen. mgr.; with Daniel, Isaac, Morris and S. R. Guggenheim, E. L. Newhouse, F. R. Foraker, Charles Earl and R. W. Straus, directors; L. Fredrick, treas.; W. E. Bennett, asst. sec.; M. M. Van Keuren, comptroller; O. L. Myers, gen. aud.; F. R. Raiff, traffic mgr. and J. K. MacGowan, purch. agt.

Inc. Feb. 28, 1907, in Me. **Cap.,** \$25,000,000 reduced, Jan., 1915, to \$17,500,000; shares \$5 par; all issued; \$14,213,125 stock owned by the Yukon Alaska Trust. Guaranty Trust Co., New York, registrar; D. A. Crockett, 120 Broadway, New York, transfer agent. Listed on New York and Boston Curb. Annual meeting 2nd Monday in January, at Augusta, Me.

Dividends: 8% (40c per share) quarterly from Sept., 1909 to Dec., 1911; 6% (30c per share) annually from April, 1912 to Sept., 1917. The annual distribution calls for \$1,050,000.

Assets: Comparative General Balance Sheet

	Property & Invest's	Equip.	Def'd Charges	Bullion & Cash	Other Current	Total
1916.....	\$12,311,019	\$8,312,943	\$501,094	\$2,046,748	\$1,735,985	\$24,907,780
1915.....	11,569,474	7,039,902	548,532	469,729	1,957,015	20,984,652
1914.....	11,524,181	7,036,424	600,066	195,283	1,509,654	20,856,608

Liabilities:

	Capital Stock	Yukon-Alaska Trust	Current	Deprec.	Surplus	Total
1916....	\$17,500,000	\$5,000,000 (a)	\$189,614	\$1,567,822	\$850,344	\$24,907,780
1915....	17,500,000	1,500,000	158,078	1,223,740	602,834	20,984,652
1914....	17,500,000	1,675,000	134,729	987,995	567,884	20,865,608

(a) Formerly Guggenheim Exploration account.

Comparative Income Account:

	Operating Income	Royal- ties Paid	Amort- ization	Int. Ch's, Exp's, etc.	Total Deduct's	Surplus
1916.....	\$2,101,701	\$362,852	\$250,647	\$390,691	\$994,191	\$1,107,510
1915.....	2,121,031	542,241	248,037	245,803	-1,036,081	1,084,950
1914.....	2,213,126	489,169	534,073	61,577	1,084,819	1,128,307

In 1916 the Yukon-Alaska Trust acquired 8 serial notes of \$625,000 each, bearing 5% interest, representing the loan to the Yukon Gold Co. of \$5,000,000, as shown above. The first note fell due on Feb. 1, 1917, but was extended for 8 years, the reason being the heavy expenditure on new properties.

Property: includes 650 claims in the Klondike, Yukon Territory; 24 claims on Flat and Greenstone creeks, Iditarod district, Alaska; considerable areas on the American, Feather, Trinity, and Yuba rivers, and Butte creek, California; lease on property of the Coeur d' Alene Mining Co., Prichard creek, near Murray, Idaho; and the Long Hike and O. K. lode claims, in the Jarbidge district, Elko county, Nev., the last operated by the Elkoro Mines Co., which see.

The new properties acquired by purchase or lease contain gold estimated to be worth \$8,000,000, of which the company's proportion will be \$3,500,000. In 1916, \$1,893,105 was spent on new property and equipment.

Heretofore Yukon Gold has confined its operations to placers, but the lode property in Nevada marks a departure from this policy.

Equipment: at Dawson, Yukon, 7 large dredges, 70 miles ditch, power plant, steam thawing apparatus and hydraulicking plant; at Iditarod, Alaska, 2 dredges; on 5 rivers in California, one dredge on each; in Idaho, one 7½ cu. ft. dredge; and at Elkoro mines, Nev., 100-ton cyanide mill.

Production:

	1916			1915		
	Yards	Yield Cents	Cost Cents	Yards	Yield Cents	Cost Cents
Alaska (dredges)	1,222,428	86.7 to 95.6	80.6 to 39.8	926,956	91.30	38.70
Klondike (dredges)	5,433,052	41.89	23.32	5,041,075	48.73	26.46
Klondike (sluicing)	2,245,084	19.40	11.90	3,031,647	13.60	7.00
California (3 dredges)	4,032,476	10.27	3.94	3,818,127	11.46	4.51

Total quantity 12,933,040

12,817,804

Company's financial and technical direction is excellent.

ZINC CONCENTRATING CO.

Officers: L. N. Godfrey, pres., 60 Congress St., Boston, Mass.; Augustus T. Clark, treas.; with D. L. Goff, Jas. B. Etherington, M. B. Ryan, Oscar Hoppe, Herbert H. Brooks, directors.

Cap., \$3,000,000; shares \$10 par; full-paid and non-assessable; all issued. Stock traded in on New York Curb.

Company owns all the patents and rights of the Campbell system of magnetic separation and the Dings' magnetic separators. The Campbell process has been successfully used at two plants, one at Linden, Wis., operated by the Linden Zinc Co. and one at Cuba, Wis., under lease to the Wisconsin Zinc Co. Company claims a regular zinc recovery of 95% and a total ore recovery, zinc, sulphur, iron, of from 85 to 90%.

The Linden Zinc Co. is reported paying \$9,000 annual royalty for one unit.

ALABAMA

ALABAMA COMPANY, THE

ALABAMA

Office: H. W. Coffin, gen. mgr., Birmingham, Ala.

Property: includes 10,164 acres of iron orelands in Etowah, Talladega and Jefferson Counties, Ala.; and in Polk Co., Ga.

Ore: production for the last 3 years was: 135,398, 166,582 and 257,958 tons, respectively.

REPUBLIC IRON & STEEL CO.

See same title in U. S. section.

ALABAMA**TENNESSEE COAL, IRON & RAILROAD CO.****Offices:** Brown-Marx Bldg., Birmingham, Ala.**Property:** 17 active mines in Birmingham district, Ala.**Production:** not published, but is probably about 3,000,000 tons, as this State yields 5,000,000 tons annually.**ALABAMA****U. S. STEEL CORP'N**

See same title in U. S. section.

ALASKA

Companies grouped by districts.

COPPER RIVER DISTRICT**ALASKA COPPER CORPORATION****ALASKA****Office:** 25 Pine St., New York. **Mine office:** Strelna, Alaska.**Officers:** Frederic B. Bard, pres.; Alvan Markle, treas.; Edward Barr, sec. **Directors:** Samuel D. Warriner, Alvan Markle, John W. B. Bausman, W. F. B. Stewart, George R. Bedford, M. J. Martin, Frank P. Lauer, Frederic B. Bard and D. George Dery. Howard W. DuBois, cons. engr.; Angus McLeod, supt.; C. C. Semple, min. engr.**Inc.** November, 1912, in Delaware. **Cap.,** \$10,000,000; shares \$5 par; fully paid and non-assessable; 1,740,000 shares issued. Guaranty Trust Co., New York, transfer agent; Columbia Trust Co., New York, registrar. Annual meeting, third Tuesday in February.

Company controls by ownership the majority of the capital stock of the Alaska Consolidated Copper Co. and holds an operating lease for 99 years from the latter company.

Property: 35 claims, 700 acres; eleven claims patented and balance in process of patent. Holdings comprise Nuggett group, situated about 18 miles from railroad station of Strelna, on the Copper River and North Western R. R., at an elevation of about 3,500'.

The property is crossed by a series of parallel fault fissure veins, in amygdaloidal greenstone, containing mostly bornite and some chalcopyrite, in a siliceous limestone gangue. The several parallel veins dip 83° N. W. and strike N. 40° E. One vein system has been followed on the surface along its strike for 3,500', by means of test pits sunk at frequent intervals. The main vein system is prominently exposed at the surface, the orebody said to have a width of 16' across its strike, and to average better than 5% copper. From the high-grade orebody, two carload shipments have been made from which smelter returns are reported to have averaged 49% copper and 13 oz. silver per ton. The property is being developed for mining both high-grade and disseminated ore. Total workings are about 4,500'.

Development: Underground workings of 2,320' were driven by hand drilling previous to the new management installing power equipment for carrying on all future development work. The power equipment includes three 30 h. p. of the N-S-O type of fuel oil engines. The air compressors are direct connected, furnishing 500 cu. ft. air per minute, at 100 lbs. pressure. The general equipment includes a No. 5 Leyner drill sharpener, one oil furnace for heating drill steel, four Tugger hoists and several air pumps. Both Ingersoll-Rand and Sullivan hammer and stoper drills are used. Employs about 100 men. Property considered meritorious, but needs large amount of money for development and equipment.

During summer of 1917, a 19-mile motor truck road, from the mine to rail at Strelna, was constructed. Ore shipments started in November, 1917. Plans are under way for erection of a concentrating plant.

ALASKA UNITED COPPER EXPLORATION CO. ALASKA

Office: 551 Coleman Block, Seattle, Wash. **Mine office:** Dan' creek, Copper River district, Alaska.

Officers: L. C. Dillman, pres. and gen. mgr.; Jas. A. Munday, v. p.; E. V. Dillman, sec.; W. A. Mears, treas.; preceding officers: A. Ingraham, W. Hughes, Frank L. Huston, Jas. J. O'Keane and Thos. M. Dunn, trustees; C. C. Jones, cons. engr.

Inc. Nov. 14, 1906, in Washington. **Cap.**, \$12,500,000, shares \$1 par. Debentures, \$150,000 6% bonds. Annual meeting, first Monday in January.

Property: 23 claims, area 460 acres, comprising the Finch, Dillman and Porcupine groups, all five miles from the Copper River railroad, on branches of the Chitina and Nizina rivers, in the Copper River district, Alaska.

Exploratory work has been done on the various groups, property having a number of small tunnels and numerous trenches and open cuts, showing copper ore said to average 35%.

The company is primarily a holding company, prospecting and developing properties in its possession for sale to other parties.

Company controls the Alaska Westover Copper Co., which see.

HOUGHTON-ALASKA EXPLORATION CO. ALASKA

Company dissolved and property sold. Fully described in Vo. XII.

HUBBARD-ELLIOTT COPPER CO. ALASKA

Offices: 327 So. La Salle St., Chicago, Ill. **Home office:** 411 New York Blk., Seattle, Wash. **Mine office:** Elliott Creek, Chitina district, Alaska.

Officers: H. P. Elliott, pres.; R. Reichardt, 1st v. p.; T. J. Dolan, 2nd v. p.; A. J. Elliott, sec.; J. T. Evans, treas.; L. G. Hinckle, supt.

Inc. Jan., 1911, in Washington. **Cap.**, \$3,500,000; shares \$1 par; 1,500,000 shares issued in exchange, share for share, for stock in the old Hubbard-Elliott Copper Mines Development Co. of Alaska; 2,000,000 shares treasury stock.

On Feb. 28, 1917, company made a 15-year contract with an Eastern syndicate for the development of its properties. Syndicate will open up the mines and provide for the marketing of all ore extracted.

Property: 35 patented claims, 5 mill sites with U. S. government titles and 84 unpatented claims, over 2,500 acres, covering over 6 miles in Elliott Creek valley. Acquired an 8/12 interest in the adjoining U. G. I. group of 8 claims, 1917. Elliott creek is an affluent of the Kotsina river, about 15 miles above junction of the Kotsina with the Copper river.

Geology: copper ore occurs in fissure veins and associated replacement orebodies in greenstone with limestone beds above it. The prominent outcrops are practically all on the north side of Elliott creek, near the contact, which runs N. 75° W. and dips 80° N. All outcrops are in the greenstone underlying the limestone beds except on the Leland and Lawton claims which are in a well-defined porphyry dike. Above the limestone is found a heavy capping of conglomerates.

The principal ore minerals are bornite, glance and chalcopyrite. The total absence of surface oxidation due to glacial action is notable and sulphides occur in a calcite matrix in the veins and with a greenstone matrix.

Development is by tunnels.

Equipment: includes compressor, drills, etc. Hydro-electric power plant and concentrating mill installed in 1914.

JOSEVIG-KENNECOTT COPPER CO. ALASKA

Address: Alaska Bldg., Seattle, Wash.

Officers: D. K. McDonald, pres.; J. B. MacDougall, v. p., with M. E. Hay, W. L. Gazzam and J. W. Roberts, directors; W. H. Seagrave, mgr. Inc. in Washington. Cap., \$2,500,000; shares, \$1 par.

Property: 22 claims, 7 miles from Kennecott, Alaska. Ore occurrence is said to be identical with that of the Bonanza mine of the Kennecott Copper Corp. Several hundred tons of over 40% ore was opened late in 1916. Estimates of reserves are placed at \$2,000,000. One wide vein is opened by tunnel for 3,000'. One of the difficulties is transportation to rail at Kennecott and an aerial tram is proposed. A number of engineers have reported on the property.

When the first 500,000 shares were offered in New York, sales were slow, and the promoters were subjected to criticism by financial journals, one of which said that the backers' best "talking point" was the property's proximity to the Kennecott Copper mines. However, work now seems to be underway.

KENNECOTT COPPER CORPORATION

ALASKA

Office: 120 Broadway, New York.

Officers: Stephen Birch, pres.; Wm. Pierson Hamilton, v. p.; Thos. Cochran, H. O. Havemeyer, Seward Prosser, Samuel J. Clarke, H. F. Guggenheim, E. A. Guggenheim and W. C. Potter, directors; C. T. Ulrich, sec.; E. S. Pegram, treas.; F. W. Hills, comptroller; J. N. Steele, gen. counsel; J. K. MacGowan, pur. agt.

Inc. April 29, 1915, in New York. Cap., \$6,000,000, increased May, 1915, to \$15,000,000, in 3,000,000 shares, fully paid and non-assessable.

On December 31, 1916, there were outstanding \$2,786,679 1/13 shares of the stock, issued for the following purposes:

	Shares
Cash (original incorporation)	100
For Kennecott Mines Co. property, assets and liabilities....	599,900
For Beatson Copper Co. property, assets and liabilities....	119,996
For 404,504 shares of Utah Copper Co.....	606,756
For all C. R. & N. W. Ry. Co. stock and bonds, and 15,902 3/4 shares of Alaska S. S. Co. stock.....	205,804
For 2,564,650 shares of stock of Braden Copper Mines Co. (all bonds acquired converted into stock).....	789,123 1/13
For \$10,000,000 Kennecott Copper Corporation bonds.....	400,000
Compensation to Underwriting Syndicate.....	65,000
Total	2,786,679 1/13

Bonds: authorized (June 1, 1915), \$10,000,000 1st mortgage 6% 10-year convertible Sinking Fund Gold Bonds. At the end of 1915 there were outstanding, \$218,000 bonds, which have all been converted into stock, so the Corporation has no bonded indebtedness.

D. A. Crockett, 120 Broadway, transfer agt.; Bankers Trust Co., New York, registrar. Annual meeting first Tuesday in May. Stock listed on New York Exchange.

Statement of Assets and Liabilities, December 31, 1916.

Assets

Property Accounts:

Mining Property	\$17,578,355
Less—Depreciation Reserves	392,248

\$17,186,107

Construction and equipment	1,463,407
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\$18,649,514

Carried forward		\$18,649,514
Investments:		
434,504 shares Utah Copper stock.....		\$33,160,787
2,564,650 shares Braden stock.....		39,456,154
500 shares Katalla stock.....		57,459
\$23,020,000 par C. R. & N. W. Ry. bonds.....		9,801,417
48,174 shares C. R. & N. W. Ry. stock.....		1
23,854 1/8 shares Alaska S. S. stock.....		2,385,412
10 shares Alaska Development & Mineral Co. stock.....		5,021
		<hr/>
		\$84,866,251
Current and Working Assets:		
Metals on hand.....		9,648,513
Ore and concts. on hand and in transit.....		137,089
Materials on hand.....		498,397
Accounts collectible		1,893,105
Deferred accounts		30,073
Marketable Securities		2,970,000
Cash		4,117,934
		<hr/>
		\$19,235,111
Grand total		\$122,750,877
		<hr/>
	Liabilities	
Stock (without nominal or par value):		
Authorized	3,000,000	shares
Unissued	213,320	12/13 shares
	<hr/>	
Outstanding	2,786,679	1/3 shares
Stated capital		\$15,000,000
Capital surplus (from conv. of bonds and exch. of stock).....		86,687,146
		<hr/>
		\$101,687,146
Current Liabilities:		
Accounts payable		\$165,830
Accrued taxes and deferred accounts.....		624,108
Treatment, refining and delivery charges (not yet due).....		924,154
		<hr/>
		\$1,711,092
Development reserves		437,411
Undivided profits		18,915,228
		<hr/>
Grand total		\$122,750,877
		<hr/>
	Income Account: year ended December 31, 1916:	
Operating Revenue:		
108,372,785 lbs. copper @ 25.88c.....		\$28,042,396
1,101,733 oz. silver @ 64.486c.....		710,462
		<hr/>
		\$28,752,858
Operating expense		6,292,338
		<hr/>
Net operating profit		\$22,460,520
Misc. income at mines		79,917
		<hr/>
Net income for period		\$22,540,437

Operating Expenses detail:

Mine and mill	\$1,595,452
Frts. to smelter	2,695,573
Sm. & ref.	1,506,522
Sell. comm.	287,065
Marine ins.	159,451
Gen. expense	48,275

Total as above \$6,292,338

Other Income:

Utah Copper Co. dividends	\$ 4,854,048
Alaska Steamship Co. dividends	941,858
Interest, discount, etc.	216,266

Total income \$ 6,012,172

Total income \$28,552,608

Deduct:

Accrued taxes, interest on bonds, administration..... 667,985

Net income \$27,884,623

Undivided Profits

Balance at Dec. 31, 1915	\$ 6,573,797
Net income for 1916	27,884,623

Depreciation of plant	\$34,458,420
Dividends (4)	222,909
	15,320,283

Balance forward to 1916 \$18,915,226

Property: Alaskan holdings of the Corporation include the Kennecott and Beatson mines; also 17 patented claims, 216 acres, at Latouche, and 11 lode claims bought in 1916.

The **Kennecott** group, 3 miles from Kennecott on the C. R. & N. W. R. R. includes the Bonanza and Jumbo mines, with 23 additional patented lode claims and 14 patented placer claims, 2,314 acres.

The **Bonanza** mine has one of the most remarkable orebodies ever found by a prospector. This great mass of high-grade ore, much of it carrying 60% copper, outcrops on the crest of a precipitous mountain overlooking the Kennecott river, a tributary of the Chitina, which flows into Copper river. In 1912 the ore reserves were estimated at 30,000 tons of 50 to 60% ore and 54,000 tons of 30% ore carrying \$13 per ton in silver, with 30,000 tons of broken ore as a talus pile beneath the outcrop. Recent development has indicated non persistence in depth.

There are no large masses of oxides or carbonates present, as glaciation and active erosion prevent the formation of an oxidized capping. The ore outcrops as massive chalcocite averaging about 50% copper and 0.2 oz. silver to each per cent copper. It was thought at first the chalcocite was primary, but later development showed chalcopyrite to be primary.

Geology: the various mining claims show Nicholai greenstone, consisting of a number of basaltic flows of lava, a hard close grained rock considerably altered and in places amygdaloidal, varying in color from brown to light green. The greenstone is overlaid by massive beds of Chitistone

limestone of Triassic age, with bedding planes parallel to the flow planes of the lava, the limestone being of a bluish color, weathered to gray at the surface. There also are diabase and andesite intrusions and dikes.

Ore occurs in more or less irregular replacement masses and in a fault zone, the orebodies being more or less parallel to the vertical fault planes, though the ore follows, to some extent, minor fault planes, as well as the bedding planes of the limestone making stockwerks and irregular masses in the crushed limestone. The outcrop is 20 to 40' wide, with an average of about 25', and is something over 400' in length, the southern half showing 2 nearly parallel bands of chalcocite, 4 to 10' in width, separated by about 10' of limestone, showing breaks in places, and at the northern end of the outcrop the chalcocite bands give place to stringers and interlacing seams of chalcocite and azurite, which thin out as they follow the vein northward and fade out as they pass into barren limestone.

In addition to the Bonanza outcrop there was a large amount of ore in the talus, or slide rock, broken off from the outcrop. This mass of broken ore and rock was about 300' wide, extending for about 500' or more down the slope from the outcrop, varying from 3 to 20' in depth. A number of testpits, sunk to the outcrop, showed an average of 4' depth, with an average assay of 13% copper, this including both boulders of chalcocite up to 200 lbs. in weight and barren limestone. Ore is extracted from the slide by a system of cuts. Two grades of ore mined with 70% and 15% copper, respectively.

Development: to depth of 1,130' is by tunnels. The highest tunnel, at an elevation of 6,200' above the sea level, extends through the vein, near the southern end of the outcrop, from the western face of the ridge, and there is a small system of workings from the eastern slope of the ridge, further north, the latter comprising an upper tunnel extending through the ridge, and a longer lower tunnel of about 300' length, directly underneath, with 10,500' of workings, Jan. 1, 1916.

Underground openings at all the company's mines during 1916 were extended 15,340', with satisfactory results.

The **Jumbo** mine is also being worked and had 9,692' of underground workings, Jan. 1, 1916. Orebodies on the 500' lowest level are larger and higher grade than on the upper levels. In stope 581, ore has been developed for a width of 50' and will average 70% copper. The Jumbo mine has been under development since 1912 and up to August 1, 1915, shipped 35,000 tons of ore averaging 39% copper, from development work only.

The Bonanza mine is connected with the mill at the lower camp by a Bleichert aerial tram, in 2 sections, the upper of 7,000' and lower of 8,000', with a drop of 4,000'. The tram line has 40 towers, longest span 1,500', with ore bins at both terminals, and has an estimated hourly capacity of 25 tons. The lower camp has the mine buildings, power plant and mill.

Equipment: includes a small steam plant and an air compressor. Buildings include a bunk house, mess house, assay office and 10,000' sawmill.

The 700-ton concentrator is equipped with Blake & Symons crushers, Hancock jigs, bull jigs, rolls, Wilfley and Deister tables. Mill recovery averaged 82.27% and concentrates produced 53.6% copper. The average grade of ore treated in 1916 was 8.49% copper. Rich ore is hand sorted, and lower grade ores, though of excellent average tenor, are being concentrated in the mill and ore and concentrates shipped to the Tacoma smelter. The 300-ton ammonia leaching plant treated tailings from the concentrator, amounting to 62,450 tons assaying 1.48% copper. It produced 703 tons of 69.9% precipitate. Capacity is being increased to 700 tons daily.

Guggenheim interests have constructed the Copper River & Northwestern railway, at a cost of about \$20,000,000, this line of 195 miles length starting at Cordova, on the sea, and ending at the lower camp, having had to cope with tidal, river and glacial floods, blizzards and other difficulties inseparable from railway operations in an extremely mountainous country near the Arctic circle.

Revenue in 1916 was \$2,911,207, less \$1,142,536 for operation, leaving \$1,768,671 profit.

The Alaska Steamship Co. is also controlled by Kennecott. It carries ore to the smelter at Tacoma and returns with supplies for the mines. Income for 1916 was \$3,816,087; expenses, \$2,449,420; profit, \$2,025,561, including balance of \$658,893 from 1915. Dividends were \$1,740,000.

The Bonanza and Jumbo mines at Kennecott, in 1916, yielded 297,848 tons of 18.69% ore, of which 98,778 tons of 53.36% was shipped direct, the remainder, 229,717 tons of 8.49% being concentrated. The Beatson mine at Latouche shipped 6,608 tons of 7.23% and milled 177,803 tons of 2.13% ore. All the company's Alaskan mines produced 482,254 tons of ore.

The Beatson mine comprises 17 patented claims, 268 acres, about 8 miles from the northern end of Latouche island, within one-half mile of tide-water, where there is a good natural harbor. Mine was located, July 4, 1897, by Andrew K. Beatson, and began shipping, 1903. Country rock is slate; ore is chalcopyrite, pyrite and pyrrhotite, occurring in brecciated portions of the country rock. The orebody is a large lens; total length developed is about 800' with an average width of 100'. Ore assays up to 30% and as shipped returns 7.23% copper and 2 oz. silver per ton.

Development: includes 9,700' of underground workings. - The ore is mined in an open pit and dropped through mill holes to the main tunnel level. Mine and mill are connected by an aerial tramway. A 700-ton concentrator, employing the oil flotation process and completed Feb, 1915, was enlarged in 1917 to treat 1,500 tons a day. The average grade of ore milled, 1916, was 2.12% copper; average recovery 78.91%; concentration ratio 8.59, and average grade of concentrates produced 14.29%. Buildings include rooming, mess and change houses, office, store and a hospital with physician in charge.

Situation, geology, ore, mining and milling methods and leaching of copper tailings with ammonia, were briefly described by H. M. Lawrence in the Eng. & Mng. Journal, Nov. 3, 1917. A 300-ton plant was erected 1917, and one of 800-ton capacity is under construction. Four 30' diam. leaching tanks with dome tops, hold 500 tons of tailing per charge in a depth of 15'. The tailing assays 1.46% copper, of which 1.14% is carbonate and the residue 0.58%. In April, 1917, 10,000 tons were treated, with 75% extraction of the carbonate. Cost is 86.5c per ton leached and 5.77c per lb. recovered.

Production: of copper was 108,372,783 lbs., at the following cost: mining and milling, 1.47c; freight to smelter, 2.49c; smelting and refining, 1.39c; selling expense, 0.26c; general, 0.04c; marine insurance, 0.15c; total, 5.80c; less 0.65c* for silver-content and 0.05c* for sundry earnings, leaving a net cost of 5.1c per pound.

The following figures show past production, costs and profits of the two Alaska companies prior to their acquisition by the Kennecott Corporation:

* Deduction. The average selling price of copper for the period was 25.34c per lb. The average product shipped from both mines during the year averaged 44.53% copper. Production for the first 7 months of 1917 was 45,082,000 lbs.

Kennecott Mines Co.:	Net Lbs. Copper		Profit
	Produced	Inc. Selling	
1916	6,872,000	5.10 cts.	\$1,390,893
1915 (5 months).....	14,240,412	4.00 cts.	1,522,747
1914	13,988,273	5.78 cts.	1,104,645
1913	14,621,834	5.48 cts.	1,424,635
1912	22,366,478	4.43 cts.	2,633,568
1911 (9 months).....	21,007,096	4.19 cts.	1,656,205
	187,634,093	4.83 cts.	\$28,867,187
Beatson Copper Co.:			
1916	101,410,000	5.10 cts.	\$20,525,384
1915 (9 months).....	1,970,947	11.41 cts.	122,504
1914	5,286,667	8.75 cts.	241,895
1913	5,178,629	8.36 cts.	353,239
1912	3,254,858	9.74 cts.	221,116
1911 (9 months).....	3,078,444	7.44 cts.	163,939
	120,179,545	8.47 cts.	\$21,628,077

Management estimates 5 years ore supply blocked out at the past average rate of production.

Copper production for 7 months of 1917 as shown above, was 45,062,000 lb., compared with 72,150,000 lb. in the same period of 1916. The last two months of this period in 1917 were affected by a miners' strike, making 60 days' output equal to less than July, 1916; but the first 5 months of 1917 were 16,166,000 lb. less than in that term of 1916. The strain of shipping high-grade ore evidently began to tell early in 1917.

The Braden Copper and Utah Copper companies are described under their respective titles.

MOTHER LODE COPPER MINES CO. OF ALASKA ALASKA

Offices: 45 Broadway, New York, and 1317 Alaska Bldg., Seattle, Wash. Mine supt., W. Bertram Hancock, Kennecott, Alaska.

Officers: Jas. J. Godfrey, pres.; Scott Calhoun and W. H. Lenk, v. p.'s; C. L. Warner, sec.-treas., with Edwin N. Ohl, Isaac Starr and Chas. M. Eaton, directors; Geo. E. Baldwin, gen. mgr.

Inc. Nov., 1907, in Washington. **Cap.**, \$5,000,000; shares \$1 par; increased, Oct., 1916, to \$7,500,000; shares \$10 par; 4,750,000 issued.

Bonds: authorized Oct., 1916, \$1,000,000 6%, 10-year convertible gold bonds, of which \$500,000 were offered to shareholders at 95% of par net plus accrued interest. Company retains right to redeem bonds at 110% of par, with interest at 60 days' notice; bondholders may convert them into stock at \$10 per share.

Stock listed on New York Curb.

Property: 70 lode and placer claims, about 1,640 acres, including the Smith-Haglund-Sall group, adjoins the Bonanza and Jumbo mines of the Kennecott Copper Corporation, in the Copper River district, Kennecott, Alaska. Mine is 14 miles by wagon road from the railroad. The Houghton-Alaska mine was bought early in 1917.

Geology: conditions at this property, according to Herman Keller, are similar to those of the Bonanza mine. The base of the mountain is formed of amygdaloidal basalt, highly altered and called the Nicolai greenstone. This is covered by thick beds of Chitina limestone, dipping north. The oreshoots occur in the limestone, and exploration has shown that contrary to general belief, the ore does not occur along the greenstone contact, but in a favorable bed 90' above it, and then only in connection with the

Bonanza fault, or shear zone. This shear zone, 20 to 24' wide, cuts both greenstone and limestone and the ore is found in chimneys and as irregular bunchy masses along the zone and as impregnations in the limestone walls. The ore consists of nearly pure glance with minor and unimportant amounts of covellite and very little malachite, etc. Like the Bonanza ore, it carries gold and silver.

Development: by tunnels, known as the South, North, Regal, Marvelous and Pittsburgh; principal work is at the Marvelous tunnel. Development aggregated 7,806', Jan. 1, 1917.

Equipment: includes Sullivan air compressor, Otto gasoline engine, Lidgerwood hoist and a 7,300' aerial tramway, connecting main tunnel with the wagon road. Buildings include office, boarding house and several other log structures.

Power-plant of 500 k. w. was installed Aug., 1917. A 250-ton mill is to be built.

New work planned for 1916 includes crosscutting on 300' level of Bonanza incline; raise and winze from 200' Pittsburgh level.

Ore reserves: management estimates 114,328 tons ore developed, averaging 8 to 21% copper and 4 oz. silver per ton, at end of Dec., 1916; also 240,000 tons of probable ore between 600 and 800' levels, containing 2.3% copper and 6 oz. silver per ton. Net value of these reserves, after deducting \$5 a ton for mining and hoisting charges, estimated by management at about \$44,000,000.

Production: first shipment for 1917 season (March), 395 tons, averaged 60.61% copper and 13.82 oz. silver; 88 tons assayed 59.1% copper and 14.62 oz. silver; 315 tons returned 34.9% copper and 8.9 oz. silver per ton. In Aug. output was 250 tons daily.

Company can pay expenses with its high-grade ore, but shareholders must look to the milling ore for dividends. Money raised by bond issue will pay for new plant.

Property has been fully and favorably reported on by Herman A. Keller and by Arthur W. Jenks, and is a prospect of considerable merit.

NORTH MIDAS COPPER CO. ALASKA

Office: 50 Congress St., Boston, Mass. **Mine office:** Strelna, Alaska.

Officers: F. A. Ball, pres.; W. D. Rich, v. p.; J. F. Crane, sec.-treas., with A. S. Nye, W. L. Hall, E. O. Powers and G. M. Wheeler, directors.

Inc. 1916 in Maine. Cap., \$1,500,000; shares \$1 par. Stock listed on Boston Curb. Old South Trust Co., Boston, registrar and transfer agents.

Property: near the Kuskulana river, in the Chitina district of the Copper River region, Alaska. Nearest railway is Strelna, on the Copper River and Northwestern, 146 miles from the terminus at Cordova.

Development: No. 1 tunnel cut a series of alternating limestone beds and porphyritic intrusions. Cupriferous pyrite in small quantity appears in the tunnel face. Above this tunnel another has exposed copper pyrite. A tunnel N. E. of the others has been driven 555' and an open cut below it shows quartz 1 to 4' thick, assaying 5 oz. gold and 22 oz. silver.

Twenty men employed.

REGAL MINES CO. ALASKA

Subsidiary of the Great Northern Development Co., which see.

Office: 77 Franklin St., Boston, Mass. **Mine office:** Kennecott, Alaska.

Officers: Walter M. Briggs, pres.; H. I. Gaskill, sec.-treas.; James Phillips, Jr., C. Hartman Kuhn, Chas. S. Farnum, Mulford Martin, E. F. Gray, W. M. Briggs, J. M. Satterfield, directors; E. F. Gray, gen. mgr.

Inc. 1912 in Maine. Cap., \$250,000; shares \$5 par; fully paid and non-assessable; issued \$28,011. Annual meeting, November 2.

Property: 17 claims, unpatented, 340 acres, near Kennecott, Copper River district. Developed by 115' shaft sunk on a contact between limestone and greenstone and showing copper glance ore. Assessment work only since 1914.

ELLAMAR
(See Latouche.)

JUNEAU DISTRICT

ALASKA DOUGLAS GOLD MINING CO.

ALASKA

Idle. **Office:** 809 Electric Bldg., Portland, Ore.

Officers: F. W. Bradley, pres.; F. A. Hammersmith, sec.-treas.

Cap., \$100,000; shares \$1 par; all issued.

Property on Douglas Island, Alaska. Assessment work only being done.

ALASKA-EBNER GOLD MINES CO.

ALASKA

Property, sold under bondholders' foreclosure for \$225,000, to A. W. Middleton, former treasurer, acting for a bondholders' protective and reorganization committee. Company's best asset was 100,000 shares Ebner Gold Mines Co. stock. Now being operated by the United States Smelting, Refining & Mining Exploration Co. Litigation described, Mines Handbook, Vol. XII.

ALASKA GOLD BELT MINING CO.

ALASKA

Address: 170 Broadway, New York. **Mine office:** Juneau, Alaska.

Officers: Sanford Makeever, pres.; A. B. Dodd, v. p.; M. M. Makeever, sec.; J. Makeever, treas.; preceding officers and D. C. Bard, directors; A. B. Dodd, supt.

Inc. 1915, in Alaska. **Cap.,** \$1,000,000, shares \$1 par, none outstanding Feb. 3, 1916.

Lands consisting of 93 lode claims, 13 tunnel claims and 18 wharfage claims, total area 2,500 acres, are located 4 miles south of Juneau and adjoining property of the Alaska Gastineau on the southeast. They cover the extension of the Juneau gold belt and the ore is supposed to be of the same general character as that of the Alaska Gastineau.

Development work was started in the summer of 1915 on the Lott-Nelson group of 30 claims, located in the upper Sheep Creek basin. Roads were built, buildings constructed, and an air compressor put in, preparatory to driving a 3,000' exploratory and development tunnel in Sheep Creek mountain to cut upper part of orebody. In July, 1916, this tunnel had been driven 2,880' and \$100,000 is said to have been spent thus far on the development work. Did some diamond drilling in an attempt to cut the Gould & Curry vein, supposed to be the main orebody of the property. At last accounts, April, 1916, this drill hole had reached a depth of 1,575' in a horizontal hole without results. Company planned to drive a 9,000' tunnel at sea-level to cut the orebody at depth, and to build a mill on the beach south of that of the Alaska-Gastineau Co. Closed down, 1917; and property reported forfeited.

ALASKA GOLD MINES CO.

ALASKA

Office: 25 Broad St., New York. **Mine** near Juneau, Alaska.

Officers: Chas. Hayden, pres.; D. C. Jackling, v. p. and managing director; C. W. Peters, treas.; K. R. Babbitt, sec.; directors, Chas. Hayden, D. C. Jackling, K. R. Babbitt, C. M. MacNeil, Sherwood Aldrich, F. H. Goff, E. A. Clark, Wm. H. Coolidge, F. L. Ames, and J. B. Hardon.

Inc. Aug., 1912, in Maine. It is the holding company, owning \$11,731,101 of the \$12,000,000 capital stock, and \$3,269,000 of the \$3,500,000 bonds

of the Alaska Gastineau Mining Co. Property is described under title of Alaska Gastineau Mining Co.

Cap., \$7,500,000, increased Jan., 1915, to \$10,000,000, shares \$10 par, outstanding \$7,500,060. Of the unissued stock, \$500,000 is reserved for conversion of 10-year, 6% debentures. Transfer agents: Guaranty Trust Co., New York, and National Shawmut Bank, Boston. Registrars: Bankers Trust Co., New York, and First National Bank, Boston. Listed on the New York and Boston Stock Exchanges.

Bonded debt: \$2,999,800, consists of \$1,500,000 10-year, 6% convertible gold debentures, series "A"; dated March 1, 1915; due March 1, 1925; int. M. & S. 1, at Guaranty Trust Co., New York, Trustee, and \$1,500,000 10-year 6% convertible gold debentures, Series "B"; dated March 1, 1916, due March 1, 1926: Coupon, \$100, \$500 and \$1,000; principal may be registered. Authorized, \$1,500,000. These bonds were sold for purpose of providing funds for increasing the mining and milling operations of the Alaska Gastineau Mng. Co. Convertible at any time into stock of the company at \$30 per share. Subject to call as a whole, or in part, at 110 and interest at any time on, or after 3 years from their date. Company agrees that it will not, while any of these debentures are outstanding, mortgage or otherwise encumber any of its assets. Company is not, however, prohibited from issuing other debentures similar to series "A," and series "B," at any time and to any amount, provided that said debentures shall not be given priority over Series "A," and Series "B," debentures. Normal income tax deducted from interest. Listed on New York Stock Exchange.

Comparative Balance Sheet: year ending Dec. 31—

Assets:	1915	1916
Invest. in stock and bonds Al. Gast.....	\$ 4,045,101	\$ 4,046,501
Al. Gast. Mng. Co., notes rec.....	6,858,265	7,612,452
Int. accr'd on Al. Gast. bonds owned.....	571,900	768,215
Cash	8,313	12,405
	<hr/>	<hr/>
Total	\$11,483,579	\$12,439,573
Liabilities:		
Cap. stock issued	\$ 7,500,060	\$ 7,500,060
Gold debentures, series "A," issued.....	1,499,800	1,499,800
Gold debentures, series "B," issued.....	.....	1,500,000
Notes payable.....	1,525,000	650,000
Int. accr'd on debentures.....	30,000	60,000
Int. accr'd on Al. Gast. bonds owned.....	571,900	768,215
Prem. on cap. stock issued in conv. of deb'ts....	120	120
Surplus	356,699	461,378
	<hr/>	<hr/>
Total	\$11,483,579	\$12,439,573

Shares in Nov., 1917, selling around \$3, as compared with \$42 four years ago. Dividends are a long way off, but those in charge are doing everything possible to increase the profits.

Alaska Gastineau Mining Co.

Operating company for Alaska Gold. Address: Thane, Alaska.

Officers: B. L. Thane, mgr.; G. T. Jackson, asst. mgr.; E. Daveler, supt. of mills; B. B. Nieding, mine supt.

Inc. Jan. 14, 1911, in New York. Cap., authorized and outstanding, \$12,000,000; shares \$5 par. Is controlled by the Alaska Gold Mines Co., which owns \$11,731,101 of the outstanding stock.

Bonded debt: consists of \$3,500,000 (Entire Issue) First Gold 6%;

dated Feb. 1, 1911, due Feb. 1, 1931. The Alaska Gold Mines Co. owns \$3,269,000 of the issue.

Balance sheet of Dec. 31, 1916, shows total assets of \$24,089,165, which includes mining grounds, titles and rights, \$14,355,438; mine development, construction and equipment, \$7,953,108; materials and supplies, \$503,566; merchandise at stores, \$40,457; product on hand and in transit, \$184,447; accts. receivable, \$139,432; cash, \$60,717; deferred charges to operations, \$746,255; deficit, \$105,740.

Liabilities: capital stock, \$12,000,000; bonded debt, \$3,500,000; notes payable, Alaska G. M. Co., \$7,612,452; acct. payable, \$89,483; pay-roll, \$64,729; bond interest accrued, \$822,500. Mining profit for 1916 was \$414,030; miscellaneous income, \$36,996; total operating profit, \$451,026.

The report for 1st quarter, 1917, shows revenue from bullion and concentrates produced, \$539,487; operating expenses, \$405,037; total operating profit, \$113,043; for 2nd quarter, 1917, produced \$577,616, less \$471,096 for operation, leaving a profit of \$114,234; for 3rd quarter, 1917, produced \$428,954; less \$420,781 for operation, leaving a profit of \$6,172, plus \$2,563 sundry income. Nine months' profit was \$236,012.

Properties: of the Alaska Gastineau Mining Co., situated in the vicinity of Juneau, Alaska, in what is known as the Juneau Gold Belt, comprise (Dec. 31, 1916) a net area of 2,166 acres, consisting of 1,672 acres of lodes, 219 acres of placers and 275 acres of millsites and homesteads. The mining claims of the company consist principally of 4 groups, formerly owned and operated independently of each other, locally known as the "Alaska Perseverance," "Ground Hog," "Silver Bow Basin," and "Sheep Creek" groups. They cover the so-called Gold Creek lode system of ore deposits, across a low spur of mountains from Gold Creek to Sheep Creek and extending into the basin of each stream, total length of lode system so covered being in excess of 2 miles. The company owns a 310-acre mill site near the mouth of Sheep Creek, on the Gastineau Channel. In addition to the above the company owns and controls lands, reservoir sites, power plant sites and rights-of-way on Salmon Creek, emptying into Gastineau Channel, in connection with its principal water power development; and also on Annex Creek and Carlson Creek, streams emptying into the Taku Inlet about 10 miles east of the mill, and on Granite Creek, Gold Creek and Lurvey Creek. The property of the Alaska Juneau Gold Mng. Co. adjoins the Alaska Gastineau on the west. The mineralized zone dips about 70° E. and in the main has a slate or a schist hanging wall and greenstone foot-wall. It is cut in a number of places by metagabbro dikes, intrusive into the vein. Gold-bearing quartz is irregularly distributed through the zone in the form of veinlets, stringers and masses. The height of vein measured on the dip above Sheep Creek tunnel and for the length of zone developed on No. 10 level is almost 2,000' with a length of 5,000'. Thickness of the main vein, as used for estimates of tonnage, is 70'. A solid block of ore this size would contain more than 50,000,000 tons. This vein is known as the Perseverance Block. It served as a basis for the purchase of the property. Another orebody, known as vein No. 2, has been opened up for several hundred feet, with an average width of over 100'. It is about midway of the length of the Alexander crosscut. On Jan. 1, 1915, the estimated tonnage of this block was 21,000,000 tons of fully-developed ore, with average assay value of \$1.75 per ton. Operating costs were calculated at 75c and tailing loss at 25c per ton. A third orebody, the Ground Hog or Footwall orebody, has been developed in a few places, principally on the Sheep Creek tunnel level, where it was opened up for 1,500' in driving the tunnel. At this point its width and value are as

large as those of the Perseverance vein, lying immediately north. The ore zone, known as No. 1, and lying between the Footwall vein and No. 2 vein, contains two, and possibly three, distinct veins, ranging in width up to 200' or more.

The several orebodies opened thus far in the Perseverance Block, are composed of schist, slate, and metagabbro and slate, with the highest grade ore found to date, occurring in the schist; it has averaged in excess of \$2 per ton; No. 2 East stope on the 5th level averages \$2.70 per ton. This orebody has a strong rake to the east appearing further away from the central shaft and workings on successively deeper levels, until on No. 10 level it is first found east of No. 2 shaft. The slate orebody is the lowest grade so far developed; west of No. 1 shaft the vein widens out to twice and three times the width of the original development of 70'; this widening of the ore zone has resulted in a decrease in assay values. East of No. 1 shaft and below No. 5 level the slate orebody is narrower and higher grade, \$1.50 to \$2.50 per ton. West of No. 1 shaft and below No. 9 level the orebody is made up of meta-gabbro and slate, the meta-gabbro dike replacing the foot-wall and making up a larger percentage of the orebody. This section so far as sampled and opened, is higher grade than the slate orebody west of the shaft, but lower grade than the schist orebody; it will furnish ore of an average grade.

It had originally been determined that if a mixture of ore could be made, approximating 25% from the schist orebody and 25% from the slate orebody, both east of the shaft, and 50% from the slate orebody west of the shaft, ore of an average grade would be sent to the mill so long as these percentages were maintained; actual results have proven this to be true, but due to unforeseen conditions underground this schedule could not be adhered to and the percentage of high grade ore as originally depended upon dropped in proportion to tonnage increase from 25%, as calculated, to 5%, Nov., 1915, and the profit per ton dropped accordingly. Without doubt new development work with the opening of new stopes, will overcome the difficulty and it will be possible to follow the original plan.

Principal development is by means of the Perseverance, or No. 1 shaft, 1,544' deep; No. 2 shaft extending from the 5th to the 10th level, with an oreway from the 10th to 13th level at this point; the Sheep Creek tunnel, or No. 13 level; and the Alexander or No. 10 level. The 8' by 10' Sheep Creek tunnel with length of 9,178' from the bottom of the Perseverance shaft to the portal near Sheep Creek was started Nov., 1912, and finished April 1, 1914. For the last 6 months of 1913 the average distance driven monthly was 583', during 3 of these months advancement was over 600', and in Nov., 661' were driven. The tunnel was driven both for the purpose of developing the property longitudinally and at depth, and to provide a transportation outlet for delivery of ores to the new mill. It is driven parallel to and in the foot-wall of the principal or Perseverance vein. At certain points, irregularities of the orebody threw portions of the vein into the direct course of the tunnel; at such places the ore was found to be of good value. The Alexander crosscut, 10th level, 700' above the Sheep Creek tunnel and 1,300' from the surface on the dip of the vein, runs from the Perseverance mine camp to No. 1 shaft, which is vertical and connects No. 13 level with the top of No. 5 level. It is used only for men and supplies, has a reinforced concrete shafthouse and is equipped on the 13th level, with an air driven hoist, which operates two cages. Between the 10th and 5th levels the mine is opened by levels spaced 200' apart. The ore is dropped from the different levels through

oreways to the 13th, or main haulage level, Sheep Creek tunnel. No. 1 oreway extends from No. 5 level to No. 13 level, parallels the vein and is almost wholly in the foot-wall. On No. 9 level there is a timber bulkhead which is used to break the fall of ore. It is hinged and can be pulled out of the way when not required. Oreway No. 2 extends from the 9th to the 13th level. It is expected to put these oreways in at 2,000' intervals.

Two methods of mining are used, shrinkage stoping in the gabbro where the back is so hard it must be drilled and blasted, and a caving system in the slate. Full sized stopes are 400' long with 40' pillars between. A 2-compartment raise is carried through the middle of each pillar, half of it being used as a manway, the other half as a skipway through which supplies are delivered from the level below by means of an air hoist. Stopes are started from the tops of chutes run along the foot-wall, a slice being taken across the lode at right angles to the dip. In order to start movement in the lode a cut is driven along the length of the stope and in the foot-wall. No attempt is made at sorting, the mining being done on a large scale and everything extracted put through the mill.

Haulage on the different levels is done in 4-ton cars of the Granby type, by means of 6-ton Baldwin storage-battery locomotives, thus eliminating the trolley-wire. The locomotives are operated for 16 hours, then charged for 8 hours. On the main haulage level four 12-ton cars can be loaded at the same time. Haulage to the mill is done over a narrow gauge railroad by electric locomotives of the trolley type. The railroad to the mill runs through Sheep Creek tunnel for 10,000', then along the north side of Sheep Creek for 6,000' to the coarse crushing plant. When the mine and mill are running at full capacity this railroad will handle from 10,000 to 12,000 tons of ore daily.

The milling plant was designed to handle a daily tonnage of 1,500 tons of ore in each of its 4 sections. Since starting operations Feb. 15, 1915, it has been demonstrated that the mill will handle from 10,000 to 12,000 tons of ore per day, necessitating a larger mine output. The mill is essentially a concentrator, accompanied by a separate small plant for retreatment of concentrates produced. It differs greatly from the conventional type of amalgamating gold mill, in that the main milling plant produces nothing but concentrates, at a ratio of about 60 into 1. A decided novelty has been introduced by crushing with rolls instead of stamps. In the retreatment plant the coarser gold containing some silver is separated from the concentrates and reduced to gold and silver bullion; this separation produces a small tonnage of lead concentrates containing gold and silver that is shipped to Pacific coast smelters. The residual portions of original concentrates, consisting chiefly of iron and zinc sulphides, are finely ground and amalgamated for gold and silver, resultant iron-zinc tailing being discarded.

The mill is built upon a very steep slope, the bottom floor is 192' above Gastineau Channel, the crushing plant 685' above the water. Supplies to the mill are handled over an inclined tramway, while supplies for the crushing plant or the mine are handled over a longer tramway to a loading station on the ore railroad. The course of the ore through the coarse crushing plant is as follows: From the mine cars to the rotary dump, capable of handling four 10-ton cars at once, to grizzly; oversize to two 36" by 42" rolls set to 5"; over caterpillar feeders to stationary inclined screens with 1½" square openings; oversize to two No. 8 gyratories set to 2"; to ore pocket beneath the crushing plant. This pocket is cut in solid rock, is 30' by 50' in cross-section and 225' in height, 110' of which is the

ore-pocket proper. Remaining 115' is a raise connecting the ore-pocket with the crushing plant. The bin has a capacity of 10,000 tons of ore. At the bottom of the bin 8 feeders supply ore to a 42" belt-conveyor, 608' long, that runs through a tunnel to the coarse ore-bins in the mill. From the bins the ore goes to stationary inclined screens, 1½" square openings; oversize to 72" x 24" rolls set to ⅞"; undersize to 54" x 24" rolls set to ⅝". Rolls are run on choke-feed and crush dry, and are of heavy design, having the large pulley in the form of an 8,000-lb. flywheel. Bearings are water-cooled. Roll shells are 6" thick and are shrunk onto the roll-cores. Five-ton skips, working in balance, raise the roll product 115' to a series of 10-mesh impact screens; undersize goes to concentrator; oversize is returned to the 54" rolls. Each of the 4 sections contains 15 impact screens, and there are two 54" rolls for every 12 screens. The two 72" rolls serve the entire 4 sections of the mill. Seven sets of skips are used; one set for each 72" roll, and one set for each of the 5 pairs of 54" rolls. Exhaust fans carry away the excessive dust caused by dry crushing.

The concentrating department has a primary set of 10 double-deck Garfield tables and 10 Wilfley tables per section. Products are tailings and a concentrate that assays nearly 50% lead, which is shipped. Tailing goes to a 4-spigot Janney classifier; product of first 3 spigots to tube-mills. Tube-mill product goes to a secondary set of 10 double-deck Garfield tables, followed by 10 Wilfley tables using as wash water the 4th spigot product of the classifier. Each primary Garfield table can handle 300 tons per day. A 15-h. p. motor drives 10 tables.

Hydro-electric power is used. The chief sources of supply at present are the Salmon Creek plants, 2 miles northwest of Juneau, and the Annex-Carlson Creek plant furnishing 4,000-h. p.; these furnish a minimum of 6,000-h. p. Ultimate capacity of the Annex Creek project will be 12,000-h. p. The Salmon Creek project necessitated the building of a concrete dam 165' high and 700' long on its crest. Base of dam is 1,000' above sea level. In order to get maximum benefit from the water available 2 power plants were built. No. 2 is a mile below the dam and operates under a head of 600'. Power Plant No. 1 is on the shore of Gastineau Channel, near the mouth of Salmon Creek. Water discharged from upper plant is conveyed by a 10,000' flume to No. 1 plant and there used under a head of 500'. Power plants No. 1 and No. 2 are each equipped with two 1,500-k. w. generating units with total capacity of 6,000-k. w. or 8,000-h. p. Office buildings, machine shops, sawmill, six 50-men bunk houses, messhouse and dock have been built on the beach below the reduction plant.

The average load for 1916 was 5,187 h. p., and that used for all purposes was 1,001 h. p. per daily ton, costing \$9.02 per h. p.-year, or 2.47c per ton milled.

Recent Work: New work in 1916 amounted to 24,562', exclusive of 15,675' of diamond-drilling, at a total cost of \$219,105. Total amount of work done since beginning of company's operations in July, 1912, to Jan. 1, 1917, 89,802' of exploration and 29,295' of diamond-drilling. No new orebodies of importance were encountered during the years' work, and operations proved a great disappointment. Recovered values per ton have been much less than expected, and there is but slight promise of an improvement in the average grade of ore now being developed in the Perseverance Block. No definite estimates can or should be made at present as to the ultimate tonnage the property may produce.

Samples during 1916—by moil and diamond-drill—numbered 20,880, making 59,750 to date. Coarse, free gold rendered checks difficult to agree. It has been found that (1) sampling of the slate zone would not

check with actual mill returns because it is difficult to define the limits of the orebody that will cave in mining, also on account of peculiarities in this deposit; (2) sampling of the orebody consisting of either schist or metagabbro was more satisfactory and uniformly averaged with actual milling results, due to the more even texture of the rock, better cores and moil samples and definite boundaries to the orebodies that could be maintained in mining; (3) on account of its greater width and irregularity the slate zone in the west section of the mine averaged uniformly lower grade than had been calculated; (4) the higher grade sections as developed lay east of the shaft where the schist orebodies had been encountered and opened; and (5) the slate zone west of the shaft showed a decrease in values beginning with No. 9 level and extending up to No. 6, where better values continued to the surface.

At beginning of 1915 the minimum estimate of fully developed, partly developed, and probable ore, was from 75,000,000 to 100,000,000 tons having a recoverable value of \$1.50 per ton. Allen H. Rogers reported in 1916, that tonnage developed and partly developed, amounting to 5,500,000 tons, would average about \$1.45 gross, and that after the newer areas are developed and contribute their proportion of milling ore, the mine should be able to supply the maximum capacity (10,000 tons) with ore that will yield a profit of 45 to 50c per ton. Management estimates ore reserves blocked out and broken down, Feb., 1917, as sufficient to maintain present rate of production of about 7,500 tons daily for 2 years.

On August 1, 1917, a re-survey of broken ore in stopes showed 2,240,235 tons remaining, an increase of 1,126,390 tons over the previous figure.

The first ore was run through the mill Feb. 15, 1915. Towards the end of the year a daily capacity of 6,000 tons was reached, but the grade of ore falling for a time, this tonnage was reduced to 4,000 tons daily. The original figure was a daily tonnage of ore handled of 6,000 tons, with a recoverable value of \$1.75 per ton and net profit of 75c per ton. During 1916, 1,892,788 tons of ore were milled. Operating profit was 23.8c per ton, or a total operating profit of \$451,026 for the year.

Production:

	Tons Milled	Gross Value	Yield	Tails	Extraction	Value Recovered	Oper. Exp. less Misc. Inc.	Profit P. t.
1917*..	1,707,647	\$1.111	\$0.905	\$0.206	81.46%	\$0.905	\$0.766	\$0.139
1916...	1,892,788	1.193	0.970	0.222	81.33%	0.970	0.732	0.238
1915...	1,115,294	1.156	0.937	0.219	81.06%	0.937	0.688	0.249

* 9 months.

Costs in 1916 were as follows: underground, 35.769c; ore transport, 2.643c; treatment, 26.861c; shipping and smelting, 2.897c; general, 6.604c; a total of 75.194c per ton; less 1.954c sundry credits, making 73.24c net cost.

All divisions of the property are complete, and nothing but vigorous development is contemplated. The management is optimistic, and considers that previous estimates may be justified. The whole project is highly meritorious, and it is a pity that results are not more favorable. Profits in 1917 will be much less than in 1916. Reviewing the third quarter of 1917, when only \$8,735 profit was made, the president blames labor shortage for affecting low tonnage, and sees little hope for improvement.

ALASKA JUNEAU GOLD MNG. CO.

ALASKA

Office: Crocker Bldg., San Francisco, Cal. Mine office: Juneau, Alaska.

Officers: F. W. Bradley, pres.; Wellington Gregg, Jr., v. p.; A. B. Davis, v. p.; G. D. Abbott, sec.-treas.; J. S. Wallace, asst. sec.; directors,

Eugene Meyer, Jr., Seeley W. Mudd, F. W. Bradley, Wellington Gregg, Jr., J. H. MacKenzie, A. B. Davis and M. L. Requa; J. H. MacKenzie, cons. engr.; P. R. Bradley, gen. supt.

Inc. Feb. 17, 1897, in West Va. Cap., \$150,000, consisting of 1,500,000 shares, increased April, 1915, to \$15,000,000, shares \$10 par; outstanding, 1,400,000 shares. Increase of capitalization to represent more correctly the value of the property and provide funds for its development. Registrar, Metropolitan Trust Co., New York; transfer agent, Central Trust Co., New York. Listed on the New York Stock Exchange. Annual meeting first Tuesday after third Monday in March.

General Balance Sheet: year ending Dec. 31—

Assets—

	Property	Devel.	Const. & Equip.	Cash	Other Current	P. & L. Surplus	Total
1916. . .	\$9,645,489	\$904,240	\$2,180,760	\$361,289	\$48,387	\$563,624	\$14,075,723
1915. . .	9,638,037	791,954	729,657	2,232,123	80,918	561,983	14,034,672

Liabilities—

	Capital Stock	Misc. Supply Accounts, etc.	1st Nat. Bk. Juneau	Total
1916.	\$14,000,000	\$75,723	\$	\$14,075,723
1915.	14,000,000	31,324	3,348	14,034,672

Income Account: year ending Dec. 31—

	Total Income	Mining Expense	Treas. Stock Sales Exp.	Other Expenses (a)	Total	Deficit
1916.	\$149,483	\$223,857	\$1,641	\$73,343	\$151,385(b)	\$1,641
1915.	253,483	162,245	544,760	91,178	708,183	544,700

(a) After deducting \$71,341, property-carrying charges.

(b) After deducting \$147,456, property-carrying charges.

Property: The mineral area of the company covers a tract of land adjoining the property of the Alaska-Gastineau Mng. Co. on the west and that of the Ebner Gold Mng. Co. on the east, located one mile inland from Gastineau Channel. In addition the company owns a large tract of land stretching along the east side of the Channel south from the city of Juneau. This area, used as the mill site, is connected with the large mineral area by two narrow strips of land, one along Gold Creek and the other farther south through which a long transportation tunnel connects the mine and mill.

The mining claims include the first quartz claims located on the wide vein called "The Juneau Gold Belt" and are supposed to be in the center of the mineralization of the belt. The property owned by the Alaska-Juneau covers the outcrop of the vein or mineralized zone, for over a mile in length. The lode has a width between walls of 900' and dips 70° east. The orebody is composed of slate with gold bearing quartz, irregularly distributed through it in the form of veinlets, stringers and masses. Metagabbro dikes, intrusive into the vein, carry gold bearing quartz similarly distributed. The quartz distribution is not regular, but it is probable that, where the gold content of the vein is too low for commercial extraction, sorting can be resorted to and a mill feed obtained that will be higher than the average mass. Associated with the gold in the quartz is pyrite, pyrrhotite, galena and a little sphalerite. The foot-wall is greenstone, the hanging wall schist.

The vein had been operated in a surficial way for a great many years. Deep development was first planned in 1899, started in 1909, but not actively

pushed until 1910, when a main working crosscut, 8'x10', called the Gold Creek tunnel, was commenced at an elevation of 425' above sea level, starting from a point immediately behind the town of Juneau. At 6,540' from the portal, where the surface could be reached in the shortest possible distance, an 800' inclined raise in the hanging-wall was put through to surface. In driving the tunnel that portion of the vein lying west of the Silver Bow fault was crosscut diagonally for 650', disclosing orebodies of average assay values slightly less than \$2 per ton. The true width of the vein where cut is 500' with average assay value close to \$2 per ton. Although this is better than shown by any surface developments, it is believed this width and assay value will persist for considerable distances longitudinally and vertically. This belief is based on the result obtained from a 30-stamp mill working 5 months each year, from 1896 to 1914, on ore mined by open-pit work along the outcrop of the vein. During this time 295,807 tons were milled, yielding \$2.26 free gold per ton, obtained by milling 63% of ore mined. The rejected vein matter was gold bearing, but of lower grade. No attempt was made to save the values in the sulphides, which would have added about 20c per ton.

Ore extracted from the Gold Creek tunnel and the intermediate level opened from the incline raise at an elevation of 495' above the tunnel was milled in the new 40-stamp mill on Gastineau Channel. A total of 50,000 tons milled up to Dec. 1, 1914, averaged \$1.36 per ton, the low value undoubtedly being due to the dilution of ore with waste attendant upon the opening up of the two levels preparatory to stoping. In Dec., 1914, there was milled 9,657 tons of average assay value of \$1.74 per ton; in Jan., 1915, there was milled 12,000 tons of average grade of \$2.09 per ton.

Confidence in the persistence of the vein and its value is also derived from milling records of the 100-stamp Perseverance mill, now part of the Alaska Gold Mines Co., adjoining on the East, and the milling results obtained by a small mill operating on the Ebner property on the west.

The mine development work as outlined, and now under way, will give a daily tonnage of not less than 8,000 tons, making available for caving and extracting 7,500,000 tons of ore in one section of the vein. All tunnels are being double-tracked and so equipped that 16,000 tons of ore daily can be transported from the mine to the mill.

Selective mining was originally contemplated, but the method is now wholesale mining, which means caving a lot of waste with the ore and consequently reducing the average value of the mixture. Mining at Juneau is concisely described by F. W. Parsons in the *Engineering and Mining Journal* of Aug. 4, 1917.

The approximate total tonnage of the vein above the Gold Creek tunnel level and between the eastern and western ends of the property amounts to 500,000,000 tons of slate, metagabbro and quartz. From this by means of selective mining there should be taken 80,000,000 to 100,000,000 tons of vein matter suitable for milling that should yield, according to estimates made by the management, a net profit of from 70c to \$1 per ton, but when the new mill is in complete operation at the expected capacity of 10,000 tons per day, the mining of this tonnage involves mixing a large proportion of waste with the ore. The assay value per ton of this mixture will probably be around \$1, and the expected profit will be about 40c. That part of the vein below the Gold Creek tunnel would seem to promise an additional tonnage of the same value, but twice as great as that which lies above the tunnel level, inasmuch as a parallel vein 2 miles distant on Douglas Island is being mined at a depth of 2,000' below sea level.

New openings in 1916 totaled 22,577', compared with 16,775' in 1915,

and 5,671' in 1914; total to date, 52,322', or nearly 10 miles. Samples totaled 3,456, averaging 38.2c per ton, in the past 3 years.

The original stamp-mills in Silver Bow basin, and the present pilot-mill, from 1893 to 1917, treated 742,220 tons of ore averaging \$1.93 per ton, for gold only. In 1916 the 50-stamp mill operated continuously, treating 180,113 tons assaying 91.24c per ton.

On a large scale the feed should average \$1 per ton in gold, silver, lead and zinc; in 1916, it was 91.24c gold, 1.76c silver, 4.43c lead and 3.56c zinc per ton, a total of \$1.009. Of this 63.85c was extracted. Gold recovered in 1916 amounted to 4,714 oz., while galena concentrate was valued at \$93,476, and iron concentrate, \$16,759.

In 1913 F. W. Bradley made comparison between the average costs per ton in the 4 operating Douglas Island mines, and the estimated costs per ton at the Alaska-Juneau as follows: Douglas Island total mining costs \$0.95, total milling costs \$0.25, concentrate treatment, plant construction, etc., \$0.20, total \$1.40. Alaska-Juneau total mining costs \$0.40, total milling costs \$0.20, concentrate treatment, plant construction, etc., \$0.20, total \$0.80.

In March, 1917, the first of four 2,000-ton units of the new mill was started. Others commenced soon after. This mill and accessories cost \$2,532,027. In May there was treated 37,000 tons of 77c ore. The quantity handled is increasing each month, and 11,000 tons daily of \$1 ore is the ultimate expected quantity, mined and milled at 40 to 45c per ton.

Briefly, the plant includes: 2 revolving tipples, 2,000-ton coarse-ore bin, four 60" apron-feeders, four 8 x 5' grizzlies, with 8" openings, two 36 x 48" jaw-crushers, four 4 x 8' grizzlies with 3" openings, four No. 9 Gates gyratory crushers, four 30" conveyors, 4 distributing boxes, two 36" shuttle conveyors, twenty-four 30" apron feeders, twelve 8 x 6' ball mills, 12 revolving screens, 12 V-shaped tanks, 12 mechanical distributors, 48 roughing tables, 24 classifiers, 12 shovel wheels, twelve 6 x 12' tubemills, 24 settling tanks, 24 mechanical distributors, 96 finishing tables, and 12 Wilfley tables. There is a retreatment department containing two 5 x 5' ball-pebble mills, pumps, classifiers and tables. Power-plant contains four 825-h. p. Stirling water-tube boilers, with economizers, and forced draft apparatus, one 9-stage Curtis 6,000-k. w. turbo-generator, condensers, and auxiliaries.

The railway between mine and mill cost \$167,144.

During 1916 there were 464 men employed at an average of \$3.82 per day. This number has since been considerably added to.

It is too soon yet to criticize results obtained at the Alaska Juneau, but the general impression is that early estimates of profits will not be attained. Calculating on 10,000 tons daily of \$1 ore, of which 80c will be recovered at a total cost of 45c per ton, we have a profit of \$3,500 daily, or say \$1,225,000 in 350 working days. On 1,400,000 shares issued, this would be about 80c per share per annum, allowing for other charges, or 7½%. Shares in Nov., 1917, reflected somewhat the market's attitude towards this meritorious undertaking, and were quoted at \$3 for the \$10 shares.

ALASKA MEXICAN GOLD MINING CO.

ALASKA

Address: Mills Bldg., San Francisco, Calif. Mine office: Douglas Island, Alaska. Under same management as the Alaska Treadwell, which see.

Inc. April, 1892, in Minnesota. Cap., \$1,000,000 in 200,000 shares, \$5 par; 120,000 of which went to pay for the Alaska Mexican Gold Mine, and 60,000 were issued to the public by the Exploration Co., Ltd., of London. Annual meeting in May. Registration & Security Co., of San Francisco, registrars.

Comparative General Balance Sheet:

Assets—

	Property & Plant	Cash	Reserve Fund	Bullion Suspense	Accounts Rec., etc.	Total
1916.....	\$733,235	\$47,775	\$93,909	.....	\$143,798	\$2,046,896*
1915.....	674,195	5,175	93,909	\$15,314	146,332	934,926
1914.....	785,692	6,955	93,909	20,532	12,298	919,386

* Includes \$1,463 other assets, and \$1,059,391 ore subject to depletion, an item required by U. S. Income Tax Law, but which value is now unavailable owing to destruction of the mine in April, 1917.

Liabilities—

	Capital Stock	Accounts Pay., etc.	P. & L. Account	Total
1916.....	\$900,000	\$12,079	\$74,426	\$2,046,896*
1915.....	900,000	24,736	10,190	934,926
1914.....	900,000	8,572	10,814	919,386

* Includes \$1,059,391 ore surplus, now unavailable on account of loss of mine.

Comparative Income Account:

	Total Income	Operating Constr'n. etc.	Net Profit	Divid's	Deprec.	Balance
1916.....	\$330,654	\$266,417	\$64,236	.....	.....	\$74,426
1915.....	401,761	302,284	99,477	\$90,000	\$10,101	10,190*
1914.....	513,318	343,298	170,020	144,000	25,451	10,814*
1913.....	496,007	324,210	171,797	180,000	21,552	10,213*

* Including balance from previous year.

Property: Located on the east side of Douglas Island, between the 700' claim of the Alaska United on the west and the Ready Bullion mine of that company on the east. For a general description see Alaska Treadwell Gold Mining Co.

Development: includes the 1,570' Mexican shaft, devoted to general use, while all ore is hoisted through the 2,817' Central shaft on the 700' claim of the Alaska United, adjoining on the west. The orebody has been opened by levels from the 110' level to the 2,300' level; distance between levels is 110'. During 1916 development work done by the A. M. Co. amounted to 776' on its own property, 10' on the adjoining 700' claim of the A. U. Co., and 3,714' done jointly with the A. T. and the A. U. Cos.

Samples totaling 1,592, taken on five levels, averaged \$1.63 per ton. From the 1,100' downward ore has assayed as follows: \$3.60, \$3.02, \$2.63, \$1.23, 64c, \$1.23 and 79c per ton, the last being at 2,100'.

On July 27, 1916, surface evidences of a hanging-wall subsidence near the Treadwell—700 Ft. Claim boundary became apparent, and to protect the Treadwell, 700 Ft., and Mexican mines, heavy drawing of reserves of caved and broken ore was stopped. The Mexican mill only worked 279 days. From Aug. 1, 1916, the 240-stamp mill and half of the 300-stamp mill of the Treadwell was stopped. Salt water began to flow into the mine, and due precautions were taken. In April, 1917, the Mexican, Treadwell, and 700 Ft. mines were flooded and shut down indefinitely. For details see the Alaska Treadwell.

Ore reserves: Estimated Dec. 31, 1916, 157,000 tons ore in sight, average grade \$1.80 per ton; against 1,188,866 tons of \$1.87 ore in 1915.

The company has a 120-stamp mill that, in 1916, operated 34% of the time with steam power and 66% of the time with water power. Duty per

stamp per day was 5.24 tons, 1 lb. of chrome shoe crushed 2.31 tons ore, and 1 lb. of Treadwell die crushed 5.15 tons ore. Mill sands are used for filling stopes.

A cyanide plant is owned and operated jointly by the Alaska Mexican, Alaska Treadwell and Alaska United G. M. Cos., the A. M. Co. owning 20% of the plant. Power plants are in conjunction with those of the Alaska Treadwell, which see.

Average number men employed daily in 1916 was 122, with average wage paid each \$3.61. Miners received \$3.50 per day.

Production and profits since 1909 are as follows:

	Tons		Concentrates		Total	Oper.	Oper.	Div.
	Crushed	Yield Free Gold	Tons Treated	Yield	p. Ton	p. Ton	Profits	
1916.....	175,476	\$119,163*	4,398	\$155,860	\$1.57	\$1.51	\$0.06	.....
1915.....	216,428	190,980	4,769	183,816	1.75	1.29	0.46	10%
1914.....	233,457	238,756	3,340	270,267	2.18	1.45	0.73	16%
1913.....	227,112	225,369	4,795	264,327	2.15	1.39	0.76	20%
1912.....	233,299	307,951	4,956	371,169	2.91	1.58	1.33	25%
1911.....	227,081	323,965	5,150	353,442	2.98	1.84	1.14	14%
1910.....	218,960	390,198	4,166	375,523	3.50	1.76	1.74	38%

* Including \$27,855 from copper plates.

Costs per ton for 1916 were: Mining, 91c; milling, 39c; cyaniding same as Alaska Treadwell. Mining costs include charges for 1,050' of development at \$21.38 per ft., and stoping 69,285 tons at \$1.04 per ton. Milling costs include crushing, 5.7c; tramming, 1.7c; stamping, 23c; concentrating, 8.7c.

As the Mexican may not produce any more ore, its total output may be given from 1894 to 1917; 4,445,807 tons, averaging \$2.61 per ton at cost of \$1.67. Out of profits, \$4,161,657, dividends absorbed \$3,507,381, or \$19.47 per \$5 share.

ALASKA TREADWELL GOLD MNG. CO.

ALASKA

Address: Mills Bldg., San Francisco, Cal. Mine office: Douglas Island, Alaska. Officers: F. W. Bradley, pres.; A. B. Davis, v. p.; F. A. Hammer-smith, sec.-treas. Preceding officers: E. W. Hopkins, H. S. King, directors; P. R. Bradley, cons. eng.; R. G. Wayland, gen. supt.

Inc. June 1, 1890, to take over the property of the Paris mine on Douglas Island, where operations had been conducted since 1882. Purchase price was \$5,000,000 in fully paid shares. Cap., \$5,000,000; shares \$25 par. Metropolitan Trust Co., New York, registrar and transfer agent.

Comparative General Balance Sheet:

Assets—

	Property	Cash	Other	Supplies	Other	Total
	& Plant		Current		Assets	
1916.....	\$3,942,947	\$245,023	\$956,034(a)	\$789,012	\$8,439,607(b)	\$14,372,623
1915.....	3,775,173	365,365	603,961(c)	565,337	308,618	5,618,454
1914.....	3,685,306	295,587	558,053(d)	599,471	309,965	5,448,382

(a) Includes: special cash fund, \$250,000; reserve fund, \$255,887; bullion suspense, \$168,478, and due from other companies, \$281,668.

(b) Includes: \$8,390,204, ore in mine, an item necessary for U. S. Income Tax law; now that mine is flooded, it is a negligible quantity.

(c) Includes: special fund (cash), \$250,000; accts. rec., \$120,600; bullion suspense, \$233,361. (d) Includes: special funds (cash), \$250,000; accts. rec., \$79,668; bullion suspense, \$228,385.

	Liabilities—		Accounts	Draft	P. & L.	Total
	Capital Stock	Pay., Etc.	Account	Account	Acc't	
1916.....	\$5,000,000	\$474,224	\$9,885	\$498,209	\$14,372,623 (e)	
1915.....	5,000,000	524,926	3,438	90,090	5,618,454	
1914.....	5,000,000	394,520	5,182	48,680	5,448,382	

(e) Ore surplus.

Comparative Income Account:

	Earnings		Other Construct'n		Divid's	Deprec.	Balance
	Gross	Net	Income & Repairs	.....		
1916	\$1,604,737	\$658,119	\$90,090	.....	\$250,000	.....	\$498,208
1915	1,828,723	706,610	177,399	\$24,822	650,000	\$167,777	41,410
1914	2,367,562	1,314,933	67,813	31,343	1,100,000	250,953	450
1913	2,358,423	1,286,498	62,592	38,599	1,000,000	487,261	176,770 (f)

(f) Deficit.

Dividends to Jan., 1917, aggregate \$78.98 per share.

Property: The Treadwell group of mines, consisting of the Alaska Treadwell, the Alaska Mexican and the Alaska United, which operates the 700' mine and the Ready Bullion, are under one management and are located on the east side of Douglas Island near the shore of Gastineau Channel. The A. T. property is farthest west. Geological conditions are the same in the mines of the 3 companies. Hanging wall of Treadwell is 1,000' distant from present shore line, while that of the Ready Bullion lies for the most part under tidal water. Though several orebodies have been found, the mines are all situated on the same lode and ore is practically of identical origin throughout. In the Alaska Treadwell, 700', and Alaska Mexican mines, the lode has been developed continuously for 3,500'. Between the Mexican and Ready Bullion mines is an undeveloped interval of 2,500'. Width of orebodies is from 300' to 400'.

Geology: the orebodies consist mainly of mineralized albite-diorite occurring in the form of intrusive dikes in black slate, whose structure they closely follow. They strike N. W.-S. E. and dip 50 degrees toward the N. E. The slates are metamorphosed shale. The ore-bearing dikes belong to a series of intrusives that appear interruptedly along the strike for a distance of about 3 miles in a zone 3,000' wide. Next to the shore of Gastineau Channel the border is defined by a heavy bed of greenstone that forms the hanging wall of both the orebodies and the intrusion zone. Many of the dikes of albite-diorite at a distance from the hanging wall have been greatly altered and impregnated with pyrite and no workable orebodies have yet been found in them. The ore consists mainly of rock impregnated with sulphides, principally pyrite, and in part shattered and filled by veins of calcite and quartz, which also contain sulphides. The ore-bearing dikes are considerably mineralized throughout, and often the whole mass can be mined. The characteristics of the deposit are believed to indicate that it was formed by ascending waters, with little, or no, subsequent secondary concentration. If this is correct there is little doubt that the ore will continue to a much greater depth than has been reached, and the limit of mining will probably depend finally upon increased costs, attendant upon operating at great depth.

Development: is by an 2,817' shaft with levels from the 110' to the 2,700' level. Upper four levels are at intervals of 110', below this at an interval of either 150' or 200', thus saving a large development expense. The 700' claim of the Alaska United adjoins on the east. During 1916 development work done by the A. T. Co. amounted to 3,044' on its own property, 1,542' for its own use on the adjoining 700' claim and 4,673' done jointly with the A. T. and the A. U. Cos. There was also 1,031' of diamond-drilling done. Sampling from 1,250' to 2,300' gave an average of \$2.02 per ton from 3,554 samples.

Ore reserves: below the 1,050' level amounted to 3,895,000 (tons, averaging

\$1.81 per ton, at the end of 1916. This ore is now unavailable due to causes explained below. Value of the ore at 1,600' was \$3.80, at 1,750', \$1.46, at 2,100', \$1.80, and at 2,300', \$1.28 per ton.

In 1882 a 5-stamp mill was built, followed in 1887 by a mill of 120 stamps, and in 1888 by an additional 120 stamps. Between 1893 and 1896 the Mexican, 700', and Ready Bullion mines were equipped with mills, and in 1899 a new 300-stamp mill started operating at the Treadwell. In 1916 the 240-stamp mill operated 81% with water and 69% with electric power. In the 300-stamp mill electric power was used 58% of the time and water power 42%.

The Alaska Treadwell owns 60% of the cyanide plant operated by the 3 companies.

Steam power was formerly used, but this has been gradually changed to hydro-electric or steam electric power. Recent equipment at the Central power plant includes three 500-h. p. Stirling boilers, one 500-h. p. Heine boiler, one 2,000-k. w. turbo-generator, one 750-k. w. turbo-generator, and all accessories. Total capacity of completed plant is 4,750-k. w. Total cost to 1916 was \$266,173, of which the A. T. Co.'s share was \$159,704. The company's hydro-electric power is obtained from its plants on the mainland on Nugget Creek and Sheep Creek. The Treadwell Co. will furnish power to the Alaska-Juneau Gold Mng. Co.

The average number of men employed per day in 1916 was 621, with average wage of \$3.67. The company has ample facilities, dwellings, store, etc., for taking care of its employees. It also has its own fire department.

Recent production:		Concentrates		Total	Oper.	Oper.		
Tons	Yield	Tons	Yield	Yield	Costs	Profits	Div.	
Crushed	Free Gold	Treated		p. Ton	p. Ton	p. Ton	Paid	
1916...	671,378	\$ 486,999	15,118	\$ 768,786	\$1.99	\$1.36	\$0.63	5%
1915...	900,211	936,092	19,177	892,631	2.03	1.23	0.80	13%
1914...	910,285	1,264,945	19,324	1,102,616	2.60	1.08	1.52	22%
1913...	886,057	1,221,642	17,603	1,136,780	2.66	1.21	1.45	20%
1912...	892,192	1,159,401	17,397	1,046,487	2.47	1.18	1.29	13%
1911(a)	1,348,504	1,879,613	25,673	1,378,818	2.42	1.40	1.02	16%

(a) May 15, 1910, to Dec. 31, 1911.

Costs in 1916 were as follows: mining, including 4,222' of development at \$22.80 per foot, 80.1c.; milling, 37.2c.; concentrate treatment, 11.8c.; and general, 11.4c.; a total of \$1.40 per ton. As the mills worked only part time, detailed costs are unnecessary.

From 1882 to 1917 the Treadwell mine has produced 16,349,663 tons of \$1.99 ore at a cost of \$1.36 per ton. Of the total profits amounting to \$18,200,338, dividends absorbed \$15,785,000, or 315%.

As the Alaska Treadwell mine will probably produce no more gold for an indefinite period, a brief review of events during 1916 is apropos, this covering the Alaska Mexican, Alaska United, and 700-Foot mines also.

Operations at the four mines had become so centralized that in July a Consolidation Committee, consisting of H. C. Perkins, Hennen Jennings, and F. W. Bradley, studied conditions at Treadwell and suggested a consolidation on the basis of 54% for the Treadwell, 12% by the Mexican, and 34% by the United companies. Future economic operations depended on such a scheme, and development and plant had been for years carried out with this idea.

As will be seen by figures given in the preceding reports, great quantities of ore had been extracted from the mines. On July 27, 1916, surface evidences of a hanging-wall subsidence near the Treadwell-700 boundary line began to be manifest, and to protect the future of the Treadwell, 700, and Mexican mines the heavy drawing of reserves of caved and broken ore was stopped. On Aug.

1, the 240 and half of the 300-stamp-mills were shut down and amalgamation was discontinued in all the mills, all gold being recovered by concentration.

In October a 127-page report was issued, including a financial program and a detailed geological report on surface subsidence and water conditions, by Livingston Wernecke. Underground conditions were discussed, causes of subsidence, flow of water, ventilation, and bulkheading. To prevent inrushes of water, numbers of bulkheads were proposed, also filling open stopes above 1,750' with tailing, and prospecting for the dike-fault at surface, which was partly the cause of subsidences.

On April 21, after warning had been given miners, the ground for 250' on each side of the Treadwell-700 Foot mines collapsed, and the water of Gastineau channel flooded the Treadwell, 700, and Mexican mines, necessitating their abandonment. It is considered possible that a deep level from the Ready Bullion mine, which is some distance away, may be driven to re-open the mines below the flooded area.

This ends the lives of three mines that have produced a total of 22,661,748 tons of ore, yielding gold worth \$54,886,968, of which \$23,072,567 was profit. Fully 12,000,000 tons of ore was lost by the subsidence, all profitable material.

ALASKA UNITED GOLD MNG. CO. ALASKA

Address: Mills Bldg., San Francisco, Calif. Mine office: Douglas Island, Alaska. Under same management as the Alaska Treadwell.

Inc. Aug. 6, 1895. Cap., \$1,000,000, shares \$5 par, issued \$901,000.

Comparative General Balance Sheet:

Assets—

	Property & Plant	Cash	Reserve Fund	Bullion Suspense	Accounts Rec., Etc.	Total
1916.....	\$910,120	\$7,991	\$201,810	\$4,296	\$28,921	\$3,807,361*
1915.....	726,180	10,192	201,810	50,245	3,900	992,327
1914.....	634,004	4,663	201,810	51,924	34,171	926,572

* Including \$2,654,222 ore subject to depletion, an item required by U. S. Income Tax Law.

Liabilities—

	Capital Stock	Accounts Pay., Etc.	P. & L. Account	Total
1916.....	\$901,000	\$243,236	\$8,902	\$3,807,361*
1915.....	901,000	55,312	36,015	992,327
1914.....	901,000	10,411	15,160	926,572

* Including \$2,654,222 ore surplus.

Comparative Income Account:

	Total Income	Operating Constr'n, Etc.	Net Profit	Divid's	Deprec.	Balance
1916	\$1,111,697	\$1,094,749	\$26,947	\$54,060	.....	\$8,902
1915	1,072,412	705,162	367,250	252,280	\$94,115	20,855
1914	975,329	727,391	247,938	162,180	81,153	4,605
1913	1,054,018	668,953	385,065	414,460	30,050	59,445(d)

(d) Deficit.

Dividends to Jan., 1917, aggregate \$11.35 per share.

Property: Located on the east side of Douglas Island, includes the 700' mine, lying between the Alaska Treadwell and the Alaska Mexican properties, and the Ready Bullion mine east of the property adjoining the Mexican. For a general description see Alaska Treadwell G. M. Co. Apparently the ore shoot of the adjacent properties is rapidly diminishing in length, with depth, and at 2,300' level, the bulk of the ore will come from the 700' mine. The Ready Bullion property is opened by incline shaft No. 1 to the 2,200' level. As this shaft crosses the orebody, and large pillars of ore are left, incline shaft No. 2 was started, 1914, in the footwall, with dip of 70° and depth to the 2,200'

level of 1,885'. Levels from the 300' to the 1,800' are 150', and below the 1,800' level are 200' apart, this distance between levels eliminating much development expense. In 1916 exploration and development work amounted to 2,461' with 434' of enlarging No. 2 shaft.

The 700' Claim is developed by the 2,817' Central shaft with levels from the 98' to the 2,700' level. Workings of the Alaska Treadwell on the west and the Alaska Mexican on the east are connected with Central shaft levels, and hoisting through this shaft is done for the 3 companies. Of 1,144,713 tons of rock hoisted in 1916, 46,279 tons was waste. In 1916 exploration and development work totaled 7,307' for the United Co., and 3,714' was done jointly by the United, Mexican and Treadwell.

Ore reserves: of the Ready Bullion mine at the end of 1916 were estimated as 3,039,000 tons, average grade \$2.88 per ton, of the 700' claim mine, 3,694,000 tons, average grade \$1.90.

The company owns two stamp-mills. In 1916 the Ready Bullion 150-stamp-mill crushed 286,078 tons ore, operating 40% with water-power and 60% electric power. Duty per stamp per day was 5.34 tons; one lb. chrome-steel shoes crushed 2.38 tons of ore and one lb. of dies crushed 4.74 tons of ore. The 700' claim mill of 150 stamps crushed 262,850 tons ore, operating 21% of time with steam power, 21% with water, and 58% with electric power. Duty per stamp per day was 5.15 tons, one lb. of chrome-steel shoes crushed 2.32 tons ore, and one lb. dies crushed 4.44 tons ore.

The company owns 29% of the cyanide mill, operated jointly by the 3 Treadwell companies. Of the 31,487 tons of concentrates treated in 1916, 11,972 tons were from A. U. mines. Power-plants are in conjunction with those of the Alaska Treadwell, which see. During 1916 the average daily number of men employed was 354, with average wage of \$3.44.

Recent production: (1) Ready Bullion mine, (2) 700-ft. claim mine.

	Tons Crushed	Yield Free Gold	Concentrates		Total Yield p. Ton	Oper. Costs p. Ton	Oper. Profits p. Ton	Div. Pd.(a)
			Tons Treated	Yield				
(1)								
1916...	286,078	\$237,715	6,630	\$338,534	\$2.11	\$1.52	\$0.59	6%
1915...	252,154	272,274	5,621	249,638	2.07	1.31	0.76	28%
1914...	233,100	282,036	5,700	252,370	2.29	1.47	0.82	18%
1913...	222,992	268,444	5,651	242,947	2.29	1.45	0.84	46%
1912...	216,454	317,970	6,128	300,188	2.85	1.50	1.35	36%
1911(b)	223,663	278,034	5,461	241,248	2.32	1.71	0.61	9%
(2)								
1916...	262,850	\$180,603	5,342	\$260,375	\$1.73	\$2.37	\$0.64(c)	
1915...	281,265	263,319	5,934	256,943	1.85	1.31	0.54	
1914...	225,214	230,509	4,409	200,874	1.91	1.62	0.29	
1913...	225,435	284,097	4,495	248,055	2.36	1.44	0.92	
1912...	234,339	282,180	4,704	294,951	2.46	1.38	1.08	
1911(b)	224,968	284,430	4,477	244,193	2.35	1.56	0.79	

(a) Total for both mines. (b) Dec. 16, 1910-Dec. 31, 1911.

(c) Loss, due to heavy development charge.

Costs per ton for Ready Bullion mine in 1916 were: Mining, \$1.00; milling, 34.4c.; cyaniding, same as Alaska Treadwell. Mining costs include charges for 2,366' of development work at \$12.66 per ft., and stoping 377,547 tons at 44.7c. per ton. Milling costs include crushing, 2.6c.; tramway, 2.2c.; stamping, 22.6c.; concentrating, 7c. Costs per ton for 700-Foot Claim in 1916 were: mining, \$1.81; milling, 39.4c.; cyaniding, same as Alaska Treadwell. Mining costs include charges for 7,771' of development work at \$20.40 per ft., stoping 284,566

tons at 81.7c. per ton. Milling costs include crushing, 5.8c.; tramming, 1.8c.; stamping, 24.2c.; concentrating, 7.6c.

Output in June, 1917, was 20,559 tons of ore yielding \$42,880 from concentrate. Including construction charge there was a loss incurred of \$28,141.

Alaska United is the only mine now being operated on Douglas Island. On April 21, the 700-Foot Claim, Treadwell, and Mexican mines were lost by flooding. The Ready Bullion mine is some distance away from these mines and escaped. From 1898 to 1917 the 700-Foot Claim yielded 2,400,868 tons of \$2.05 ore, at a cost of \$1.66 per ton, giving a profit of \$946,259. The Ready Bullion produced 3,967,135 tons of \$2.08 ore at a cost of \$1.56 per ton, and total profit of \$2,049,406. Of combined profits, \$2,995,664, \$2,045,270 was paid in dividends.

ALASKA WESTOVER COPPER CO.

ALASKA

Office: 551 Coleman Block, Seattle, Wash. Mine, 18 miles from Copper River railroad in the Chitina district.

Officers: L. C. Dillman, pres., W. A. Mears, sec.-treas.; preceding officers, F. B. Whiting, F. J. Perine, F. B. Chandler, trustees.

Property: The Westover group, title to which was transferred from the Alaska United Copper Explor'n Co. Owns 23 claims, about 460 acres, covering a contact between limestone and greenstone. The contact lies horizontally and the ore outcrop is from 6 to 14' thick and 43' long in a perpendicular bluff at 4,990' elevation.

Development consists of 1,000' of tunnels. One tunnel started at the south end is reported to have shown 4 to 20' of ore for 45' in a S. E. direction, and a crosscut on the ore body shows 2' of glance claimed to assay 50% copper. It widens to 14' for about 36'; is then cut off by a fault, but continues about 12' to the north.

CHICHAGOFF MINING CO.

ALASKA

Chichagoff Island, Alaska. Controlled by Hugh P. Wallace and W. R. Rust of Tacoma, Wash. James L. Freeburn, supt.; Angus Mackay, cons. engr.

Property: the Chicagoff mine, better known as the De Groff, 60 miles from Sitka, 125 miles from Juneau, carries high-grade, free milling quartz, said to average better than \$7 per ton. Reported to be shipping over \$50,000 in bullion a month.

Equipment: 30-stamp mill with tube mill section and daily capacity of 110 tons of ore. A flotation unit is planned. Company has hydro-electric plant with dam at Rust Lake. 125 men employed. See U. S. G. S. Bull. 504, p. 22.

EAGLE RIVER MINING CO.

ALASKA

Address: care D. C. Jackling, Hobart Bldg., San Francisco, Calif., who with his friends controls the company.

Property: a group of gold quartz claims is 4 miles from Echo Harbor and 25 miles from Juneau, Alaska, adjoining and on the same belt as the Yankee Basin and Cottrell groups. Ore occurs in 8 small shoots in black slate zone, broken by an elaborate faulting system and reported to average \$20 per ton.

Development: by tunnel, 2,000' long, that tapped ore at a depth of 700'. In 1915, 2,000' of diamond drilling in 7 holes was done. Property worked since 1903, producing upwards of \$500,000, according to reports.

JUALIN ALASKA MINES CO.

ALASKA

Company is a subsidiary of the Alguncian Development Co. Jean Van-ophem, pres., 18 Rue Boissiere, Paris, France; C. G. Titus, mgr., Juneau, Alaska.

Property: 30 claims on the north shore of Berners Bay, in the Juneau region, is developed by 360' main shaft, crosscuts, and drifts. A drainage-tunnel to be 7,500' long when completed, has been driven 2,000'.

Ore is reported to be 90% free milling. **Production:** under former owners said to total 50,000 tons of \$11.20 per ton gold ore. Property was closed in

Aug., 1914, but reopened in May, 1915. To May, 1917, the output was 22,366 tons of \$11.10 ore.

Equipment: includes 5½-mile tram, connecting the mine with the wharf, 450-h. p. compressor and hydro-electric plant. Recent installations for winter service were 4 Petters semi-Diesel engines of 150-h. p. each. Plans are under way for increasing the mill capacity from 40 to 150 tons daily.

READY BULLION COPPER CO.

ALASKA

Mine near Juneau, Alaska, developed by 2,600' incline shaft. Developing on the 2,400' and 2,600' levels, July, 1917. Owing to shortage of labor, the mill operates day shift only.

KETCHIKAN DISTRICT

ALASKA CONSOLIDATED MINING & SMELTING CO. ALASKA

Mines at Copper Mount, Sulzer P. O., Prince of Wales Island, Alaska.

Officers: Geo. H. Crosby, pres.-gen. mgr., Lonsdale Bldg., Duluth, Minn.; A. M. Sellwood, v. p., with A. L. Warner and Henry W. Armstrong, directors. Thos. Wright, supt.

Inc. Oct., 1912, in Ariz. Cap., \$2,500,000, shares \$5 par; \$1,500,045 outstanding.

Company purchased property of the Alaska Copper Co. at sheriff's sale. Property consists of 23 claims, 18 patented and 5 being patented, with 15 acre mill site, known as the Copper Mountain group, situated on Copper Harbor, Prince of Wales Island, Alaska.

Property covers a contact metamorphic zone between granite and limestone with a porphyry intrusion along the contact. Orebodies are from 3 to 50' wide with mineralized zone 900' wide and quite attractive surface showings. Development by 4,600' of tunnels and several shallow shafts. Engineer on ground for past year has kept a few men at work waiting for company to be financed.

Equipment includes smelter, sawmill, tramway and many buildings, put up before sufficient ore had been found to keep smelter in operation. Reports made by W. H. Weed and other engineers on file in company office. No ore shipped since 1907. Idle.

ALASKA INDUSTRIAL CO.

ALASKA

Office: 115 Broadway, New York. Mine office: Sulzer, Prince of Wales Island, Alaska.

Officers: A. E. Spriggs, pres.; S. I. Frankenstein, v. p.; Belmont Ephraim, sec.; S. B. Thomas, treas.; Hon. Charles A. Sulzer, lessee.

Inc. in Washington. Cap., \$1,000,000, shares \$1 $\frac{1}{2}$ par. Annual meeting, second Saturday in January.

Property: The Jumbo group of 35 claims, patented, area 700 acres, also 60 acres in mill sites and miscellaneous properties. Main holdings are near the head of Hetta inlet, 2 miles from the beach and 1,500 to 2,000' above tidewater.

Mine, known as the Jumbo, has a mineralized contact metamorphic zone up to 1,000' in width, with granite foot and limestone hanging, ore fading into the lime. Property shows 7 lenses and irregular masses, ore being mainly chalcopyrite, with some bornite and a little tetrahedrite in a gangue of magnetite, garnet, epidote and other contact minerals, together with occasional molybdenite. Ore averages 4 to 5% copper, with \$3 gold and silver per ton. Average recovery said to be 100 lbs. copper per ton of rock, at cost of seven cents per lb. copper produced.

Development is mainly by tunnel, with 4 shallow shafts and numerous open cuts. The tunnels are in series, lowest 500' vertically below the highest, all connected by winzes, and the mine has over 3 miles of workings; greatest depth of workings is 100'. The ore stands well, requiring little timbering, even in stopes up to 50' in width.

The property carries an available water power, rated at 5,000 h.p., and this has been partially developed by a 36" Pelton wheel, taking water from Beaver creek and actuating a 6-k.w. generator, and a 16" Pelton wheel taking water under a 330' head from Jumbo creek, through a 10" pipe line of 3,000' length, this actuating a 55-k.w. 3-phase 2,300-volt 60-cycle generator, current being stepped down to 220 volts for lighting and power. Mine is equipped with electric fans, blowers and Temple-Ingersoll electric drills.

A 9,000' Riblet aerial tram has 14 wooden towers with 22 half-ton buckets, operated by gravity with a 600' auxiliary tram. Capacity of tram line is 10 tons per hour. The main tram has small bins at the mine and 4,000-ton storage bins at tidewater, where there is a 200' wharf.

Equipment includes a 200-h.p. electric hoist and an Allis-Chalmers duplex air compressor, electrically driven. Buildings include a 35x40' warehouse, 30x35' power house, smithies, store, office, dwellings, bunkhouses and various smaller buildings.

Production was begun 1907, and now aggregates 137,000 tons, over \$1,000,000. Earnings have gone back into the property for development and permanent improvements. Company now shipping about 2,000 tons monthly to the Tacoma smelter.

Property considered valuable and management good.

ALASKA METALS CO.

ALASKA

Idle. Mine office: Bruce, Prince of Wales Island, Alaska. Harry Corbin, supt., at last accounts. Property on the west coast of Prince of Wales Island, formerly known as the Corbin mine, and the Copper Mountain Mine. No recent returns secured. Slightly developed.

ALASKA TIDEWATER COPPER CO.

ALASKA

Office: 602 Alaska Bldg., Seattle, Wash.

Officers: W. E. Hall, pres.; F. G. Swann, v. p.; R. C. Hill, sec.-treas., with H. E. Wills and R. B. Frue, directors; R. W. Sweet, Craig, Alaska, supt.

Inc. 1916, in Washington. Cap., \$1,000,000; shares \$1 par; 532,184 shares outstanding.

Property: 8 claims, 5 owned and 3 held under lease in the Ketchikan mining district, Prince of Wales Island. Ore carries a quartz vein, traversing diorite and limestone, having a pay shoot of chalcopryrite ore 3-7' wide, said to carry gold, silver, copper and iron values, with average assays of 7.5% copper.

Development: 700' tunnel, 120' vertical shaft and drifts. Equipment includes an aerial tramway. Compressor plant being installed in 1917. Production in 1916 amounted to 134,949 lbs. copper, averaging 7.17%. Shipments were made to the Tacoma smelter. Management reports work for 1917 consists of sinking working shaft, with no shipments to date.

BEAVER MOUNTAIN MINING CO.

ALASKA

Idle. Mine office: Sulzer, Prince of Wales Island, Alaska. Henry Miller, pres.; George Comer, mgr., at last accounts. Lands: on the southern side of Beaver mountain, Hetta inlet. Development: by tunnels, showing ore carrying copper, nickel and cobalt. Operations confined to annual assessment work.

CYRMU COPPER CO.

ALASKA

Idle. Office: 117½ South Tenth St., Tacoma, Wash. Mine near Baldwin, Prince of Wales Island, Alaska. J. M. Miller, Jr., pres.; F. P. Hicks, v. p.; Frank D. Nash, sec.-treas.

Inc. 1905, in Washington. Cap., \$50,000; shares \$1 par.

Property: 6 claims, 100 acres, on Moira sound, shows 3 lenticular ore-bodies, reported by company as of 40' aggregate width, assaying 6 to 10% copper, 4 to 6 oz. silver and \$2 gold per ton, mainly from chalcopryrite ores. Mine

has a 100' shaft and a 187' tunnel, with hoist and a 6-drill air compressor. A 4,000' surface tram conveys ore to a 1,000-ton ore bin.

Shipments in 1906 were 3,000 tons of copper ore, returning 4½% copper and \$1.25 in gold and silver. Idle since 1907, owing to litigation among the stockholders; reported under bond to a stock company organized by Geo. V. Bland, of Ketchikan, Alaska, in 1914.

IT MINE**ALASKA**

Ketchikan, Alaska. Mine 1 mile from the shore on Kasaan bay, Prince of Wales Island, Alaska.

Being operated by the Granby Consolidated Company. Fully described in Vol. XII.

LAKINAW TAGISH AND MOIRA MINES CO.**ALASKA**

Address, Carcross, Y. T. and Cymru mine, Moira Sound, via Ketchikan, Alaska. Holds bond on Cymru mine (which see) and on Portland (or West-lake King) group. Company is working the Yukon properties, formerly held and operated by the Conrad Consolidated Mines, now dead.

At the Cymru a 100' shaft has been sunk and the mine equipped with 3-drill compressor and gasoline hoist. A mile long tram with gasoline motor connects mine and shipping wharf; 300 tons of ore were shipped to Tacoma in July, 1916.

The Portland Group, near Mineral Lake, is 1½ miles from the Cymru. It shows a 4' vein carrying silver-zinc-lead and copper values, zinc being predominant.

Development: by 130' shaft. The ore is transported by 1,000' aerial train to Mineral Lake, from there by scows to the Cymru; 500 tons were reported ready for shipment to Oakland, Calif., in 1916. Ten men employed.

MOUNT ANDREW IRON & COPPER CO.**ALASKA**

Former Office: Empire Bldg., Seattle, Wash. W. J. Rogers, supt.

Property: held under lease from the Mount Andrew Mining Co., on Kasaan Peninsula, Prince of Wales Island, Alaska.

Geology: ore carries chalcopryrite disseminated in magnetite, with hornblende gangue, and is practically unaltered at surface, masses of sulphide ore even showing glacial striations. Ore averages about 3.75% copper and \$1 to \$1.60 per ton in combined gold and silver values. The orebody has been stripped for about 2 acres and is developed by tunnels of 300' and 700', with a 70' blind shaft from the tunnel, and 10 small glory-holes, opened upwards to surface from the tunnels.

A 4,600' aerial tram of 40 tons hourly capacity leads from a 50-ton loading bin at the mine to a shipping bunker 500' from tide water.

Equipment: includes two 50 h. p. boilers, with 5-drill and 7-drill Ingersoll-Sergeant air compressors. Buildings include office, boarding house, bunk house and smithy.

Under option, 1913, to Granby Cons. M., S. & P. Co., Ltd., but relinquished. Reported working 1916.

Letters returned from Seattle address in Aug., 1917.

NIBLACK COPPER CO.**ALASKA**

Niblack anchorage, Prince of Wales Island, Alaska. A. A. Wakefield, agent. Property formerly worked by the Niblack Copper Development Co., afterwards the Niblack Copper Co., is reported to have reverted to the Geo. M. Wakefield Mineral Land Co. Fully described in Vol. VIII, Copper Handbook. No work done on the property since 1912 and 1913 save annual representation. Niblack Copper Co. is said to still have a corporate existence.

NORTHLAND COPPER-GOLD GROUP.**ALASKA**

Letters returned from last address, 518 Hinckley Bldg., Seattle, Wash., in 1917.

Property: 8 claims, in Ketchikan district, west coast of Prince of Wales Island, S. E. Alaska, said to show a 600 to 800' mineral zone containing numerous veins, traceable for 3 miles. Claims show limestone and greenstone porphyry intrusions, with flat dipping veins alongside, that run N. E. and S. W. The veins are from 1 to 8' thick and contain lenses of ore with chalcopyrite mixed with pyrite, lying beneath the greenstone hanging wall.

Development: by 70' crosscut tunnel and a 50' shaft, showing 3' of ore. A 112' tunnel taps this shaft and shows 18' solid 20% ore, according to owners. Shipments of 153 tons are said to have returned 10.05% copper, 26.3% iron, 14.2% silica, \$1.38 in silver and gold, or a total value of \$19.84 per ton. Smelting rate to Tacoma is \$1.50 per ton for this ore.

RUSH & BROWN GROUP.

ALASKA

Address: Kasaan, Prince of Wales Island, Alaska. U. S. Rush, mgr., and Geo. F. Brown, owners.

Property: 9 claims, 180 acres and 5-acre mill site, near the end of Kasaan Bay, 8 miles N. W. of Kasaan. The claims show greenstone intruded by granodiorite and carry three orebodies, 2 in an E. W. shear zone in the greenstone, the third orebody along the greenstone-diorite contact. The latter carries magnetite-chalcopyrite ore in a body of unknown extent, but opened for 200' in length, width of 63' and to a depth of 63'.

One shear zone contains the sulphide body. The ore occurs as massive chalcopyrite in stringers, bunches and lenses, and also as a commercial impregnation of the greenstone and chloritic schists. The massive chalcopyrite, without waste, assays 20% to 30% copper, with \$12 to \$18 gold. The lenticular shoots of the clean ore run with the shear zone, and are as much as 7' thick. Pyrite, quartz and calcite are practically absent. The sulphide body, in which these lenses occur, has an average width of 14', varying from 8' to 20' between walls. It has been developed to a depth of 250', and for a length of 170' on the 100' level; 345' on the 200' level, and 90' on the 250' level, with drifts on ore both ways from a winze on the 250' level.

On the footwall side, and at a distance of 30' from the hanging wall, a parallel short vein, evidently in the same shear zone, has been exposed for 45' on the 200' level.

Development: exclusive of stopes amounts to 2,000' of which 1,090' are in ore. It includes a 177' shaft with 1,350' of drifting on the 1st and 2nd levels, and a 50' winze from 2nd level to 250' level.

Equipment: includes a steam plant with hoist and necessary mine buildings. Ore is taken over a 3-mile private railway of 42" gauge to Venus Bay.

Work was suspended, 1907, because of the depression of the metal market, and was resumed July, 1910.

Production: for 1912 was about 700,000 lbs. fine copper, with small gold and silver values; 1,900 tons shipped in 1914. About 30,000 tons of ore have been shipped from the mine. Smelter returns for four years reported to range between 3.31%-7.1% copper, 0.12-0.20 oz. gold, and 0.52-1.03 oz. silver. Mine considered promising.

VICTORY COPPER MINING CO.

ALASKA

Inactive, and letters returned in Aug., 1917, from company's last office, 817 Alaska Bldg., Seattle, Wash. **Mine office:** Ketchikan, Gravina Island, Alaska.

Officers: M. McTernan, pres.; E. D. Fisher, v.-p.; Maurice D. Leehey, sec.; J. R. Kelley treas., Dr. C. O'Connor, C. J. Cronin and E. F. Tiernan, directors. **Inc. March, 1901, in Washington. Cap., \$1,500,000, shares \$1 par; non-assessable; fully issued. Annual meeting, first Monday in September.**

Property: 14 claims, 9 patented, 260 acres, on Seal Bay, Gravina Island, 22 miles S. of Ketchikan, extends from sea level to 4,000' above the beach.

Lands show granite, greenstone and limestone reported to be cut by 11 veins, of which 4 were developed. The main vein is estimated by management to average 22' in width, carrying chalcopryite with quartz gangue, and to assay about 5% copper, 19% sulphur, 19% iron and 52% silica, with \$2 per ton in combined gold and silver values.

Development: by 2,100' tunnel, intersecting 11 veins.

LA TOUCHE DISTRICT

(including Prince William Sound and Ellamar)

ALASKA HOMESTAKE MINING CO.

ALASKA

Address: Crary Bldg., Seattle, Wash.

Officers: Edw. Eckern, pres.-mgr.; S. A. Pepper, v. p.; Edmund Smith, sec.; C. P. Topliff, supt., with L. L. Bain, directors.

Inc. May, 1916, in Washington. **Cap.**, \$1,000,000; shares \$1 par; 600,000 shares outstanding.

Property: 4 claims, about 100 acres, at Port Wells, Prince William Sound, said to show shoots of gold-silver-lead ore, 12"-36" wide, in a contact deposit in granite, averaging \$50 per ton. Developed to depth of 250' by tunnel, in 400', Aug., 1917. About 5,000 tons of ore reported blocked out.

Equipment: includes gas hoist, 24-ton mill, 18-ton concentrator and compressor. About \$12,000 expended in development work to date. Is a prospect.

BEATSON COPPER CO.

ALASKA

Entire property, assets and liabilities acquired by the Kennecott Copper Corporation, and company dissolved Oct. 4, 1915.

W. A. DICKEY COPPER CO.

ALASKA

Office: 31 Nassau St., New York. **Mine office:** Ellamar, Alaska. **W. A. Dickey**, pres.-gen. mgr.; **Duncan Edwards**, v. p.-treas.; **H. C. Bryan**, sec. **T. W. Blakney**, supt.

Cap., \$50,000 Is a close corporation.

Property: 2 miles from tide water at Irish Cove, Prince William Sound, Alaska, is developed by tunnels and has over 1,000' of workings. Ore contains chalcopryite in lenses along shear zones, in greenstone, with gold and silver; lenses of gold ore have been developed to a depth of 300'. Shipments of 400 to 600 tons monthly of 12% ore were made to the Tacoma smelter in 1912.

Company bought the Mason-Gleason group, on Fidalgo Bay, for \$15,000. The latter group shows high-grade ore, but nearest shipping point is Irish Cove, 3 miles distant.

ELLAMAR MINING CO.

ALASKA

Office: 211 American Bank Bldg., Seattle, Wash. **Mine office:** L. L. Mid-dlecamp, supt., Ellamar, Prince William Sound, Alaska.

Officers: F. M. Jordan, pres.-treas.; C. S. Packer, sec.; preceding, with **W. R. Rust** and **Chas. de Steigure**, directors.

Inc., 1900, in Washington. **Cap.**, \$10,000,000; shares \$100 par. Reorganized in 1916 with \$2,500,000 capitalization; shares \$5 par. Gross earnings in 1915 amounted to \$740,000, \$722,000 from ore sales. Controlled by **F. M. Jordan & Co.**, Seattle.

Property: 14 claims, patented, known as the Ellamar mine, at Ellamar, on Virgin Bay, 20 miles S. W. of Valdez. The mine has a 600' three-compartment vertical shaft, with levels at 100' intervals, and has about 3 miles of workings, said to block out about 250,000 tons of ore for stoping.

Ore: occurs in a lens 80x200' and lies wholly within the slate, pinching out 30' below the 500' level. Ore is mainly chalcopryite associated with pyrite, pyrrhotite and sphalerite in a gangue of slate, graywacke and quartz, assaying from 3 to 25% copper, 3 oz. silver and up to \$50 gold. Mine was the first copper producer in Alaska, beginning shipments in 1901. A cofferdam has been

built to permit mining orebody outcropping on the beach, below the ocean level, and from 1910 to 1913 mining was confined to that part of orebody between surface and 200' level. In 1913 development work was done on the 200, 300 and 400' levels. Geology fully described, p. 90, U. S. G. S. Bull. 605, 1915. Ore is mined by underhand filling.

Equipment: includes a 300 h. p. steam plant, with 3 boilers, a 3-drill Ingersoll-Rand air compressor, Nordberg compressor, a 12x24 Nordberg engine, a 60 h. p. hoist. In 1914 a 200-ton per hour aerial tramway and new loading dock were completed. The tramway conveys ore from mine bunkers a distance of 2,200' across shallow water to the loading dock, having 25' of water at low tide. Buildings include a machine shop, smithy, laboratory, mess house and 12 other buildings.

Costs are said to be about \$3 per ton, for ore loaded on vessels, with about \$3 transportation charges to the Tacoma smelter.

Production: 1911, over 16,000 tons, averaging 0.24 oz. gold, 0.80 oz. silver and 6% copper; 1912, 22,000 tons, averaging 0.30 oz. gold, 0.90 oz. silver and 2½% copper; 1913, 25,000 tons; 1914, 31,000 tons; 1915, 36,000 tons, averaging .168 oz. gold, .607 oz. silver, 2.18% copper; 1916, 46,000 tons, averaging .15 oz. gold, .60 oz. silver and 2.83% copper. 1917 shipments: 150 to 200 tons of 2% ore per day, high in iron, and holding \$3 to \$5 per ton in gold. Employs 80 men.

FIDALGO-ALASKA COPPER CO.

ALASKA

Ellamar, Alaska. Thos. Donahue, pres.; L. A. Levensaler, mgr.; E. D. Reiter, supt.

Property: 24 claims, about 15 miles from Ellamar and one-half mile east of Irish Cove, on the southern side of Fidalgo Bay, an inlet of Prince William Sound.

Development: includes a 450' main tunnel following a well-defined fracture zone, in slate, carrying 2 lenticular ore shoots, said to be 5x50' in cross-section, cut at 200' and 300' from portal, with many small stringers.

Ore: mainly chalcopyrite, said to give average assays of about 10% copper, occurs as cementing material of fractures, irregular stringers, disseminated grains and as lenticular replacements of country rock, the fracture zones being very erratic in size and extent.

Equipment: includes 1,000' aerial tram, ore bins and wharf, besides several mine buildings. Company employing 16 men at last reports, and management plans further development. Geology described on page 118, U. S. G. S. Bull. 605.

LATOUCHE COPPER MINING CO.

ALASKA

Latouche, Latouche Island, Alaska. Geo. Barrach, mgr.

Property: 7 claims, about one-half mile north of the Bonanza mine of the Beatson Copper Co., at the northern end of Latouche Island. The vein has been traced about 750', by trenches and pits, and is developed by a 750' tunnel, showing chalcopyrite, associated with pyrite and pyrrhotite, having small gold and silver values. There is an 1,175' ground tram to a shipping wharf.

Under development by W. A. Dickey, 1917. Shipment of 300 tons of sorted ore, August, 1917, reported made to the Tacoma smelter.

LATOUCHE ISLAND COPPER MINING CO., LTD.

ALASKA

Office: 330 Burke Bldg., Seattle, Wash. **Mine office:** Latouche, Latouche Island, Alaska.

Officers: Jas. A. Murphy, pres.; L. G. Wheeler, v. p.; A. E. Fraser, 2nd v. p.; C. P. McCormick, sec.; A. L. Cohen, treas.; preceding officers, Tenning Carlson and H. J. Jacobs, directors.

Inc. in Washington. Cap., \$5,000,000; shares \$5 par.

Property: 42 claims, with about 4 miles of tidewater frontage, is on the N. E. shore of Latouche Island, 60 miles S. of Valdez. The property has 3 practically parallel N.-S. veins, of 5 to 15' estimated average width, with dip of about 65°, proven by trenches for about 3 miles.

Ore carries bornite and chalcopyrite, with quartz gangue, and averages about 4% copper, with some gold-silver values. It closely resembles that of the Beatson mine, and is said to be amenable to flotation.

Development: by a shallow shaft and 4 short tunnels.

Equipment: includes a small hydro-electric plant having a water wheel and a Class E Rand air compressor.

REYNOLDS-ALASKA DEVELOPING CO.

ALASKA

Office: 45 W. 34th St., New York. **Mine office:** Latouche, Latouche Island, Alaska.

Officers: Marvin F. Butler, pres.; H. M. Coffin, v. p.; J. Frank Birdsell, sec.-treas.; preceding, with A. E. Austin, Hon. J. G. Brady, F. A. Reynolds, W. C. Gilbert, John Yule, O. C. McGilvara, Geo. K. Hinds and G. B. Wrigman, directors. F. A. Hancock, Latouche, supt.

Inc. 1903 in Washington. **Cap.**, \$3,000,000; shares \$1 par; in \$1,000,000 cumulative 6% preferred stock and \$2,000,000 common stock. Authorized March 3, 1908, a \$500,000 twenty-year 6% gold bond issue; issued, \$125,000. Annual meeting, first Tuesday in April.

Property: 102 claims, about 2,000 acres, in Valdez district, Prince William Sound, Alaska. Company was in receiver's hands until June, 1910, when discharged by court order. Former management fully described in Vol. X, Copper Handbook.

The Boulder Bay group of 31 claims, 620 acres, is on the mainland at eastern side of Prince William Sound. Claims show a contact deposit between greenstone and slate, carrying chalcopyrite said to assay up to 11% copper and \$3 gold per ton, but averaging 2 to 4% copper. Developed by 2 tunnels. Equipment includes a 60 h. p. boiler and a 5-drill Rand air compressor.

The Iron Mountain group of 62 claims includes the Duchess and Duke properties, on Horseshoe Bay, Latouche Island. The Duke mine has a 4' vein of ore, formerly claimed to average 7% copper, slightly developed by a shaft now filled with water.

The Duchess mine, last worked in 1911, when 400' of drifting was done on the lower tunnel, is developed by 2 tunnels, the upper a 375' drift tunnel, and the lower having 500' of drifts on the orebody, which has an average width of 25'. This group shows massive sulphide ore, estimated by the management to average about 3% copper. Assessment work only has been done since 1911.

In 1916 the Duke shaft was unwatered and the orebody explored. Vein is 29' wide and has been opened 120'. Drifts are 300' below the lower Duchess tunnel. Ore is of similar character and value to that in the Duchess. Work was continued in the lower Duchess during 1916. Estimated ore opened above this tunnel is said to be over 600,000 tons, averaging 2% copper, \$2 gold, 40% iron and 43% sulphur; maximum width of orebody in last completed crosscut was 124'.

Equipment: includes a 200 h. p. hydro-electric installation, with a flume and steel pipe leading from Big Falls Creek to a Pelton wheel, direct-connected to two 40 k. w. generators; a 50 h. p. hoist and 2 Rand air compressors, of 5 drills aggregate capacity, with 6 air drills and 10 Ingersoll-Temple electric drills.

SEATTLE-ALASKA COPPER CO.

ALASKA

Office: 638 New York Blk., Seattle, Wash. **Mine office:** Latouche, Latouche Island, Alaska.

Officers: E. Sparks, pres.; Geo. W. Terwilliger, v. p.; Geo. J. Hodge, sec.; Jos Bjorn, treas., and O. B. Hess, directors.

Inc. in Washington. **Cap.**, \$1,000,000; shares \$1 par; non-assessable.

Property: 35 claims, about 700 acres, near Montgomery Bay, in the southern and central part of Latouche Island. Claims are in 2 groups, one of 10 claims on tide water, with another of 25 claims about a mile from the harbor, latter being said to carry the extension of the Beatson-Bonanza vein.

Development: by a 287' tunnel, on the Delta claim, showing a vein of 4 to 6' width; ore, when sorted, assays 11 to 22% copper. The Santa Clara No. 1 claim has a 101' shaft, with a 140' tunnel and an 85' crosscut, showing 2 veins, one of 4' width.

Equipment: includes steam power, and there is a mill operated by water power, having five 1,000-lb. stamps, with room for additional stamps, 2 Card tables, and 1 slime table. Shipments have been intermittently made to the Tacoma smelter since 1914.

STANDARD COPPER MINES CO.

ALASKA

Controlled by Galena Bay Mining Co.

Idle. Office: 68 William St., New York. **Mine office:** Landlock, S. E., Alaska.

Officers: Morris B. Mead, pres.; John L. Steele, v. p. and engr.; E. F. Bourke, sec.; J. O. Molander, treas.; Jas A. Bourke, gen. mgr., with Thos. R. Manley and Chas. Williams, directors.

Inc. Feb. 2, 1906, in New Jersey. **Cap.**, \$300,000; shares \$100 par; issued \$220,000. Bonds, \$300,000 issued. Is operated as a close corporation. Annual meeting, third Saturday in December.

Property: 13 claims, at Thorn Arm, on Landlock Bay, in the Prince William Sound district. The lands, which are very precipitous, show country rock of greenstone, reported to carry 17 fissure veins, of which 4, under development, carry lenticular shoots of ore estimated to average 6% copper, 1 oz. silver and 90 cts. gold per ton.

Development: by a shaft and tunnels of 290', 175', 85' and 660', with about 1,300' of workings, estimated to show 20,000 tons of ore with 12,000 tons blocked out for stopping.

The mine is connected with 500-ton ore bunkers on a wharf at tide-water by a 3,300' aerial tram, in 2 sections, 1 of 912' and 1 of 2,526' length.

THREE MAN MINING CO.

ALASKA

Office: 31 Nassau St., New York. **Mine office:** Landlock, Prince William Sound, Alaska.

Officers: W. A. Dickey, pres. and gen. mgr.; H. C. Bryan, sec.; Duncan Edward, treas.; officers are the directors.

Inc. in New York. **Cap.**, \$1,000; shares \$100 par; fully issued. Is a close corporation, having only 3 shareholders.

Property: 43 claims, 10 patented, 812 acres, on tidewater, at Landlock Bay, in the Valdez mining district of Alaska, giving the company nearly a mile along a great shear zone, only one end of which has been developed. The property, which has been under continuous development since 1903, is said to show 10 orebodies with a general E.-W. strike, occurring as fissure veins and as replacement deposits in shear zones in greenstone and slates. Orebodies reported to average 8' in width and to carry chalcopryrite ore in lenticular shoots averaging 10% copper. Low-grade ore is continuous, with rich ore found mainly on the footwall in paystreaks of 1 to 8' width, the largest shoot carrying massive chalcopryrite, assaying 10% copper, 1 oz. silver and 50 cts. gold per ton. The quantity of low-grade ore of concentrating tenor is very much greater than that of the smelting ore, but it is not available for present use.

Development: by tunnels, with 6,000' of workings. Six levels have been opened up on one orebody, giving a little over 600' of stopping depth on the

ore. Another orebody has been opened up on 8 levels, giving about 500' of stoping depth. No stoping has been done, all ore produced having been extracted from levels and upraises. Company claims to have over 200,000 tons of 3% copper ore developed.

The mine has no machinery or power equipment, owing to development by tunnel, but has 14 buildings, with ore bunkers on a wharf at tidewater, connected by a short ground tram with the portal of the 5th level.

Production: about 600 tons of 10% ore were shipped, 1910, to the Tacoma smelter, yielding 120,000 lbs. fine copper, and over 3,000 tons of 10% ore yielding 610,000 lbs. fine copper in 1912. No shipments were made in 1913 and 1914, but in 1915 300,000 lbs. copper was produced. Over 5,000 tons of 10% ore have been shipped. Total production to date is about 1,000,000 lbs. copper, shipments being under name of W. A. Dickey and not the company. Property considered promising.

UNITED METALS CO.

ALASKA

See Alaska Metals Co. Property is the Corbin mine, near Coppermount.

NOME DISTRICT

ALASKA MINES CORPORATION.

ALASKA

Address: c/o August Heckscher, 50 E. 42nd St., New York City.

Officers: Jas. Gayley, pres.; T. S. Cram, v. p.; W. S. Reed, sec.-treas., with August Heckscher, M. W. Newton, Louis Eisenlohr and E. E. Powell, directors. John H. Miles, mgr.

Inc. June, 1916, in Virginia. Cap., \$10,000,000; shares \$1 par; \$4,000,000 outstanding. Stock listed on New York and Boston Curbs.

Property: about 2,200 acres of mineral land at Nome, owned outright and partly controlled by option to purchase. Diamond drill operations reported to have proved the existence of 165,000,000 yards of gold-bearing gravel, averaging 36 cts. per yd. Operates 3 dredges, with total capacity of 2,000,000 cu. yds. per dredging season of 8 months.

Equipment: includes electric power plant and an all-steel machine and repair shop. Plans for 1917 include construction of two 15' bucket boats, among the largest dredges in operation. The five dredges will handle 6,000,000 cu. yds. per season at an estimated cost of from 6-9 cts. per yd. Production in 1916 amounted to \$1,500,000.

CONSOLIDATED ALASKA CO.

ALASKA

Idle. Is a successor of Alaska Bonanza Mng., Trading and Trans. Co., reorganized 1900. Owned property at Nome, Alaska.

PIONEER MINING CO.

ALASKA

Office: Alaska Bldg., Seattle, Wash.

Officers: Jafet Lindeberg, pres. and mgr.; E. O. Lindblom, v. p.; J. E. Chilberg, sec.; G. W. Campbell, treas., with W. H. Metson and J. L. Hagelin, directors.

Inc. Dec. 27, 1901, in Washington. Cap., \$5,000,000; shares \$1 par; all issued.

Profit for year ended Dec. 1, 1916, was \$242,904, of which \$100,000 was paid as No. 17 dividend. Surplus at end of year was \$240,153.

Dividends: 8% in 1902; 11% in 1906; 12% in 1907; 3% in 1908; 9% in 1909; 6% in 1910; 3% in 1911; 2% in 1915, and 4% in Jan., 1917; a total of 58% or \$2,900,000.

Property: placer areas in the Nome district, Alaska, worked by hydraulicking since 1899. They are fully equipped and plant stands in accounts as worth \$57,428. Company controls the Miocene Ditch and United Ditch companies.

SEWARD DISTRICT

ALASKA FREE GOLD MINING CO.**ALASKA**

Originally organized as a stock company, now operated under an 8-year lease that began in 1912. Wm. Martin is lessee.

Property: 22 claims, surveyed for patent, in Fishhook Creek Valley, Willow Creek district, south-central Alaska. It was on this property the first gold quartz of the district was discovered in 1906. Two orebodies have been opened on two different veins, that are sharp, clean fissures in quartz diorite, traceable for several hundred feet on surface. Ore treated in the mill has averaged about \$36 per ton. Development is by means of several tunnels, maximum length 100', with some stoping.

Equipment: includes 3 aerial tramways, mill and cyanide plant. Sixty men employed. Production is said to have been \$40,000. Operating costs are high, due to short season of 100 to 150 days each year, and the isolated position in which property is located. District will be made easily accessible by the Gov't railroad from Seward to Fairbanks, construction of which is under way. See U. S. G. S. Bull. 607, page 60. Installation of electric power planned for 1917.

GOLD BULLION MINING CO.**ALASKA**

Donald Harris, supt.

Property: 8 claims, on the S. E. wall of Craigie Creek Valley, 4 miles above mouth of Creek, in Willow Creek district, south-central Alaska.

Ore: gold quartz in vein from 2' to 14' wide.

Development: by several tunnels. Vein is said to be proven for a length of 3,500'.

Equipment: includes 2 aerial tramways, the longest 3,253', with a rise of 850'; a 7-stamp mill and small cyanide plant. Water power is used. About 70 men were employed in the 1915 season. Company reported to have taken an option in 1915 on property of the Brooklyn Dev. Co.; located at the head of Willow Creek.

Operating costs in the Willow Creek district are high, due to short season of 100 to 150 days each year, and the isolated location of property. District will be made accessible by the Government railroad from Seward to Fairbanks, now being built. See U. S. Geol. Survey Bull. 607, pp. 66, 71.

INDEPENDENCE GOLD MINING CO.**ALASKA**

Seward, Alaska. **Property:** 5 claims and a mill site, in process of patent, in Fishhook Creek Valley, on the east slope of Granite Mountain, Willow Creek mining district. Mine located in 1907, and formerly owned and operated by the Alaska Gold Quartz Mining Co., shows 2 veins. The Granite Mtn., or main vein, from 2"-4' thick, occurs in quartz diorite, showing native gold, pyrite and chalcopyrite; strike N. 14°, 20° W., with dip 2° to 20° S. W. Developed by opencuts, stopes and several tunnels, longest 386' follows vein for 265', and at the face has an incline 480' deep on the vein. The Independence, or upper vein, 620' vertically above and running parallel to the Granite Mtn., has strike N. 12° W. with average dip of 42° W., averages 12" thick and is only slightly developed.

Equipment: includes 3 stamp mills, with one Nissen stamp and concentrator, 2 aerial trams connecting mine and mill. Production in the past has been mainly from the Granite Mtn. workings. Operated in 1917. No later returns. Probably idle.

KENAI-ALASKA GOLD MINING CO.**ALASKA**

Jas. Hayden, mgr., Seward, Alaska. **Property:** on Great Falls Lake, adjoining the Skeen-Lechner, shows a 2' vein, cut on the 260' level, which is said to carry ore mining better than \$60 per ton.

Developed: by 1,700' of tunnels and stopes.

Equipment: includes 5-stamp mill, operating since 1914, and a 6,000' aerial tram connecting mine and mill.

MABEL MINING, MILLING & POWER CO.

ALASKA

Address: Anchorage, Alaska.

Officers: W. E. Barthoff, pres.; F. Lawton, v. p.; T. Caveny, sec.-treas.; above, with J. H. Barthoff, F. McCoy and W. Martin, directors.

Inc. Nov. 1, 1915, in Alaska. **Cap.**, \$100,000; shares \$1 par.

Property: 11 unpatented claims in Willow Creek district, said to show a quartz vein in diorite, dipping 42° S. W., with N. W.-S. E. course. Orebody varies from 1" to 7' in width, and yields over \$50 gold per ton.

Development: by tunnels.

Equipment: includes 3,500' aerial tram, 1 mile of ditch, No. 1 Denver quartz mill, 20-ton crusher, and water power.

Production: \$12,000 in 1916, and \$10,000 from May 28 to June 26, 1917. Seasons are short, with probably not over 120 days available for surface work.

TALKEETNA MINING CO.

ALASKA

Address: Wasilla, Alaska.

Officers: D. M. Fulton, pres.; E. H. Barthoff, v. p.; C. T. Hatcher, sec.; K. I. Fulton, mgr.-treas., with H. McGregor, directors.

Inc. Sept. 25, 1915, in Washington. **Cap.**, \$1,000,000; shares \$1 par; 800,000 issued. Annual meeting 1st Monday in October. Operating expenses for 1916 amounted to \$7,000.

Property: 8 claims, in Willow Creek district, about 40 miles N. of Anchorage, said to show a quartz vein in diorite, carrying gold ore assaying \$10-\$200 per ton.

Development: by several tunnels, longest 130'.

Equipment: includes 2 aerial tramways and 15-ton mill. Further development planned, 1917-1918.

WILLOW CREEK MINES CO.

ALASKA

Address: Doheny & Thomson, Knik, Alaska. Company leases and operates the Gold Bullion mine, one of the largest gold producers of the Willow Creek district. Plant includes 12 stamps, 2 concentrators and cyanide annex.

VALDEZ DISTRICT

ALASKA PITTSBURGH GOLD MINING CO.

ALASKA

Office: 702 Arrott Bldg., Pittsburgh, Pa. Mine office: Valdez, Alaska.

Officers: B. C. Wiltse, pres.; A. L. Miller, v. p.; O. A. MacVay, sec.; Wilber Galbraith, treas., with V. H. Chlebus and W. E. Flick, directors.

Inc. in Delaware. **Cap.**, \$1,000,000; shares \$1 par. 425,000 shares outstanding. Annual meeting, first Tuesday in March.

Property: 8 claims, 160 acres, known as the Dailey-Bennett mine, on Bettles Bay, Prince William Sound, Alaska. Ore, carrying gold and silver, occurs in a porphyry dike, cutting through slate. Course is northerly, with dip of 20°. The orebody has been opened up for about 5,000' at surface, showing galena, sphalerite and arsenopyrite, also free gold. Mill tests reported to average \$13.59 p. t. Developed by 400' tunnel. Ore reserves estimated by management at 18,000 tons, June, 1917.

ALASKA STANDARD COPPER MINING CO.

ALASKA

Office: Suit 921, 115 Broadway, New York City. M. L. Hewitt, pres.; John L. Steele, mgr.

Inc. in South Dakota. **Cap.**, \$2,000,000; shares \$1 par; 700,000 shares issued. Security Transfer & Registrar Co., N. Y., transfer agents and registrar. Company holds a 3½-year lease, with option to purchase at \$500,000, on the Standard mine of the Standard Copper Mines Co., at Landlock Bay, Prince William Sound, about 30 miles from Valdez.

Property: 7 patented claims and a mill-site, 150 acres, said to carry a 6' vein of copper-gold-silver ore.

Development: by 3 tunnels to depth of 430', reported to have proved 300,000 tons of 4% ore and 10,127 tons of 8% ore. Fourteen men employed. Management plans driving a new deep tunnel in 1917 to cut the orebody at a depth of 2,000'. Standard Copper Mines Co. is described in Vols. X and XI. Is a Mary L. Hewitt promotion.

ALICE MINING CO.

ALASKA

Address: Valdez, Alaska. Property consists of the Alice mine, situated at sea level on west side of Shoup Bay, 1½ miles northwest of the Cliff mine. The vein, located in March, 1910, is a well-defined fissure, strike N. 60° W., dip 70° S., width from a few inches to 2½'. Ore minerals include gold, pyrite, chalcopyrite, arsenopyrite, and sphalerite. The country rock is composed of graywackes, slates and green schists.

Development: at beginning of 1915 consisted of a 247' tunnel, a two-compartment shaft, 170' deep, and 100' of drifting at the bottom of the shaft.

Equipment: Includes 100 h. p. boiler, 3-drill air compressor, 50-light dynamo, 5 h. p. steam engine, steam hoist, pumps, blacksmith shop, mess house and bunk house. Small shipments were made to Valdez in 1913; no returns available. At last reports, Aug., 1914, work was at a standstill, pending a settlement of financial difficulties. See U. S. G. S. Bull. 622, p. 175.

CAMERON-JOHNSON GOLD MINING CO.

ALASKA

Reorganized in 1916 as Valdez Gold Co. J. D. McDougall, supt.

Valdez, Alaska. Owns a group of claims on the right side of Shoup Glacier, N. W. of Valdez, which show fissure veins in graywacke and argillite.

Ore: free milling gold quartz. About 3% of the ore is said to be sulphides of iron, lead and zinc.

Development: several hundred feet of tunnels. The upper workings are mainly on the Treasury Note vein; said to show from 3" to 36" ore. Lower workings are chiefly on the Mazuma claim, said to have the largest vein, as well as lowest grade on the property. In 1914 over 700' of work was done.

Equipment: includes a 3,850' aerial tram, 5-stamp mill, a 7' Lane mill, concentrator and bunkhouse. Power is supplied by a No. 3 Pelton water wheel operating under a 240' head. Thirty men are employed on the property. Report for 1913 shows an expenditure of \$41,267, with a production of 180 oz. bullion in test runs. See U. S. G. S. Bull. 622, p. 172.

GALENA BAY MINING CO.

ALASKA

Offices: 540 Orchestra Bldg., Chicago, Ill., and 811 Lowman Bldg., Seattle, Wash. **Mine office:** Valdez, Prince William Sound, Alaska.

Officers: J. B. Carter, pres. and mgr.; A. Stamford White, v. p.; Albert Barge, sec.; J. S. Jurey, asst. sec.; L. J. Rusk, treas.; Chas. Sonnenstad, supt.

Inc. 1906, in Washington. **Cap.,** \$500,000; shares \$1 par, non-assessable; 486,001 shares outstanding. Stock held by voting trust of 7 trustees (J. B. Carter, Arthur W. Cutten, E. C. Bodenoch, R. E. Pearse, B. G. Proctor, L. J. Rusk, C. A. Hayes and John S. Jurey, who are also directors) for a term of 10 years, the Continental & Commercial Trust & Savings Bank issuing trust certificates, in lieu of stock, which are negotiable and transferable. Annual meeting, second Tuesday in October.

Property: company now owns control of the Nikolai Mining Co.

The company's holdings proper, acquired in 1907, are all on Galena Bay, about 30 miles from Valdez, and include the Sunnyside, Copper Crown, Starvation, Sheep Run, Vesuvius, and 20 other claims, 22 of which are patented.

Development: by 2,200' adit on the Starvation, 400' adit on the Sunnyside, with only surface work and diamond drilling on the Copper Crown and Sheep Run claims. Ore occurs in lenses of chalcopyrite, pyrrhotite, quartz

and calcite, 4-5' long and up to 14" in width. On the Copper Crown a 4' vein of solid sulphide ore was opened up in a N. E. shear zone, assaying \$3-\$4 gold per ton. Geology fully described, p. 100, U. S. G. S. Bulletin 605. Work done since 1912 has been that necessary to secure patents, but regular work is to start as soon as plans are perfected.

GOLD KING MINING CO.**ALASKA**

Probably dead. Described, Vol. XII.

Chas. R. Crawford, mgr., at last accounts, Valdez, Prince William Sound, Alaska.

Property: Gold King mine, at elevation of 3,750' on east end of an ice-surrounded mountain rising out of Columbia Glacier, 6 miles from Shoup Bay and 15 miles from Valdez. Reached by 8-mile trail from head of Shoup Bay.

Ore: free milling gold in quartz veins in graywacke. Veins vary in width from 2" to 36". Development by tunnels.

Equipment: includes 2-stamp mill, amalgamating plates, and a concentrator, operated by gasoline engines during about 6 months each year; production said to be about \$15,000 monthly.

GRANITE GOLD MINING CO.**ALASKA**

Valdez, Alaska. **Officers:** B. F. Millard, pres. and treas.; W. R. Millard, 1st v. p.; O. S. Larsen, 2nd v. p.; J. W. Gilson, sec.; above, with S. L. Carter and Jafet Lindeberg, directors.

Inc. 1913, in Alaska, upon purchase from original locators for \$50,000. **Cap.,** \$500,000; shares \$1 par; outstanding, 430,000 shares. Annual meeting, first Tuesday in October. **Transfer office:** Childberg Bldg., Seattle, Wash. Listed on New York Curb, Spokane and Seattle Exchanges.

Company claims to have spent \$330,000 to March, 1916, on the property, and to have had a total production of \$277,000. Monthly expenses \$8,000 to \$10,000, with a monthly output of \$20,000; surplus March 1, 1916, \$21,000. Initial dividend, 2 cts. per share, paid April 10, 1916, and 2 cts. paid in May.

Property: 3 claims, 60 acres, unpatented, on the west side of Port Wells, on the coast between Hobo Bay and Harrison Lagoon, covers 3,000' of a vein of 3-3½' average width, strike N. 60° W., dip 81° N. Country rock consists of interbedded slates, graywackes and argillites cut by large masses of granite. Present development is said to indicate a split in the vein on the 200' level, continuing as two veins below this level. Metallic ore minerals are gold, and the sulphides of iron, zinc, lead and antimony. Ore said to run from \$6 to \$50, with average of \$12 per ton. See U. S. G. S. Bull. 622, pp. 136-138.

Development: 200' incline shaft and tunnels, with 4 levels opened up from 300' to 500' in length. Total underground workings, about 3,000'. Two levels are worked through the shaft, the other two through the 900' lower tunnel level. Reported in April vein had been cut on lower tunnel level about 900' from portal, said to give an additional 300' of back.

Equipment: includes 15 h. p. gasoline hoist, 180 h. p. oil-burning engine, 5 gasoline engines of from 7 to 36 h. p., 150 h. p. electric generator, 100 h. p. motor operating an air compressor, 600 cu. ft. capacity, 4,800' transmission line, and a 70-ton concentrator equipped with a 10-stamp Hendy mill, 7' Lane mill, crushers and rolls.

Production: 1916, averaged 60 to 70 tons per day, yielding about \$20,000 gross per month:

Reported in June that mill had been closed down, that a mistake had been made in figuring ore reserves and that development work was being done in an attempt to open up ore. Milling resumed in November, 1916. Good ore was opened on hoist, 210, and 350' levels. In April, 1917, an option was taken on adjoining property for \$100,000.

GREAT BRITAIN GROUP**ALASKA**

Owned by a Vancouver and Victoria syndicate. **Property:** at Whalebone Cove, on the western shore of South Valdez Island, Alaska, comprises 4 claims, showing bornite, tetrahedrite and chalcocite ore, occurring in the contact between limestone and altered lime.

Development: by 3 tunnels, showing 4 to 12% copper ore. Ore blocked out estimated at 1,800 tons by F. J. Crossland. Shipments of 700 to 800 tons have been made to the Tacoma smelter, said to average 3% copper. A 500-ton bunker was being erected on the beach for loading shipments on vessels. Probably idle. No returns secured.

GREAT NORTHERN DEVELOPMENT CO.**ALASKA**

Operating office: Valdez, Alaska. **Mine and works office:** Philips, Alaska.

Officers: Jas. Phillips, Jr., pres.; E. F. Gray, v. p.; Walter M. Briggs, sec-treas.; Edwin F. Gray, gen. mgr.; preceding officers, J. C. Fairchild, H. F. Knoblauch and H. I. Gaskill, directors.

Inc. 1906, in Maine. **Cap.**, \$1,000,000; shares \$10 par, non-assessable; issued, 70,100. Is a holding company. Annual meeting, first Tuesday in November. Petley Morse & Co., auditors, 43 Exchange Place, New York.

Property: a solid tract of about 165 claims, about 3,000 acres, on the south bank of the Kotsina river, below the mouth of Roaring Creek, near the Copper River Railroad, and about 60 miles from the Bonanza mine of the Ken-necott Co. Lands apparently lie in the greenstone formation.

Development: work totals 8,000', and is said to have opened up a large low-grade copper mine. Management plans to install flotation plant, 1918.

HEMPLE COPPER MINING CO.**ALASKA**

Valdez, Alaska. **Mine office:** Landlock, Alaska. **Officers:** S. A. Hemple, pres., treas. and gen. mgr.; F. S. Sylvester, v. p.; S. I. Hemple, sec.; preceding, with Arthur Lang and R. P. Ferguson, directors; Fred Mills, supt.

Inc. March, 1910, in Alaska. **Cap.**, \$1,000,000; shares \$1 par; non-assessable. Company is said to have expended considerably over \$75,000 on the property.

Property: 6 claims, 4 patented, 120 acres, with a 2-acre mill site, all timbered, near the Standard and Three Man mines, at Landlock Bay. Shows greenstone, slate and quartzite, carrying 3 veins with 5 or 6 shoots, said to average 24' in width and to be traceable 2,000', carrying chalcopyrite giving average assays of 3 to 6% copper. Mine is opened by tunnels of 50', 300', 575' and 800', with about 2,000' of workings, estimated by management to show about 200,000 tons of ore blocked out for stoping, which estimate seems high. There is no power plant, but property has 6 buildings and gasoline engine. Working two shifts, 1917, in the expectation of opening up the orebody on the 700' level.

LANDLOCK BAY COPPER MINING CO.**ALASKA**

Office: Valdez, Alaska. **Mine office:** Landlock, Alaska. Dr. W. A. Rystrom, pres. and mgr.

Inc. 1907. **Cap.**, \$1,000,000; shares \$1 par; issued 750,000 shares.

Property: 7 claims, 140 acres, on a small peninsula, with tide water on both sides, has 2 tunnels on the western side, besides a shallow shaft, 500' of drifts, a winze and raises, showing chalcopyrite, sphalerite and pyrrhotite ore assaying 7½% copper. Developing at last accounts. Geology fully described, p. 97, Bull. 605, U. S. G. S.—1915.

PATTEN CO-OPERATING CO.**ALASKA**

Address: Valdez, Alaska. W. E. Patten, mgr.

Cap., \$100,000; shares \$100 par.

Property: 23 claims, 475 acres, in Valdez mining district. Ore occurs as contact deposit in shale and bornite, carrying gold, silver and nickel values.

Development: by 400' of underground workings.

Equipment: includes compressor, steam power, pump, tramway. Management plans installing electric power in 1917 and erecting a 150-ton smelter.

RAE-WALLACE MINING CO.

ALASKA

Address: Don S. Rae, mgr., Gyde-Taylor Bldg., Wallace, Ida. Mine in the Willow Creek district, Alaska, reported under development, Sept., 1917.

RAMSEY-RUTHERFORD GOLD MINING CO.

ALASKA

Valdez, Alaska. Inc. in Sept., 1913.

Property: 10 miles N. E. of Valdez at an elevation of 3,500'; trail to the mine goes over Valdez glacier, making transportation difficult.

Ore: free milling gold quartz in fissure veins in graywacke.

Development: at the end of 1914 consisted of a 162' shaft with 500' of workings.

Equipment: includes several gasoline engines, air compressor, and a 5-stamp mill, which cannot be operated during the winter. In 1915 company employed 20 men and was reported to have considerable ore blocked out. Prospecting only being done, 1916-17. See U. S. G. S. Bull. 622, pp. 159-161.

SEA COAST MINING CO.

ALASKA

Address: Seattle, Wash., and Valdez, Alaska.

Officers: C. Christopher, pres.; Earl R. Pulver, sec.-mgr.

Property: 8 claims on Shoups Bay, near Valdez, said to show 6 gold quartz veins in graywacke and argillite. Developed by tunnels. Sampling is said to give results of \$30 per ton. Development work was being done, 1916, and a 10-stamp mill, hydro-electric power plant, 1,800' aerial tram were being built; an air compressor will also be added. Mill and power plant sites are near the landing, while the mine workings are at elevations from 1,750' to 2,600'. See U. S. G. S. Bulletin 622, p. 178.

VALDEZ CREEK PLACER MINES

ALASKA

Office: 705-8 Newport Bldg., Boston, Mass. **Mine office:** McKinley, Alaska.

Officers: G. W. Sias, pres.; F. E. Nye, v. p. and sec.; R. B. Griffin, treas.; also trustees.

Inc. Nov. 1, 1911, as Express Trust Co., in Massachusetts. **Cap.**, \$2,500,000; shares of no par value, non-assessable; 2,408,186 issued. Bonds: \$500,000 authorized, of which \$454,100 are outstanding.

Assets as at Dec. 31, 1916, are given as \$6,720,505, including properties, \$6,163,198; development, \$246,010; equipment, \$178,625; cash, \$1,120; bonds, etc., receivable, \$89,470; accounts receivable, \$21,154; interest prepaid, \$11,556. Liabilities include nominal share capital, \$5,571,465; mortgage, \$500,000; notes, \$567,642; and accounts payable, \$81,398.

Gross earnings in 1916 were \$23,436, and expenses, \$113,516.

Property: placer claims on Valdez Creek, headwaters of Susitna River, Alaska. Examined by Forbes Rickard and Pierre Bouery. A large quantity of gravel awaits hydraulicking, for which ditches, piping, power plant, etc., have been constructed. The property is in a remote district and the cost of securing supplies is high, 4.8 cents per lb. from Chitina, a distance of 240 miles. The season is short also.

Production: in 1916 was 36,000 cu. yds. of 62-cent gravel. Since company acquired property it has yielded \$69,880. Prior to this about \$300,000 was recovered by simple methods.

ARIZONA

AJO, PIMA COUNTY

AJO CONSOLIDATED COPPER CO.**ARIZONA****Office:** Calais, Maine.**Officers:** Jas. Phillips, Jr., pres.; Walter M. Briggs, v. p.-treas.; H. I. Gaskill, sec., with Jeremiah Hourin, H. C. Slack, Guy Murchie and A. D. Parker, directors. James P. Gaskill, mine supt., Ajo, Pima Co., Ariz.**Inc.** Dec. 5, 1912, in Me. **Cap.**, \$6,000,000; shares \$10 par; non-assessable; 600,000 shares outstanding. Annual meeting, June 14th.**Property** purchased in 1917 by New Cornelia Copper Co., which sec.**AJO CORNELIA COPPER CO.****ARIZONA****Address:** P. O. Box 78, Miami, Ariz.**Officers:** Ed. J. Grant, pres.-mgr.; E. B. Shockley, v. p.; J. D. Elliot, sec.-treas., with I. L. Greninger and J. B. Johnston, directors.**Inc.** Dec. 11, 1916, in Arizona. **Cap.**, \$1,500,000; shares \$1 par; 768,000 shares outstanding.**Property:** 14 claims, 280 acres, adjoining the Ajo Consolidated at Ajo, Pima county, carries a lenticular deposit of carbonate and sulphide ore in rhyolite, said to average better than 10% in gold-silver-copper. Assessment work done in 1916. Is a prospect of doubtful merit.**ARIZONA CORNELIA MINES CO.****ARIZONA****Office:** Tucson, Arizona.**Officers:** John Nelson, v. p. and treas.; Tom K. Richey, sec., with John Latz and M. C. Adams, directors.**Inc.** 1917 in Ariz. **Cap.**, \$2,000,000; shares \$1 par.**Property:** 7 claims, adjoining the New Cornelia in the Ajo district, Pima Co. Company plans diamond-drill exploratory work.**COLONIAL COPPER CO.****ARIZONA****Norwood, Mass.** Geo. H. Morrill, Jr., former president, reported that company was sold out on foreclosure sale, March, 1916.**Inc.** April 29, 1910, in Maine. **Cap.**, \$3,000,000; shares \$10 par, non-assessable; issued, \$1,720,000. Was a reconstruction of the Growler Copper Co. Bonds, \$500,000 authorized, at 5%; issued, \$41,000. Annual meeting, first Monday in June.**Property:** 30 claims, 26 patented, 516 acres, in 2 groups, also a 10-acre mill site, apparently held under bond and lease, in the Growler Mountains, 15 miles south of Ajo and about 60 miles southeast of Gila Bend, the railway junction point. The Copper Hill group, of 18 claims, shows an ore zone up to 300' wide, between diabase and limestone, with a gossan traceable 1½ miles, reported by company to carry 3 veins, of 2 to 7' width, having oxidized ores, silicates, bornite and chalcocite, giving assays of 2 to 46% copper, 1 to 66 oz. silver and 0.12 to 2 oz. gold per ton.**Development:** by the 100' Daisy shaft, 260' Copper Hill shaft, and 320' Yellow Hammer shaft, and the 185' Copper Hill tunnel, with a total of 1,600' of workings, estimated by management to show about \$1,000,000 worth of ore.**Equipment:** includes 170 h. p. steam plant, with 8 h. p., 26 h. p. and 70 h. p. hoists, and a 2-drill Ingersoll-Rand air compressor. Buildings include assay office and commissary, boarding house and smithy, with 6 tent houses. Idle.**CORNELIA AJO COPPER CO.****ARIZONA****Office:** 50 Broadway, New York City, and Tucson, Ariz. **Mine address:** Frank C. Meyer, supt., Ajo, Pima Co., Ariz.

Officers: J. P. Harvey, pres.; J. B. Wright, v. p.; E. I. Chapman, sec.; H. J. Schellenberg, treas.; preceding, with Nathan Kendall, C. H. McArthur and W. P. Michel, directors. Security Transfer & Registrar Co., transfer agents; Corporation Trust Co., registrar.

Inc. in Delaware. Cap., \$2,500,000; shares \$1 par; 1,340,000 outstanding; fully paid and non-assessable.

Property: 27 mining claims and option on 2 others, making a contiguous group with combined area of about 500 acres, on the southern slope of the Ajo Mountains adjoining the New Cornelia and the Ajo Cons. Copper Companies at Ajo, Ariz. Owns property of Cornelia Extension Copper Co.

Geology: in general is similar to that of the New Cornelia Copper Co., which see, but claims are wholly outside the area of mineralized monzonite. Samples from the shallow shafts and open cuts are reported to run from 1.5% to 38% copper.

Development: no 1917 development reported. Old development consists of open cuts, trenches and shallow shafts up to 50' deep. Company prospectus states that property would be developed by diamond drilling to a depth of 1,000' to 1,500', and a main shaft would be sunk to 200' depth in 1918.

CORNELIA WEST MINING CO.

ARIZONA

E. E. Ganz, trustee, Phoenix, Ariz.

Company organized by Phoenix, Ariz., people to take over the 12 claims of Geo. Sayer adjoining the New Cornelia Copper Co. The contract cost of the property was \$37,500. It was reported that company would incorporate for \$7,500,000, shares \$5 each. Very little development work has been accomplished to show value of the property.

LITTLE AJO COPPER MINING CO.

ARIZONA

Officers: W. A. Knox, pres., Apex, Mo.; C. C. Wheeler, v. p.; O. T. Richey, sec.; C. E. Walker, treas., all of Tucson, Ariz.

Inc. 1917. Cap., \$1,000,000; shares \$1 par. First allotment of 100,000 shares treasury stock offered at 25 cents.

Property: 3 claims adjoining the mines of the New Cornelia, Ajo Consolidated and Cornelia Ajo, at Ajo, Arizona. Greater portion of the claims is covered with conglomerate, while the bottom of a 50' shaft is said to show slightly altered porphyry.

NEW CORNELIA COPPER CO.

ARIZONA

Subsidiary of the Calumet & Arizona Mining Co. Gordon R. Campbell, sec., Calumet, Mich. **Operating office:** Ajo and Warren, Ariz. Same directorate as the Calumet & Arizona Mng. Co., with Dr. L. D. Ricketts and Geo. H. Augustine.

Inc. Sept. 28, 1909, in Delaware, as a reconstruction of the Cornelia Copper Co. Cap., \$8,000,000; shares \$5 par; non-assessable; issued, \$6,000,000.

Company authorized an issue of \$4,000,000 6% 12-year sinking fund gold bonds, dated Sept. 1, 1915, maturing Sept. 1, 1927, convertible into stock at \$10 per share, to finance the purchase of necessary equipment and construction work. All subscribed at par. 76% of the stock and \$3,100,000 bonds owned by C. & A. Co.

History: company's early history and its experiments with new processes are fully described in Vols. VI, VIII and X, Copper Handbook. In 1910, the General Development Co. bought 20,000 shares of stock for \$20,000, spending the money under an option for a stock control, putting down 5 diamond-drill holes, deepest 188', which showed the ground to be oxidized to a depth of about 30', followed by sulphides, estimated by the company to average 2 to 2.75% copper. The option was forfeited 1910 and property was leased to H. C.

Chamberlain, who shipped concentrates from 800 tons of 4% ore to the Cop-
per Queen smelter.

In 1911 the Calumet & Arizona Mining Co. took an option on 76% of New Cornelia stock, and under the direction of John C. Greenway, general manager, and Dr. L. D. Ricketts, cons. engr., proved the existence of a large body of low-grade copper ore. Laboratory tests showed that the carbonate ore could be treated by leaching with dilute sulphuric acid and the sulphide ore by flotation.

Experimental leaching plants of one ton and later of 40 tons per day capacity were erected at Ajo and tests made for over a year. Results of 310 charges showed: average heads, 1.31% copper; average tails, .271% copper; extraction, 79.36%, and 0.88 lbs. per k. w. hr.

Meanwhile wells were drilled to locate a water supply, and a shaft sunk on a hole 7 miles from the property found a satisfactory water stratum. In the summer of 1915 the Tucson, Cornelia and Gila Bend Railroad from Gila to Ajo was started, and completed in Feb., 1916. Work was immediately started on a 5,000-ton leaching and electrolytic precipitation plant, which was in operation in May, 1917. Rated production of this plant is 100,000 lbs. of cathode copper daily, but this will be increased later.

In July, 1917, the New Cornelia Copper Co. acquired the property of the adjoining Ajo Consolidated Copper Co. property, in which a substantial tonnage of similar ore has been developed by diamond drilling and underground work.

Property: 55 patented and 38 unpatented claims, and one patented and 14 unpatented mill sites at Ajo, 44 miles south of Gila Bend, Ariz. Property comprises about 1,704 acres, 55 of which constitute the New Cornelia orebody.

Property of the Ajo Consolidated, 7 patented and 52 unpatented claims, adjoins the New Cornelia on the south, and the orebody as developed, a continuation of the New Cornelia, covers about 21 acres.

Geology: claims cover an area of rhyolite, lava, breccia and tuff beds, intruded by a huge mass of monzonite porphyry, which cuts and uplifts the rhyolite. There were subsequent intrusions of diorite and diabase porphyry, probably connected with the great mass of Tertiary basalt and andesite lava flows which cover the surrounding country. Mineralization has formed a low-grade disseminated deposit with high-grade veins in monzonite and narrow rich veins in the adjoining rhyolite. The disseminated orebody, covering about 55 acres, has a pear-shaped outline. The depth of the ore varies from less than 50' on the outskirts to more than 600' in the center of the orebody.

In the Ajo Consolidated property the disseminated mineralization often extends beyond the monzonite into thoroughly brecciated rhyolite, but in general the ore followed the contact of the two rocks, dipping steeply S. W. and more flatly and irregularly to the S. E. For about 300' along the contact there is a lens of ore of much higher grade than the average.

The original mineralization was chalcocite and bornite with comparatively little pyrite. Surface alteration has converted the primary sulphide minerals to malachite to a depth of about 20' below the deepest arroyos and 150' below the highest hills. The plane of demarcation between carbonates and sulphides is almost horizontal, agreeing with the present ground water level. Chalcocite is rare in the New Cornelia orebody, but locally of much importance in the Ajo Consolidated ground, particularly in the ore in rhyolite below the water level.

Development: 84 diamond drill holes of an average depth of 300', with over 5,000' of underground work to check results obtained have proved the existence in the New Cornelia orebody of 11,954,400 tons of carbonate ore carrying 1.54% copper and 28,303,600 tons of sulphide ore carrying 1.5% copper, or a total of 40,258,000 tons carrying 1.51% copper.

Sixty-four diamond drill holes of an average depth of 445' and a large amount of underground development have indicated the existence on Ajo Consolidated ground of 846,100 tons of carbonate ore averaging 1.96% copper, and 11,998,800 tons of sulphide ore averaging 1.79% copper, or a total of 12,844,900 tons carrying 1.8% copper. The extent of the orebody to the south and east has not been determined. Several drill holes on both properties stopped in ore at from 400' to 600'.

Ore reserves: total estimated tonnage, based on a 1% minimum basis, is 53,102,900 tons carbonate ore, carrying 1.58% copper. Gold and silver values in the carbonate ore are negligibly small, but the sulphide ore carries between 30 c. and 50 c. per ton in precious metals.

All the carbonate ore and about 22,500,000 tons of the sulphide ore are available for steam shovel mining. The occurrence of ore at the surface obviates stripping and loss of ore or vitiation of grade through admixture of ore with capping. Grade of ore already mined has averaged .12% above estimates.

Equipment: plant is located about one mile from the orebody, with which it is connected by a double-tracked standard gauge railroad. Ore is loaded into cars by three 100-ton steam shovels, the cars dumping directly into the large crusher.

Ore is crushed to 6" size in a large gyratory crusher; 4 smaller gyratory crushers reduce it to 3" cubes before it goes by belt conveyors to the storage bins. From the 10,000-ton storage bins the ore is carried by 4 pan conveyors to 12 Symons disc crushers, reducing it to 1/4" in size.

From the crushing plant the ore is carried by an overhead conveyor 100' long to 11 leaching tanks, each 88' square and 15' deep, built of reinforced cement lined with lead. The conveyor advances across the tanks at 12' an hour. Each tank holds 5,000 tons of ore, and each charge remains in the tank 8 days. The acid solution is handled by two 3,500 gal. a minute horizontal centrifugal pumps.

The pregnant solution from the tanks is treated in 4 sulphur dioxide gas towers, 20' in diam. and 40' high, to change ferrous to ferric iron, and then pumped into the 152 electrolytic tanks, holding 77 cathodes. The anodes are of lead, and the starting cathode sheet is 3' square, weighs 16 lbs., but accumulates copper by the electric current until it weighs 165 lbs., when it is withdrawn. The discarded solution goes over scrap iron. The sulphur dioxide gas is made by burning pyrites in 4 Wedge furnaces and purified by the Cottrell process.

The \$1,000,000 power plant has 5 oil-fed 825 h. p. boilers, 2 steam turbines of 7,500 k.w. capacity, 3 rotary converters.

Production: late in 1916 shipments of silicious ore were begun to Douglas, where the ore is used as a flux in the C. & A. smelter. About 200 tons of 2.5% ore being shipped daily, 1917, for this purpose, and both grade and tonnage will be increased by mining the higher grade ore in the recently acquired Ajo Consolidated property.

New Cornelia is a big mine, resembling the Chino in occurrence and size, but its output is at present oxidized ore. When the deeper-seated sulphide ore is mined a concentrator will either be added or a battery of roasting furnaces installed.

It is believed that the new plant will produce about 35,000,000 lbs. of copper yearly at a cost of 9.5 cts. per lb., giving the stock an intrinsic value far above the market price, even with copper at 15 c. The stock is considered a good investment.

*BAGDAD, HILLSIDE, YAVAPAI COUNTY***ARIZONA HILLSIDE DEVELOPMENT CO.****ARIZONA**

Address: 308 Continental Bank Bldg., Salt Lake City, and Hillside, Ariz.

Officers: E. R. Pembroke, pres.; P. P. Clark, v. p.; J. H. Wimwood, sec.-treas.; directors.

Inc. Sept., 1917, in Arizona. Cap., \$1,500,000; shares \$1 par; 750,000 issued.

Property: 400 acres in Eureka district, Yavapai Co., Ariz., showing a fissure vein in a crushed or sheet zone in schist, dipping W. with N.-S. course. Orebody is up to 14' thick. Ore carries zinc, silver, copper and lead, shipments returning 45% zinc, 6 to 9 oz. silver, 4 to 6% lead, and 1 to 2% copper.

Development: by 200' incline shaft. Reserves are estimated at 10,000 tons. Mine was only recently taken over by this company and is in process of development.

BAGDAD COPPER CO.**ARIZONA**

Office: Suite 3249, No. 120 Broadway, New York. Mine at Bagdad, via Hillside, Yavapai Co., Ariz.

Officers: E. B. Bronson, pres.; F. C. Hart, v. p.; B. E. Page, sec.-tres.; Herman Cook, asst. treas.; preceding officers, H. Richardson, Gideon Giroux and G. D. Hopkins, directors.

Inc. in 1911 in Delaware. Cap., \$6,500,000; shares \$5 par; outstanding, 1,097,428 shares.

In May, 1911, an unsuccessful attempt was made to finance the company by the offer of 100,000 shares to the public at \$4 a share. In Oct., 1912, a 2-year bond on the property was given to the General Development Co. of New York (Lewisohn), and this company at once began drilling operations to develop more ore. Work with 3 churn drills was carried on up to April, 1913, when the bond was relinquished, but a new option on control of the company was taken in Oct., 1913, and is still in force.

Property: 53 patented claims and 9 unpatented, over 1,000 acres, in the Copper Creek region, Eureka district, Yavapai Co., 26 miles by wagon road from Hillside, on the Santa Fé line to Phoenix. Company has spent over \$600,000 on the property in purchase and in development.

Development: by tunnels and churn drilling. There were about 8,000' of underground workings and 33,255' of drilling Oct., 1915. In 1911 Allen H. Rogers estimated 4,324,500 tons of ore, averaging 1.93% copper. In 1912 F. H. Clark estimated 4,883,600 tons, averaging 1.934% copper. In 1914 H. A. Geisendorfer made detailed estimates of 6,031,000 tons of blocked ore, averaging 1.77% copper and 7,246,200 tons probable ore, averaging 1.60% copper, a total of 13,277,200 tons of ore, averaging 1.68% copper, underlying 67.88 acres. Average thickness of ore is estimated at 58.4'.

In 1915 a reconnaissance survey for a branch railroad was made. Work planned includes a branch railroad, water-power installation, mining equipment and a 3,000-ton concentrator.

NIAGARA COPPER CO.**ARIZONA**

Presumably dead, and mine near Bagdad, Ariz., idle. See Copper Handbook, Vol. XI.

*BISBEE, COCHISE COUNTY***BISBEE COPPER MINING & DEVELOPING CO.****ARIZONA**

Office: Bisbee, Ariz.

Officers: Daniel B. Seed, pres.; Joseph Water, v. p.; W. G. Hubbard, treas.; A. H. Livingston, sec.; above, with P. Winwood, directors.

drill cores has not shown any commercial values. A 3-compartment shaft is being sunk near the drill hole on the Pauline claim.

In our opinion the claims are entirely out of the mineralized area and have little, if any, chance of becoming profitably productive.

A New York brokerage house has sent out very attractive-looking advertising matter regarding Bisbee and the Bisbee Copper Mining & Dev. Co., which contains many misleading statements.

The property is not in the "heart of the Bisbee Copper Camp," and such gross misrepresentation cannot be too strongly condemned.

Development on the property is quite insufficient to predict its becoming a "second Calumet & Arizona" and an "early dividend payer," and the public buying stock on such promises is doomed to be disappointed. Apparently the company is basing all its hopes of developing a mine on its geographical position in utter disregard of geologic conditions.

BISBEE-SONORA DEVELOPING CO.

ARIZONA

Company owned several mining locations southwest of Bisbee in 1906-7, but failed to do assessment work and lost property. No meeting was held for over 4 years, and company is insolvent.

H. C. Beumler, pres., Douglas, Ariz., writes in 1917: "Company out of business." Was the holding company for Badger Hall, Bisbee & Duluth M. & D. Co. and Paradise Mng. Co. Fully-described, Vol. XII.

BUTTE & ARIZONA COPPER MINING CO.

ARIZONA

Office: 619 Hennessy Block, Butte, Mont. Mine near Hereford, Cochise Co., Ariz.

Officers: B. H. Dunshee, v. p.; A. S. Nichols, sec.; John C. Adams, treas.; preceding officers, L. O. Evans, Chas. S. Shoemaker, A. P. Henningson, C. B. Mosely, John E. Corette and D. M. Watts, directors.

Cap., \$1,250,000; shares \$1 par.

Property: 14 claims, 11 patented, costing considerably over \$60,000, was exchanged for \$450,000 stock. Property is in the Huachuca Mountains, 35 miles S. W. of Bisbee, and about the same distance north of Cananea.

Geology: claims show an ochrous gossan of 10 to 300' width, covering a contact vein between syenite and limestone carrying occasional copper oxides, carbonates, pyrite and argentiferous gray copper, and chalcocite of fair tenor, though not in large quantities.

Development: by a long main tunnel cutting several small veins giving assays up to 18% copper with an average of 4.5% tenor, mine having upwards of 3,900' of workings. Main vein, 350' from mouth of tunnel, is claimed to show 39' of 6% chalcopyrite, which is an overestimate.

Nearest railroad is 15 miles, with a fair wagon road. Has steam power and an air compressor. Idle since end of 1908. Company has no debts, considerable treasury stock and is being carried by the directors, who are advancing the money required to pay taxes and maintain the property.

CALUMET & ARIZONA MINING CO.

ARIZONA

Office: Calumet, Mich. **Mine office:** Warren, Cochise Co., Ariz.; L. D. Ricketts, acting mgr. **Works office:** Douglas, Cochise Co., Ariz.

Officers: Chas. Briggs, pres.; Capt. Jas. Hoatson, v. p.; Capt. Thos. Hoatson, second v. p.; Gordon R. Campbell, sec.; Peter Ruppe, treas.; preceding, with Thos. F. Cole, Walter B. Congdon, Chas. d'Autremont, Jr., William E. Corey, Henry R. Rea, and Geo. E. Tener, directors; Henry B. Paull, auditor; John C. Greenway, gen. mgr.; W. B. Gohring, mine supt.; H. A. Clark, smelter supt.; D. M. Rait, engr.; J. B. Rawlings, purch. agt. John Hooper, supt. at Jerome, and M. Curley, supt. at Ajo.

L. D. Ricketts will act as general manager, pending J. C. Greenway's absence on war work.

Inc. March, 1901, in Arizona. Cap., \$2,500,000; shares \$10 par, increased Feb. 15, 1911, to \$6,500,000; shares \$10 par; issued 642,462 shares; held for exchange, 338 shares. The company, which already controlled the Superior & Pittsburgh Copper Co., through ownership of 1,494,333 shares out of a total of 1,499,792 shares issued, in Feb., 1916, took over the property. All S. & P. assets were transferred to the C. & A. Co., effective Dec. 31, 1915, basis of exchange being $3\frac{1}{2}$ shares Superior & Pittsburgh for 1 Calumet & Arizona, and a bonus of \$1 per share for quick delivery of stock. American Trust Co., Boston, and Mechanics and Metals National Bank, New York, registrars; State Street Trust Co., Boston, and Bankers' Trust Co., New York, transfer agents. Stock is listed on the New York and Boston Stock Exchanges. Annual meeting, second Monday in April.

Balance sheet of Dec. 31, 1916, gave quick assets of \$8,276,703, including cash, \$2,643,570; copper, silver and gold in process, \$3,898,137; notes and accounts receivable, \$1,045,614; supplies and items in suspense, \$689,382; accounts payable are \$670,040.

Total surplus, \$38,083,964. Total earnings on copper, gold and silver were \$20,495,430; interest, \$92,511; expenditures were \$9,431,105; net income, \$11,155,005.

Dividends have been as follows: \$2 in 1903; \$6.50 in 1904; \$8.50 in 1905; \$13 in 1906; \$16.50 in 1907; \$4 in 1908, 1909, 1910, 1911; \$4.25 in 1912; \$5 in 1913; \$3 in 1914; \$3.25 in 1915; \$9 in 1916; \$9 to Sept., 1917.

In 1911 the company took an option on the New Cornelia claims, 243 acres in the Ajo district, 42 miles south of Gila. The C. & A. was to receive treasury stock of the New Cornelia Copper Co. (described under its own title), for all money expended in development work on the property. It exercised its option in 1913 and now owns 918,821 shares, 76.57% of the stock of the subsidiary company. Stock cost C. & A. \$1,617,325, about \$1.76 per share. Later it subscribed at par for \$3,100,000 bonds of an issue of \$4,000,000, which amount it set aside from earnings over dividends during 1914-15. It built jointly, with the E. P. & S. W., the 43-mile Tucson, Cornelia and Gila Bend Railroad, running from Gila Bend to Cornelia. All told, C. & A. has about \$6,000,000 in New Cornelia, so that dividends during the years 1914-1916 were necessarily lower than earnings would warrant if it had not had this extra burden to carry. The New Cornelia Co. entered the producing class in June, 1917.

The C. & A. also took an option on 70% of the \$1,000,000 capital stock of the Gadsden Copper Co., at Jerome, Arizona, in October, 1916, and is obligated to spend \$100,000 in exploration work on the property. Property consists of 39 claims adjoining the United Verde Extension Mining Co. on the south. In Sept., 1917, property was fully equipped and shaft was down seven hundred feet.

Property: includes the original claims at Bisbee, claims formerly owned by the Superior & Pittsburgh C. Co., bought Dec. 31, 1915; the American Saginaw group, bought in 1912; the Calumet & Bisbee group and the Higgins group, bought in 1913; total area of about 2,068 acres, patented, within the mineral zone of the Warren district, Ariz.

Side-line agreements with the Copper Queen Cons. Mng. Co., the Denn-Arizona Mng. Co. and the Shattuck Arizona Copper Co., insure freedom from possible litigation, and continuance of the friendly feeling and neighborly cooperation existing from the very inception of this company.

Geology: the mine is opened in limestone, near a porphyry contact, with occasional porphyritic intrusions. The surface gives small indications of values, showing but small and infrequent outcrops, the existence of the original orebodies in the Irish Mag claim, farthest to the north, having been inferred from underground work in the adjoining territory of the Copper Queen.

after careful study of the general geological conditions of the district. Ore occurs in highly irregular bodies, the mine having native copper, cuprite, melaconite, azurite, chalcocite, bornite and chalcopyrite, usually with a talcose gangue, and with considerable hematite and manganese ores, the latter carrying malachite in small disseminated nodules, frequently averaging 10 to 18% in copper. The ore, which is practically self-fluxing, averages about 2 oz. silver and 0.05 oz. gold per ton, as smelted.

Development: diamond-drill borings to depth of 1,800' have penetrated limestone strata to that depth. The orebodies are extensively developed, but are not largely blocked out, owing to the constant shifting of the ground, caused by the creeping of the mountain above, as is the case at the neighboring Copper Queen mine, requiring very heavy timbering, with frequent bulkheading, and constant care for all openings, which renders it prudent to keep costs down by blocking out ore but a comparatively short time ahead of actual stoping requirements.

There are 6 main working shafts in operation, from which a rhomboidal area a mile long is being actively developed and worked. These shafts are the 1,390' Irish Mag, 1,375' Oliver, 1,480' Cole, 1,630' Briggs, 1,680' Hoatson and 1,837' Junction shafts. Underground work totals about 144 miles, 50% of which is open and in use. New openings in 1916 amounted to 125,282'. It requires one foot of development work to open up 12 tons of ore. Mines have electric traction on the 1,400', 1,600' and 1,800' levels.

The 4-compartment Irish Mag shaft, sunk on a single 20-acre claim, was the original mine, and the shaft is sunk in hard limestone throughout, except where occasional orebodies were cut, rendering it unusually safe from drawing. The Irish Mag has yielded some of the best copper ever mined, including some entire stopes of 30 to 40% copper. The Irish Mag shaft has a 78' steel headgear, a 114' ore bin and a 250 h. p. electric hoist, raising 3-decked cages. The shaft is 1,390' deep and was retimbered to the 900' level in 1916. The Oliver shaft, 4 compartments, 1,375' deep, is equipped with 600 gal. Nordberg electric pump and hoist. It develops both of the Senator and Buckeye claims, cutting ore at 710'. Sulphide ore averaging about 5% copper is being mined from orebodies on the 1,150', 1,250' and 1,350' levels. Oxidized ore is being mined on the 850' and enriched sulphide ore on the 950' levels.

The Powell shaft, started Nov., 1908, is on the line between the Hope and Wagner claims, which lie 2,000' S. W. of the Irish Mag shaft. This ground was explored by a crosscut from the Irish Mag that traversed 600' of the Copper Queen ground, stopping about half way across the group, showing nothing of value. This shaft, about 600' deep, has an electric hoist.

The area below the 1,350' and 1,450' levels was diamond drilled, 1911, showing a downward extension of the mineral zone, several hundred feet to the bottom of the limestone, but without disclosing commercial ore.

The Washington, Angel and Old Republic claims lie on the porphyry side of the gulch, and were secured mainly as a possible smelter site, then being considered of little promise for ore.

In 1915, 5,165' of churn drilling on this group developed a substantial tonnage of low-grade disseminated ore in an irregular body from 170' to 450' below the surface.

The Cole shaft handles the output from the southwestern part of the company's holdings. The greater part of the recent production has come from a body of oxide ore of great size between the 800' and 1,100' levels. Smaller bodies have contributed sulphide ore from the 1,000' to the 1,400' levels. This shaft has Prescott and Cameron station pumps caring for a flow of 225 gals. of water per minute.

The Congdon shaft, on the Black Bear claim, only 650' from the Mag, is

1,267' deep, but has been out of commission for several years, as the territory can be worked to better advantage through the Cole shaft. Surface equipment includes a 300 h. p. steam plant, with a 12x36" double-drum hoist.

The Hoatson shaft, on the Del Norte claim, 2,500' from the Briggs, has 5 compartments, and is 1,680' deep. Ore is being mined from a large body on the 1,300' level. This ore is taken by electric haulage to the Junction and Briggs shafts, where it is hoisted. Equipment at the Hoatson shaft includes a steel headgear, double-drum hoist, good for 2,000' depth. Power plant has 6 boilers.

The Junction shaft has 5 compartments and is 1,837' deep, being the deepest of any shaft in the Bisbee district. Shaft is concreted to bottom level. The Junction is the main hoisting shaft of the Briggs-Hoatson-Junction division, and virtually the entire production of the 3 mines, about 2,000 tons daily, is hoisted through it. Ore is hoisted in 5-ton skips, crushed in Allis-Chalmers gyratory crusher, and loaded by belt conveyor into railroad cars.

Large bodies of both oxide and sulphide ore have been opened up from the 1,300' to the 1,800' levels. Development of the 1,600', 1,700' and 1,800' levels was started in 1915, and valuable orebodies have since been found. In addition to the ore of shipping grade developed, immense bodies of solid pyrite, carrying between 1% and 2% copper, have been found on the 1,400', 1,500' and 1,600' levels.

The Junction shaft drains the entire Calumet & Arizona and Copper Queen group of mines. Water pumped during 1915 was close upon 1,900,000,000 gals., about one-half coming from the 1,800' level, remainder from the 1,500' level.

Pumping plant consists of five 1,000-gal. pumps on the 1,000' level, two 2,250 and one 1,500-gal. pumps on the 1,500' level; one 1,000, one 1,500 and one 1,650-gal. pumps on the 1,800' level.

Surface plant consists of thirteen 250 h. p. Marine boilers, a 4-cylinder Nordberg, double-reel main hoist, good for 2,500' depth, and a Sullivan single-drum hoist, used as an auxiliary hoist for handling men and timber.

There is a 5,000' Nordberg compressor having compound air cylinders driven by a four-cylinder triple expansion steam engine. This machine has an attached air pump and condenser. In addition, there is a 3,500' Nordberg compressor, having compound air cylinders, driven by a cross compound steam end.

The Briggs shaft, about 3,000' south of the Junction shaft, is 1,630' deep and 3,000' east of the Lowell shaft of the Copper Queen. Large bodies of enriched sulphide ore of much greater horizontal than vertical extent, averaging about 5½% copper, have been developed between the 1,200' and 1,400' levels. A substantial tonnage of oxide ore of good grade is being mined from the 900' to the 1,400' levels from nearly vertical fracture zones. With the exception of about 150 tons of oxide ore, hoisted at the Briggs shaft, the tonnage from this mine is handled by electric haulage on the 1,400' level to the Junction shaft and hoisted.

Equipment at the Briggs shaft includes wood gallows frame. Power plant has 2 boilers of 250 h. p. each, burning crude petroleum, with a powerful hoist.

The Campbell shaft, recently started on the Regular Claim, is about 2,000' east of a point midway between the Junction and Briggs shafts. Preparations are being made to eventually sink to a depth of at least 2,000'. This shaft will develop an extensive and hitherto unprospected territory.

The Copper Giant group, at Copper Creek, Graham County, Ariz., includes 35 claims, known as the Scanlon or Clark-Scanlon property, 16 miles northwest of Mammoth. This property, bought Sept., 1908, has been extensively tested by diamond drills, giving good cores, and has a 600' two-compartment working shaft, with several levels opened, and considerable medium to high-

grade sulphide ore is blocked out. A 15-mile railway will be required to render this property a producer.

Equipment: surface equipment is very complete. The original machinery plant was clustered about the Irish Mag shaft, on a steep hillside, where limited room was secured by grading, but the principal plant is now at the Oliver shaft, including five 280 h. p. marine boilers, burning crude petroleum, with storage tanks.

The principal compressor plant, at the Oliver, has a 35-drill Sullivan Corliss cross-compound 2-stage air compressor, with 17x34" steam cylinder and 20x34" air cylinder, having a piston displacement of 6,600 cu. ft. of free air per minute. There also are 3 Sullivan straight-line air compressors. Much of the ore is so soft that it can be bored with a breast auger, thus reducing requirements in the way of air for power drills. Electricity is used extensively on surface and also for pumping. The electric power plant at the Oliver shaft has 1,000 k. w., 500 k. w. and 300 k. w. Westinghouse-Parsons 2,200-volt, 60-cycle, 3-phase turbo-generators, two 220 k. w. 2,200-volt 60-cycle 3-phase motors, direct-connected with the steam turbine, a 300 k. w. General Electric rotary converter, transforming a 2,200-volt alternating current to a 550-volt direct current, for operating the street-car line to Warren.

The steel-frame machine shop is divided into two 60x48' parts, for the machine shop and smithy. Adjoining is a plate shop, 40x128', of steel frame, with corrugated iron roof and siding. There is a framing mill at the Irish Mag shaft, also a warehouse and office building. A 60x125' administration building is planned to be erected at Warren, the town site adjacent to the Calumet & Arizona. A hospital with an efficient staff is maintained for the employees, and a model changing house has hot and cold running water, tub and shower baths and lockers for 500 men. Fire protection is furnished by direct pipe lines to large storage tanks, all hose couplings being made to connect with those of the Bisbee fire department. An automatic telephone system has stations underground and on surface, and is connected with the smelter at Douglas.

The company's smelter is located at Douglas, 25 miles from the mine, receiving ore over the El Paso & Southwestern Railway, at a very favorable freight rate. The original smelter was blown in Nov. 15, 1902, and has been twice enlarged, giving the old works a capacity of nearly 3,000 tons daily.

The Smelter

The new smelter, completed 1913 at a cost of about \$2,000,000, was designed by C. H. Redpath and built and equipped with the able assistance of Messrs. Greenway and Wood. It is fully described by Richard H. Vail, in the *Eng. and Min. Journal*, vol. 98, p. 102, July 18, 1914. The works consist of a sampling mill, crushing plant, calcining plant, reverberatory, blast furnace and converter departments and 6 mixing beds, each of 10,000 tons capacity, together with a 5,000-ton coke storage bed.

The crushing and sampling plant, 40x84' on the ground and 5 stories high, is built of steel and concrete throughout, and is divided into 2 sections, operating independently of each other. Each section has a crushing and sampling department. Ore from the crushers at the receiving bins is delivered over an incline conveyor to the crushing and sampling plant, where the large sizes are screened out for the blast furnaces. The sampling department, equipped with Snyder automatic samplers, cuts the ore 4 times, making a sample weighing 1.6 or 3.2 lbs., as desired, per ton of ore passing through. The plant is flexible and ore may be crushed and screened and discharged at any desired size.

The material from the sampling and crushing plant is passed to mixing beds similar to those in use at the Cananea smelter, there being 3 beds for

coarse and 3 for fine ore. The coarse ore mixed with coke is conveyed directly to the coke charge bins over the blast-furnace charge floor, the fine ore going directly to the calciner, or roaster plant.

The roaster plant has twenty-four 258" Herreshoff roasters, having a capacity of approximately 80 tons of fine ore per day. The plant is equipped with a tile and steel dust chamber, 60x140x70' high, equipped with baffles and wires and roofed with copper, discharging into a brick-lined steel chimney, 20' inside diameter by 279' high.

Twelve of these roasters were completed early in 1917, and are being used in connection with a newly constructed sulphuric acid plant, which is furnishing 200 tons of 60 degree Baume acid to the New Cornelia Copper Co.

A 222x460' building, of steel frame, sheathed with iron, covers the blast furnace, reverberatory, converter, and copper-casting departments. The blast-furnace department consists of two 48x40' blast furnaces, and has a steel dust chamber, 60x180x70' high, equipped with suitable baffles and wires. The gases from the converters will also pass through this chamber and be discharged into a brick-lined steel chimney, 25' inside diameter by 305' high. Ore and coke is discharged directly from the bin over the charge floor into cars resting upon platform scales, the charge car being propelled from the scales to the charge doors of the furnace by an electric motor.

The reverberatory department contains 4 reverberatory furnaces, 19x100' in size, with a foundation and building for a fifth furnace in place. Each furnace is equipped with two 712 h. p. Stirling boilers. The furnaces are charged directly from the calcine cars running on a track overhead. Matte is tapped into 20-ton pots, and transferred by cranes to the converters, slag being skimmed directly into 25-ton pots, running on tracks underneath and just in front of the skimming end of the furnaces.

The converter department, having a main converter aisle 55' wide, and two 40-ton electric traveling cranes, has stands for 6 Great Falls type converters. There are also 2 straight-line casting machines and other necessary equipment. The converter slag is poured directly into the reverberatory furnace.

The power house, formerly 80x160' in size, was increased, 1907, by the building of a transverse section 100x100' in size, the new building being divided through the center by a row of columns into 2 bays, each 50' wide, and each served by a 10-ton hand-power traveling crane. Equipment includes two 14 & 28x36 Allis-Chalmers Tandem Corliss engines, all driving No. 10 Connersville blowers. One 22 & 48 & 52 & 52x48 and one 22 & 42 & 48 & 48x48 Nordberg cross compound Corliss blowing engines, and one 20 & 40 & 44 & 44x48 Allis-Chalmers blowing engines.

There are also a 750 k. w. and a 500 k. w. Allis-Chalmers steam turbine, driving 440-volt, 60-cycle, 3-phase generators, and one 165 k. w. and one 200 k. w. motor generator sets for converting alternating current to direct current for cranes and locomotives.

There are also 2 triple expansion steam pumps, size 8 & 12 & 20 & 22x24, and 3 motor-driven centrifugal pumps for water service; also two 14 & 25 & 2-36x24 Prescott steam condensers. Steam is supplied from the boilers over the reverberatory furnaces and the old boiler plant is closed down.

The smelter plant includes a machine shop and smithy, both of steel frame, and a considerable number of dwellings.

Ore reserves: October, 1916, are given as 1,976,815 tons of 4.99% ore, compared with 1,610,264 tons in 1915.

Production: up to July, 1917, the Calumet & Arizona mines at Bisbee have produced 5,763,226 dry tons of ore, yielding 634,694,594 lbs. copper and \$6,913,072 in gold and silver. This tonnage is exclusive of the Superior & Pittsburgh production prior to consolidation.

Production since 1910 is as follows:

Year	Lbs. Copper	Oz. Silver	Oz. Gold	Net Cost Copper (a)	Selling Price Copper
1911.....	49,945,905	453,947	18,114	7.34 cts.	12.49 cts.
1912.....	53,108,628	594,319	22,881	7.02 cts.	16.25 cts.
1913.....	52,987,383	880,915	18,989	7.65 cts.	15.57 cts.
1914.....	52,667,929	922,143	24,122	8.19 cts.	.....
1915.....	65,268,910	1,381,077	35,264	8.00 cts.	.....
1916.....	74,898,788	1,863,149	43,378	9.04 cts.	24.70 cts.
1917*.....	44,695,205				

(a) Per pound copper, after crediting gold and silver.

* First nine months.

During 1916, 843,813 tons of ore were mined, dry weight. There was shipped 35,785 tons of low-grade sulphide ore to Sasco and Miami, where a premium was paid for high iron and sulphur contents. Smelter treated 1,085,082 tons of dry ore, of which 275,581 tons were custom ore.

Production for 1917 was somewhat hampered by labor strikes, resulting in the forcible deportation in July of 1,168 "undesirables," belonging to the I. W. W., by the citizens of Bisbee.

Mining operations for 1916 at the Bisbee properties were the largest in the history of the company. Over 162,703 more wet tons of ore were mined than in 1915, and nearly 6 miles more of development work was done. Although an enormous tonnage was shipped, ore reserves showed a very large increase.

Safety organization, which was formed in 1915, did very effective work. With 26.6% more men employed at top-notch production for entire year, total accident rate decreased 18.1%, while fatal accidents decreased 47.7%. New hospital, to cost \$100,000, will be started in 1917.

Has extremely valuable holdings at Bisbee, only part of which are explored. It is reasonable to assume a 20-year life for this area.

In 1912, when copper sold at 12.6 c. per pound, Calumet & Arizona stock sold as high as \$83.25 per share. In 1916, with net earnings of \$11,156,836, and copper averaging 25.75c, the stock sold as low as \$66. In 1917, the earnings for first six months were nearly \$6,000,000, equivalent to \$9.10 per share. The stock is a safe and profitable investment at present prices.

An analysis of the 1916 balance sheet by Geo. L. Walker shows cash and current assets of \$10.30 per share outstanding after setting aside \$843,387 for depreciation, etc. In addition it owns New Cornelia stock, which at \$18 per share and bonds at par, is equivalent to \$30.72 for each share; sundry investments equivalent to 84 c. per share, giving a total value of \$42.08 for the stock, exclusive of its Bisbee holdings its smelter and sulphuric acid plant. As these Bisbee and Douglas properties earned \$17.35 per share of issued stock in 1916, it is evident that the shares represent an actual value in excess of \$100, and that New Cornelia will soon replace any probable lessening of earnings in future years.

COCHISE COPPER CO.

ARIZONA

Property reported sold to Standard Mining Co., for \$100,000, Oct., 1914.

COCHISE DEVELOPMENT CO.

ARIZONA

Bisbee, Cochise Co., Ariz. Officers: Lemuel C. Shattuck, pres.; Chas. L. Jones, v. p.-gen. mgr.; T. O. McGrath, sec.; Jos. M. Muheim, treas.

Inc. Aug. 1, 1905, in Arizona. Cap., \$1,000,000; shares \$10 par, succeeding the Cochise Copper Mining Co. Annual meeting, second Tuesday in January.

Property: 16 claims, 176 acres, abutting on the Holbrook mine of the

Copper Queen Consolidated, and lying north of the Dividend fault and Dubacher gulch.

Development: by a 900' three-compartment shaft. Drifts on the 300', 600' and 900' levels show small bunches of sulphide ore.

Equipment: includes a 100 h. p. boiler, a 10x30" first-motion double-drum hoist, good for 1,200', and a 6-drill Sullivan straight-line air compressor. Buildings are an engine house, boiler house, 20x40' carpenter shop, 20x30' smithy, and a coal trestle. Idle since 1907.

COPPER QUEEN CONSOLIDATED MINING CO.

ARIZONA

Branch of Phelps-Dodge Corporation, which see.

DENN-ARIZONA COPPER CO.

ARIZONA

Bisbee, Cochise Co., Ariz. **Officers:** Martin Pattison, pres.; Lemuel C. Shattuck, treas.; J. G. Williams, sec.; Byron M. Pattison, Thos. Bardon and H. L. Mundy, directors.

Inc. Jan. 14, 1907, in Minn., as successor of Denn-Arizona Development Co. Cap., \$3,500,000; shares \$10 par, fully issued; increased June, 1917, to \$5,000,000, and 55,000 shares new stock offered for sale, at \$10.

Property: 13 claims, patented, 200 acres, immediately east of the Junction shaft of the Superior & Pittsburgh. The Dividend fault traverses the company's ground for about 4,000', and big orebodies have been found on adjoining properties near this fault. Mine has a 1,600' shaft, started in conglomerate but penetrating limestone at 840', with upwards of a mile of workings. The 1,000' and 1,100' levels show considerable leached ore, with little commercial ore, though carrying occasional small bodies of rich cuprite. The 1,250' and 1,350' levels also show large areas of leached ore, with some low-grade sulphides on the 1,250' level, and a little native copper on the 1,350' level. The lower level has a little ore of 12 to 15% copper tenor. Management estimates the average tenor of ore developed, almost exclusively oxides and carbonates, at 8% copper. Apparently some good orebodies may be developed at 1,800' or deeper, though the ore is erratic. The mine is wet, and has two 1,000-gal. triple-expansion pumps on the 1,000' level, and five 800-gal. sinking pumps.

Equipment: includes a 1,600 h. p. steam plant, with 6-drill and 25--drill Sullivan air compressors, and an 18x36" Ottumwa Corliss first-motion hoist, raising double-deck cages. There is a railroad spur to the mine.

Last production, 1909, was 99,222 lbs. fine copper and 41 oz. gold. Development work was energetically carried on despite very heavy pumping expenses until 1912, when an unusual influx swamped the pumps and the mine was closed down.

Operations were resumed in Sept., 1917, the shaft retimbered, a station cut on 1,400' level, and a crosscut driven.

The Denn has an excellent chance of making a big mine, the claims covering an extension of the big ore zone of the camp, but the ore horizon at this point is lower than on the other properties. The deep development of the Junction, C. & A. and Saginaw properties will drain this ground as well as prove it, and further exploration will be easily and cheaply done. There is strong probability that this company and the Shattuck will be merged at some future time. Property is a splendid prospect. It may be several years before it makes a mine, but eventually, we believe, will be a valuable one.

EMPIRE STATE MINING CO.

ARIZONA

Office: 182 Buick Ave., Utica, N. Y. **Mine office:** Bisbee, Cochise Co., Ariz.

Officers: R. E. King, pres.; F. L. Guillaume, v. p.-treas.; E. M. Penny, sec.; W. A. Fenn, Geo. P. Langford, John A. Losee, John A. Urschel, directors. John A. Collins, gen. mgr. and purch. agt.; O. P. Zane, cons. engr. and supt.

Inc. June 27, 1904, in Arizona. **Cap.**, \$1,000,000; shares \$1 par; 813,000 shares issued. Annual meeting in June.

Property: 11 claims, 230 acres, near the Modern mine, about 5 miles N. W. of Bisbee, is developed by a 1,400' tunnel, said to show about 150' of low-grade copper ore, slightly auriferous and argentiferous, estimated to average about \$8 per ton. Ore is found in small stringers, typical of the district, and property is not considered well located. Idle since June, 1914.

HARTFORD-ARIZONA COPPER MINING CO. ARIZONA

Hamburg, Cochise Co., Ariz. Henry Hamburg, pres. and mgr. In Sept., 1913, the Arizona Corporation Commission authorized the company to incur a \$100,000 6% bond issue, for further mine development. Owns the Wisconsin group in the Huachuca mountains. Company has surveyed a line for tramway to wagon road and will ship to Hereford or to a point on Fort Huachuca branch of the El Paso & S. W. R. R. Property developed by tunnels, has steam plant and compressor and employed 30 men at last accounts. No recent returns secured.

HIGGINS LEASING CO. ARIZONA

Inc. 1912, to prospect the Higgins property for silver-lead and copper ores. Lease has expired and property reverted to owner, Thos. Higgins, of Los Angeles, in 1916.

OCOTILLO COPPER MINING CO. ARIZONA

Office: 502 Corby-Forsee Bldg., St. Joseph, Mo. **Mine office:** Bisbee, Ariz.

Officers: R. A. Grant, pres.; C. A. Blair, v. p.; T. G. Sortor, sec.-treas.

Inc. "under the common law" in Ariz. **Cap.**, \$2,000,000; shares \$1 par; \$1,000,000 in treasury. Stock offered the public, 1917, at 35 c. a share, either on the installment plan or with a 10% discount for cash.

Property: 16 claims, about 320 acres, 4 miles from Bisbee, Cochise Co., Ariz., said to be in lime and granite porphyry. A shaft is being sunk on a vein near the lime-porphry contact on the Lucky Tramp claim. Material is impregnated with iron and carries some gold-copper values. Assays of the ore at 10', 20' and 40' in depth are given as \$2, \$5 and \$40 per ton.

Company's prospectus devoted mostly to the big producing mines of Arizona, their dividend records, etc., and advises investment in the Ocotillo mine, which, it states, may raise another crop of millionaires. This prospect, for it is not even a near-mine, is in an unpromising area outside of Bisbee. Investors are warned to await results of development to at least 100' in depth.

PORTAGE LAKE & BISBEE MNG. CO. ARIZONA

Office: care John Funkey, Hancock, Mich. **Mine address:** Bisbee, Ariz. Chas. Lewis, treas.

Inc. April, 1903, in Arizona. **Cap.**, \$1,000,000; shares \$1 par; succeeding Portage Lake & Calumet Development Co.

Property: 12 claims, 3 fractional, 191 acres, several patented, 3 miles S. E. of Bisbee, S. E. of Warren Dev. Co., showing country rock of limestone, with a porphyry contact. The mine has a 2-compartment 302' shaft, with a small compressor, Worthington pump, 75 h. p. hoist, etc. Inactive many years.

QUEEN CALUMET COPPER EXTENSION CO. ARIZONA

Address: 121 So. Central Ave., Phoenix, Ariz., or Bisbee, Ariz.

Officers: Jas. Wood, pres.; P. L. Woodman, v. p. and gen. mgr.; J. F. Cleaveland, sec.; Chas. A. McDonald, treas., with A. K. Stacy, W. W. Perkins and W. W. Searles, directors.

Inc. Dec. 12, 1916, in Ariz. **Cap.**, \$1,500,000; shares \$1 par.

Property: the Don Luis group of patented claims, about 421 acres, and the Gold Knob group of 253 acres in the Warren mining district, Cochise County. Structural geological conditions warrant drilling, which will be done.

RADIUM MINES CO.

ARIZONA

W. H. Mercer, mgr., Globe, Ariz.

Property: 60 claims, 4 miles north of the Old Dominion mine, Globe, said to show vanadium ore in a vein or mineralized fault zone in diabase. The ore shows galena associated with iron oxide and manganese; vanadinite occurs as crystalline incrustations around other minerals, but has not yet been found in commercial quantities.

RED MOUNTAIN DEVELOPMENT CO.

ARIZONA

Office: P. O. Box 3007, Lowell, Ariz.

Officers: Frank Briggs, pres., treas. and gen. mgr.; Wm. Hawley, v. p.; E. J. Briggs, sec.

Inc. Oct. 5, 1908, in Arizona. **Cap.**, \$1,000,000; shares \$1 par; non-assessable. Annual meeting, second Tuesday in September.

Property: 17 claims, 340 acres, crossed by the Southern Pacific Railway, shows schist, porphyry and limestone, with a vein claimed to be 130' wide and traceable 2 miles, carrying copper and lead ores, including copper oxides and chalcopyrite.

Development: consists of a 100' shaft. Idle owing to lack of funds.

SHATTUCK-ARIZONA COPPER CO.

ARIZONA

Office: 120 Broadway, New York. **Mine office:** Bisbee, Cochise Co., Ariz.

Officers: Thos. Bardon, pres.; H. L. Mundy, v. p.; Archibald M. Chisholm, sec.-treas.; Lemuel C. Shattuck, managing director; preceding officers and Louis W. Hill, directors; Norman E. LaMond, asst. sec.; Arthur Houle, supt.; T. O. McGrath, auditor.

Inc. March 22, 1904, in Minnesota. **Cap.**, \$3,500,000; shares \$10 par; non-assessable; fully issued. Company is closely connected, in ownership and management, with the Denn-Arizona Copper Co. National Shawmut Bank, Boston, and Bankers' Trust Co., New York, registrars; Old Colony Trust Co., Boston, and Guaranty Trust Co., New York, transfer agents. Shares listed on the Boston and New York Stock Exchanges. Annual meeting, third Saturday in February.

Dividends: \$2 in 1910; \$1 in 1911; \$1.50 in 1913; \$1.50 in 1914; \$2.50 in 1915; \$4.75 in 1916; \$5 in 1917, to October 20.

Annual report for 1916 shows net profits of \$3,074,013, as compared with \$1,174,028 in 1915. Total net surplus, Dec. 31, 1916, was \$2,274,256. Net profit for first 5 months of 1917 was at a rate of \$8.70 per share per year.

Property: 8 claims, patented, 109 acres, lying in the northeastern portion of the Bisbee camp, about one-half mile south of the original workings of the Copper Queen, and to the north of the Calumet & Arizona. The property shows carboniferous limestone, with intrusive porphyry dikes, and a big fault, covered with a silicious gossan of 30 to 50' width. Ores carry copper and lead with gold, silver and vanadium values, and are oxidized down to 800', with low-grade sulphides at depth.

The orebodies occur as irregular replacements along certain bedding planes, and along dike contacts.

Development: the mine is opened by a 935' three-compartment shaft, 15x4' 6" in size, connected with the Uncle Sam shaft of the Copper Queen on the 800' level, with the Powell shaft of the Calumet & Arizona on the 600' level, and with the workings of the Wolverine & Arizona on the 200' level. Mining work was begun Aug., 1904, and ore shipments started Sept., 1906, continuing until Nov., 1907, when the panic put a stop to all work for some months. Production was resumed Dec. 4, 1908. The mine is opened by levels at 100' intervals, from 100' to 900' inclusive, and to March 31, 1917, had 118,539' of workings. New work in 1916 totaled 21,822'; 1917, first quarter, 6,477'.

Development during 1916 was done on all levels from 100' to 900', inclusive, and company's report for that year cites following various orebodies, giving their approximate dimensions as they stood at end of year.

On the 100' level a zone 160' in length showing 30' width of 6% copper oxide ore was exposed on the Southwest claim. The long axis of the orebody strikes N. E.-S. W., with development faces continuing in good copper ore. This orebody is an upward continuation of important ore find on 200' level made during 1916, and is expected to develop a large tonnage during 1917.

On the Southwest claim, not yet entirely exposed, an orebody on the 200' level, continuing upward above the 100' level, 240' in length and over 40' wide, assays 5½% copper; and a 80' body of lead-silver ore assaying 12% lead, and \$5 gold and silver per ton, has been partly blocked out on this level, adding a large quantity to previously known silicious lead ore. A silicious lead orebody on the 300' level, 100' thick, assays 10% lead and \$3 gold and silver.

High-grade orebody on Iron Prince claim, 400' level, has exposed kidneys of glance ores averaging 35% copper and 20 oz. silver per ton. A good tonnage of 6% copper carbonate ore is also exposed here. Recent developments on 500' level exposed a width of 14' of carbonate ores assaying 12% copper. The lead ore tonnage on the 600' level was greatly increased by intermediate developments. Shipments from this territory netted profit of approximately \$15 per ton. Orebody averaging 8% copper, encountered on the 700' level, as exposed, shows 18' width and face continuing in ore. A primary sulphide orebody on the Copper Rock claim, 800' level, at last reports 520' long and 21' thick, assaying 4% copper, has developed a large tonnage, and a substantial tonnage of 3% semi-oxidized ores have been exposed and developed on the 900' level.

Plans are under way for a 300-ton daily capacity mill to treat the silicious oxidized ores of lead, of which there is indicated approximately 1,000,000 tons, assaying 10% to 12% lead and \$1 gold and 6 oz. silver per ton. Recent experiments indicate a profit of at least \$4 per ton can be realized on this ore at normal market prices for lead and silver. Many of these orebodies are only partly developed. Development of new ore has exceeded shipments since January 1, 1916, when the total and partly developed reserves were estimated as 921,968 tons, containing approximately 56,600,000 lbs. copper, 70,000,000 lbs. lead, and \$4,000,000 in gold and silver.

The ore is smelted by the Calumet & Arizona Mining Co. at Douglas, Arizona, under contract in effect to July 1, 1923. About 500 men are constantly employed, and 550 tons of copper ore are shipped daily, returning about 6% copper, with appreciable gold and silver. Until company's own mill is completed, about 150 tons of lead ore are shipped weekly to El Paso for treatment.

Equipment: 12 mine buildings, including machine shop, carpenter shop, smithy, boiler house, engine house, warehouse, sawmill, and a change house with accommodations for 300 men.

The 750 h. p. steam plant has five 150 h. p. boilers. The main hoist is an 18x48" Allis-Chalmers duplex double-drum engine, working under 125 lbs. steam pressure, with 2 drums, each carrying 1,500' of 1½" round steel cable, capable of handling continuously a 15,000-lb. unbalanced load at a vertical hoisting speed of 2,000' per minute. The air plant includes a 40-drill Sullivan cross-compound air compressor. Fuel is petroleum, with a normal yearly consumption of about 20,000 bbls.

A 3,300' aerial tram of 500 tons daily capacity, with average grade of 18%, supported by 14 towers of 12 to 40' height, built of 12" timber and set on concrete foundations, leads from a 1,000-ton ore bin near the shaft to the El Paso & Southwestern Railway, the buckets discharging loads direct into 50-ton ore cars.

Recent Production:

	Copper Lbs.	Lead Lbs.	Silver Oz.	Gold Oz.	Copper Cost	Per Lb. Sold
1917.....	(a)9,010,647	1,799,433	120,847	1,202	.....	.....
1916.....	18,161,763	3,413,445	314,718	4,721	8.71 cts.	23.18 cts.
1915.....	11,154,211	2,345,342	201,869	3,151	(b) 8.44 cts.	18.5 cts.
1914.....	10,846,918		198,419	2,444	(b) 8.47 cts.	14.13 cts.
1913.....	13,219,756		236,000	2,033	7.22 cts.	

(a) First 8 months. (b) Under curtailed production from Aug. 14 to Oct. 23 when shipments were discontinued, resumed in April, 1915.

Producing about 18 million lbs. of copper annually at a cost of 8½c, the company can earn about \$3.50 per share on a 15c copper market, with much increased earnings if a higher price is realized.

Labor troubles and shortage curtailed 1917 production considerably. Reported in Sept. that a 400-ton flotation mill would be built.

TWO PEAKS MINING CO.**ARIZONA**

Address: Turner, Ariz.

Officers: W. G. Gilmore, pres.; J. C. Akard, v. p.; E. P. A. Larrieu, sec-treas.; with J. S. Trowbridge and T. D. M. Larrieu, directors.

Inc. Jan. 4, 1916, in Arizona. Cap., \$2,500,000; shares \$2.50 par; 432,054 issued.

Income, \$102 from ore and \$1,773 from shares sold in 1916; \$3,817 operating expenses.

Property: 45 claims, 1,012 acres, at S. end of Whetstone Mts., Cochise Co., Ariz., said to show a contact with a mineralized shear zone striking S. 48° W., through the overlying monzonite porphyry, below which is limestone. Ore occurs as lenses in sheeting planes and through the porphyry mass, and according to company carries 3.16% copper, 0.034 oz. gold and 2 oz. silver per ton in shear zone. Minerals are chalcopyrite in shear zone, and bornite and chalcopyrite in contact deposit. Carload in 1916 averaged 4.03% copper.

Development: by shafts 36, 55, 60 and 100' deep, and by 270 to 280' tunnels. Workings to depth of 150'; total, 1,500'.

WARREN REALTY & DEVELOPMENT CO.**ARIZONA**

Property sold in 1917 to Phelps, Dodge & Co., and company liquidated. For description, see Vol. XII.

WOLVERINE & ARIZONA MINING CO.**ARIZONA**

Office: Calumet, Mich. Marc Bailey, mine supt., Bisbee, Ariz.

Officers: John Daniell, pres.; Paul P. Roehm, v. p.; Edw. Ulseth, 2nd v. p.; W. Frank James, treas.; Chas. Chynoweth, sec.; preceding, with W. H. Brophy and Fred C. Smith, directors. Jos. Bosch, supt.

Inc. March, 1905, in Arizona, as successor of Wolverine & Arizona Development Co. Cap., \$3,000,000; shares \$15 par, issued 118,674 shares, par value 1,457,340, subject to assessment, and 21,792 shares, par value \$326,880, of full-paid stock. Levied 25-cent assessments March 19, 1906; Sept. 17, 1906; June 17, 1907; Nov. 18, 1907. Annual meeting, second Wednesday in November.

Receipts for fiscal year ending Sept. 30, 1916, totaled \$188,892, including \$155,975 from 1915, and \$28,588 ore sales; with total disbursements of \$77,997, including \$34,369 for mining and \$29,699 for dividends. Cash on hand, \$108,654; but by Sept., 1917, this was reduced to \$90,000.

Dividends: 10 cts. per share, in Dec., 1914; 25 cts. per share, in Dec., 1915; 21 cts. in 1916.

Property: 9 claims, 152 acres, known as the Cairo, Memphis, Kentucky, Georgia, Louisiana, Chicago, Warren, George and Broken Promise. The Georgia claim lies 600' from lands of the Calumet & Arizona, and is about 3,000' from the Irish Mag shaft of that company, and from the Spray and

Holbrook shafts of the Copper Queen. The Uncle Sam and White Tail Deer claims of the Copper Queen are adjacent to the Wolverine & Arizona.

Development: claims lie along the high limestone ridge W. of Bisbee, extending westward to the open valley, and the first development was begun on the farthermost side of the group. The Broken Promise shaft, 700' deep, with 3 compartments, cut mineralized limestone showing considerable iron but no ore in commercial quantity. A drift on the 500' level, running 850' toward the Pittsburg & Duluth group (Cal. & Ariz.) cut leached ore and ledge matter, carrying traces of copper. Drifts running in other directions showed leached ore, but not in encouraging quantities, and work in this area was suspended, 1909.

Exploratory work on the western claims proving disappointing, the easternmost claims were prospected in 1906 by diamond drill and a hole 410' deep passed into 50' of 4 to 10% oxidized copper ore near the Shattuck mine. This orebody being inaccessible from the Broken Promise shaft, the use of the Higgins tunnel was acquired and the ore opened up from the Bisbee side of the mountain. The tunnel was extended 310' to the Wolverine boundary and then southerly to intersect the orebody on the Wolverine ground. Orebody proved to be a replacement deposit of rich oxidized ore, lying within the limits of the Warren claim, about 2,700' from the tunnel portal. After working out the oxidized ore down to the Shattuck boundary, exploration upward was begun and a fine body of sulphide ore was developed in the footwall limestone above the oxidized zone.

In 1916 the sulphide copper ore was worked out in the east end of the Warren claim. The oxide zone is supplying ore at present. Exploration amounted to 1,844'. A tunnel to explore the Shattuck fault, which crosses the property, has been put in. During Sept., 1917, the tunnel through the Higgins mine opened 7% ore. New workings in the Broken Promise are producing 4½% ore.

The mine has been a small but steady shipper of high-grade ore to the Douglas smelter, this ore paying all working expenses and building up a small surplus. It formerly averaged about 10% copper, but the sulphide ore is of lower grade. The mine has about 3,000' of workings and its orebodies connect downward with great stopes in the Shattuck mine, the deposit being the top of one of the ore-shoots of that property. The mine is connected underground with the Uncle Sam mine of the Copper Queen Co., as well as with the workings of the Shattuck mine.

Equipment: includes a 250 h. p. steam plant, 2 single-drum hoists and a 6-drill air compressor, all at the Broken Promise shaft and all unused for several years.

Production: 2,524 tons, netting \$37,962 in 1910; 984 tons, netting \$11,873 in 1911; 762 tons, netting \$12,861 in 1912. The output for fiscal year ending Sept. 30, 1915, yielded \$130,370, or \$17.13 per ton. In 1915-16 the output was 1,193 tons, averaging \$23.96 per ton, equal to \$28,588.

The property is excellently handled.

BOUSE, YUMA COUNTY

ARGUS COPPER & GOLD MINING CO.

ARIZONA

Address: Planet, Ariz.

Officers: A. B. Jones, pres.; D. M. Jones, v. p.; A. B. Hardwick, sec.

Inc. in Arizona. Cap., \$2,000,000; shares \$1 par; 500,000 shares in treasury.

Property: 46 claims, 920 acres, adjoining the Planet mine at Planet, Yuma County, slightly developed and said to show several well-defined veins, carrying gold-copper ore, which will assay from \$5-\$20 gold and 10% copper per ton

BLACK GIANT MINES CO.**ARIZONA****Mine office:** Salome, Ariz.

Officers: P. J. Lyons, pres., Mobile, Ala.; D. W. Hall, v. pres.-mgr., Salome, Ariz.; C. R. Hall, sec.-treas.; preceding officers, G. S. Leatherbury, J. B. Davis and H. H. Smith, directors, all of Mobile, Ala.

Inc. April 3, 1917, in Ariz. **Cap.**, \$1,500,000; shares \$1 par; 750,000 shares outstanding. No bonds. Annual meeting, first Monday in January. Transfer office, Mobile, Ala.

Property: 11 claims, 220 acres, located in the Harcuvar Mountains, about 18 miles N. E. of Salome, in Cunningham Pass. Work was started, 1917, on a vertical shaft down 160', but planned to sink to 500'. Orebody reported to be from 25-100' long, nearly vertical, and running N. W.-S. E. It is a fissure, with iron gossan. Values are in copper and gold.

Equipment: 25 h. p. Fairbanks-Morse gasoline hoist and 2-drill Inge soll compressor. Work begun in 1916.

BLUE BELL MINING & REDUCTION CO.**ARIZONA**

Mine P. O.: Swansea, Yuma Co., Ariz. **W. P. Martin**, pres.; **E. T. Miner**, v. p. and supt.; **K. E. Newcomb**, sec.

Property: 23 claims, about 5 miles from Swansea, just across the Bill William's Fork River from the Swansea pumping plant.

Development: 200' two-compartment shaft and several hundred feet of tunnels, showing ore carrying up to 10% copper, with fair gold and silver values.

No recent returns.

BOWYER GOLD & COPPER CO.**ARIZONA**

Office: Quartzite, Ariz. **Mine office:** Bouse, Yuma Co., Ariz. **Jos. Bowyer**, pres.; **E. N. Jenkins**, v. p. and sec.; with **E. E. Northrop**, **E. B. White** and **Geo. Mee**, directors. Phoenix National Bank, treas.

Inc. July 15, 1909, in Ariz. **Cap.**, \$5,000,000; shares \$5 par, non-assessable. Annual meeting, first Monday after first Tuesday in July.

Property: 7 claims, known as the Bowyer group, also 160 acres miscellaneous lands, in the Plomosa district, on the western slope of the Dome Rock Mountains, about 20 miles west of Bouse. Property has 3 contact deposits, between schist hanging and limestone foot, showing 50 to 200' gossans and carrying malachite and chalcocite, estimated to average 2 to 10% copper and \$1 to \$10 gold per ton. Company has sunk a 50' shaft near the hanging wall, all in ore, and has reached the sulphide ore beneath the leached zone. Management plans development work and the installation of hoist and air drills in 1917.

CLARA CONS. GOLD & COPPER MNG. CO.**ARIZONA**

Declared bankrupt, Jan. 27, 1912. Reorganized as the Swansea Consolidated Gold & Copper Mining Co., receiving 1,500,000 shares of the total of 4,000,000 shares for the transfer of the property with its indebtedness and liabilities. A suit was filed against the Clara Consolidated in Oct., 1912, by George Mitchell, former president, for \$75,000, and by Mary Mitchell for ejectment from several mining claims valued at \$25,000 and the recovery of \$200 a month rental therefrom. At last accounts, this suit had not been settled. The Swansea Cons. is also bankrupt.

Property leased in 1916 to W. A. Clarke interests for 10 years.

COPPER CHIEF MINES CO.**ARIZONA**

Office: Wm. J. Coughlin, fiscal agent, 381 Main St., Bristol, Conn.

Mine address: Bouse, Ariz.

Officers: Richard Darling, pres. and treas.; Quartzite, Ariz.; Richard Darling, Jr., v. p.; B. A. Darling, sec.

Inc. 1910, in Ariz. **Cap.**, \$5,000,000; shares \$1 par; outstanding, \$3,000,000.

Property: 28 claims, patented, 560 acres, 20 miles S. W. of Bouse, shows schist and greenstone with a contact deposit dipping at 35° and containing copper and gold ore that assays 1.3% to 20% copper.

Developed by 2-compartment 304' vertical shaft, which has passed through greenstone into a replacement body of copper ore in limestone. Shaft will be continued to water level, as ore deposit is leached above it.

Examined by L. A. Dunham, E.M., in 1910, who reported that the remarkably favorable iron outcrops on all the claims of this company would probably be underlain by high-grade copper ore.

Equipment: includes a 25 h. p. gasoline hoist, a small compressor and 50 h. p. engine.

EXCELSIOR GOLD & COPPER CO.

ARIZONA

Gus Mudersbach, pres., Bouse, Yuma Co., Ariz.

Inc. Aug. 1, 1902, in Ariz. **Cap.**, \$2,000,000; \$1 par; stock owned by two Flagstaff men and the president. Is the successor of the Record Mines Co.

Property: the Mudersbach mine, with 31 claims, 8 miles S. of Bouse, on the main road to Quartzite, in the foothills of the Palomas Mountains. The property covers the strike of a mineralized contact metamorphic zone showing gossan of specular hematite, underlain by oxidized ores to shallow depth, succeeded by copper sulphides, an average sampling said to have given 4.5% copper.

Ore: occurs as bornite, chalcopyrite, pyrite and hematite in a garnet-epidote gangue; it is an irregular bunchy replacement, a few inches to a few feet thick, of limestone resting on schist and altered by quartz monzonite.

Development: by the 150' Excelsior shaft, with drifts at 50', 100' and 130', and the 200' Mammoth shaft, with 600' of drifts and crosscuts.

Equipment: includes two 15 h. p. gasoline hoists, a gas engine and air compressor. The mine is developing, with a small force.

Production: 48 tons of 12% ore shipped in 1916, and a carload of 4.25% copper ore with 50% iron and another of 6% ore. 1917 work consisted of a level at 50' depth of No. 2 shaft; sulphide ore has been cut in the 200' level of the No. 1 shaft.

GOLDZONA-SCOTCHMAN MINING CO.

ARIZONA

Address: Bouse, Yuma Co., Ariz.

Inc. by R. King, W. C. Miller, B. A. Kipp and others, of Los Angeles, Cal.

Property: 600 acres, on which \$100,000 has been spent. **Equipment:** gasoline hoist, compressor, drills, buildings.

GREATER AJO COPPER CO.

ARIZONA

Miami, Ariz. **Officers:** G. F. Senner, pres.; A. E. Soderman, v. p.; J. Considine, sec.-treas.; preceding, with A. B. Saling, R. L. Payne, E. Becher and B. S. Garcia, directors.

Cap., \$5,000,000.

Property: at Palomas, Yuma Co., Ariz.

The prospectus—if it can be called such—of this company is unique. It talks of nearly everything, the property receiving small space. One engineer predicts the Greater Ajo to be "The biggest mine in the State of Arizona."

INLAND COPPER CO.

ARIZONA

Idle. Letters to 1017 Commerce Bldg., Kansas City, Mo., and to the mine at Planet, Yuma Co., Ariz., unanswered. L. E. Corbin, pres.; A. W. Bork, v. p.; S. D. Dodson, sec.-treas.

Inc. in Arizona. **Cap.**, \$5,000,000; shares \$1 par; non-assessable.

Property: 40 claims, including 2 groups of about 15 claims each, in the Bill Williams range, near the Bill Williams Fork River, with a mill site, smelter site and water rights. The mine has 2 tunnels, and a 2-compartment shaft equipped with an 18 h. p. gasoline hoist. Company advertised for copper

ores, presumably to show its stockholders, since it had no reduction plant of its own. Is not regarded favorably.

MOHICAN COPPER CO.

ARIZONA

Office: 340 Wilcox Bldg., Los Angeles, Calif. Mine office: J. V. Allison, Bouse, Ariz.

Officers: W. C. Miller, pres.; B. A. Kipp, v. p.; Rol. King, sec.; with G. M. Swindell and A. Herrman, directors:

Inc. Mar., 1914. Cap., \$2,000,000; shares \$1 par; non-assessable; 1,000,000 issued.

Property: 30 claims, 9 patented, in Plomosa district, Yuma Co., Ariz., said to show copper sulphide ore.

Development: by shafts 32, 60, 110 and 500' deep, with total workings of 1,000'. New shaft to be sunk to 1,000' depth.

Equipment: includes hoist and compressor. Mill and 50-ton K. & K. flotation plant ordered, 1917.

MUDERSBACH MINE

ARIZONA

See Excelsior Gold & Copper Co.

NEW LA PAZ GOLD MINING CO.

ARIZONA

Office: 930 Merchants' National Bank Bldg., Los Angeles, Cal.

Officers: O. L. Grimsley, pres.; W. H. E. Bravender, v. p.; Leo Keller, sec.; G. A. Scroggs, treas., with Geo. Renwick and S. G. Marshutz, directors.

Inc. May 2, 1910, in Arizona. Cap., \$1,000,000; shares \$1 par; non-assessable; 933,282 issued. Operating expenses in 1916 were: \$12,291.

Property: 14 claims, 1,606 acres, in La Paz or Weaver district, Yuma Co., Ariz., 55 miles W. S. W. of Vicksburg, said to show a deposit of gold-bearing gravel 6 to 40' deep, lying on decomposed granite and porphyry. There are reported to be 5,300,000 cu. yds. of gravel, averaging \$2.15 per yard. Operations to be by hydraulicking, for which a 1,750,000 gal. storage dam and 12 in. pipe line from Colorado River are being constructed.

Property reported on by A. J. Condee, E. Shurley Wilson, A. B. Hall and E. A. Rasor. If \$2 per yard can be recovered, good profits should be made by this company.

NEW PLANET COPPER MINING CO.

ARIZONA

Office: 61 Broadway, New York.

Officers: Alex. Rae, pres.; Geo. S. Barton, v. p.; Herman Cook, sec.-treas., with Julius H. Susmann, S. S. Rosenstamm, Geo. Crompton and T. M. Lloyd, directors.

Inc. July 13, 1909, in Delaware. Cap., \$4,000,000; shares \$5 par; non-assessable; issued 842,905 shares. Is a reconstruction of the Planet Copper Mining Co., stock of which was retired by exchange for 240,000 shares of New Planet stock. Farmers' Loan & Trust Co., New York, registrar. Annual meeting, third Wednesday in June.

Property: the Planet mine, with 31 patented, 10 unpatented and 3 fraction claims, 800 acres, in the Harcuvar district, on the southern bank of the Bill Williams Fork River, 21½ miles from Bouse on the Santa Fe cutoff and about 6 miles from Swansea.

Geology: copper occurs mainly as oxidized ore, though nucleal particles of sulphides mixed with specular hematite are seen in the deeper workings. The orebodies are replacements in limestone, the ore bed developed at the Planet shaft lying on the contact between this rock and underlying gneiss. This deposit is 3 to 20' thick and dips 15° south. Much high-grade ore has been shipped from other parts of the property in past years; it was found as crusts, or shells, about impure hematite in limestone, especially near bodies of amphibolic rock now altered to black gneiss. A deep-seated mass of granite is the not improbable source of mineralization, although later igneous activity is

shown in a volcanic plug not far distant and in the basalt flows which cover the surrounding country. The geology is very fully discussed in U. S. G. S. Bull. 451, p. 47, written by Howland Bancroft.

The ore deposits show a heavy iron gossan, mainly of hematite, apparently of workable grade, and it has been estimated that the property shows about 500,000 tons of 60% iron ore. The main orebody developed in the Planet shaft is about 300' in width, has a thickness of 4' 3", and an average copper content of 5.9%, according to a report by A. H. Kellar.

Development: aside from open cut and tunnels, is mainly at the Planet shaft, an incline sunk on the ore bed at an average angle of 15° to a depth of 733'. There are drifts, crosscuts, etc., amounting to 2,500'. A vertical 350' shaft connects with these workings and gives ventilation.

The old workings include 8 tunnels, longest 225', and 12 vertical pits and shafts, of 25 to 325' depth. About \$150,000 was expended under the management of the General Development Co. in sinking the vertical shaft and putting down a number of churn-drill holes, 3 holes showing low-grade sulphide ore below the old workings.

The Planet mine is probably the oldest copper mine in Arizona. It was opened in 1864, worked in a small way until 1874, and reopened in 1884, when a 36" circular blast furnace was erected. The property was taken over, 1902, by the predecessor of the present company. The mine produced, 1864-74, upwards of \$500,000 worth of high-grade ore, ranging from 15 to 40% in copper, which was presumably shipped down the Colorado River to Guaymas, and thence to Swansea, for reduction.

Equipment: includes a 75 h. p. gasoline plant, with two hoists and a 5-drill air compressor. Buildings include a carpenter shop, smithy, 2 shaft houses and 3 dwellings.

Property considered as still unproven, churn drilling being too limited to determine existence, or non-existence, of large orebodies, and the greater part of the area is unexplored. Property leased to Northwestern Leasing & Development Co. from Oct. 1, 1915, to Oct. 1, 1918.

Lessees are shipping ore and paying royalty to the New Planet Co., which has been able to pay off its debts and now has over \$70,000 in treasury.

NORTHWESTERN LEASING & DEVELOPMENT CO. ARIZONA

Address: New Planet Copper Mining Co., 61 Broadway, New York.

Company has a 3-year lease on the New Planet copper mine (which see), to Oct. 1, 1918. Leasers agree to do 300 shifts per month and to pay royalty of 10 to 20% of the net smelter returns.

Is a close corporation, financed by Globe and Miami mine officials.

RECORD MINES CO.

ARIZONA

At one time operated the Mudersbach mine at Bouse, now owned by the Excelsior Gold and Copper Co., which see.

SHAMROCK MINING CO.

ARIZONA

Duncan, Yuma Co., Ariz. **Officers:** Robt. McEntee, pres.; Lawrence McEntee, v. p., with B. F. Barbour and G. N. Neal of Birmingham, Ala., directors.

Property: 840 acres, in the footslopes of the Plomosa range, Vicksburg district, Yuma Co.

Equipment: includes hoist, compressor, etc.

Production: made intermittently since 1913; has consisted of high-grade ore, running from \$800 to \$1,050 per carload.

SWANSEA CONS. GOLD & COPPER MINING CO.

ARIZONA

O. M. Souden, trustee, c/o U. S. Nat'l Bank, Los Angeles, Calif. Leased to Judge W. J. Thomas of Los Angeles, early in 1915; operated, 1916, by the Thomas Estate.

In May, 1917, W. A. Clark of Jerome secured a 10-year lease on the mine,

calling for a 1,000' shaft, 50% royalty on ore, to be not under \$5,000,000 in 10 years. Shipments were 30 cars per week in Sept., 1917.

Trustee's report for 4 months ended Feb. 23, 1917, showed a net cash balance of \$47,311, plus \$22,335 carried forward, making \$69,646. There were shipped 452 cars of ore, worth \$252,466.

In May, 1917, company was discharged from bankruptcy, and had \$80,000 on hand. There is still a bonded debt of \$1,000,000. Company has 3,000,000 shares outstanding.

Property: reported as 132 claims, 3,300 acres, about 10 miles from Planet, includes the Signal mine, erroneously called the Clara, and the Moro and Clara groups, at Swansea, Yuma Co., Ariz.

Geology: the Signal orebody is a replacement deposit formed in a limestone bed 15 to 100' thick, associated with overlying shales and amphibolitic schist and resting on granite gneiss, all of pre-Cambrian age. The outcrop is an irregular replacement, 30' wide, of copper-stained hematite, dipping at 52° N. This orebody extends 150' downward in the mine, is 20 to 30' wide, 90' long, and contains boulders of unreplaced limestone. The orebody is encased in soft chloritic schist derived from amphibolite and appears to rest on a strong fault plane that separates the granitic gneiss from the sedimentary series. Two parallel, smaller, but similar orebodies occur in the hanging wall of the deposit. The ore consists of soft, red hematite with manganese-oxide and chlorite, holding grains and nodules of chalcopyrite and pyrite. The ore as a whole averages perhaps 2.5% copper, though 4% ore is obtained for smelting by rough sorting. See U. S. G. S. Bull. 451, pp. 59-67.

Development: by 2 main shafts with extensive underground workings along the main fault or lode, and by stopes on 3 orebodies. The mine has 4 vertical and 2 inclined shafts. No. 1 shaft, 400' deep, vertical, has a 15 h. p. Fairbanks & Morse gasoline hoist, raising ore with a bucket. No. 2 shaft, 325' deep, is an incline, and has a 50 h. p. Western gasoline hoist, operating a 2-ton skip. No. 3 shaft, also inclined, is 200' deep. No. 4 shaft, the largest and deepest, 3 compartments, is 500' deep, with a hoist. No. 5 shaft, 373' deep, has a 75 h. p. steam hoist, and No. 6 shaft, 250' deep, has a 25 h. p. steam hoist. Some drilling done 1908, with a Keystone churn drill, showed another orebody.

Equipment: the power plant has two 250 h. p. boilers, a 300 k. w. d. c. Westinghouse motor, and a 150 k. w. belt-driven Ideal motor, latter operating pumps at the Bill Williams Fork River, supplying water to the mine and works through 3" and 6" pipe lines. Buildings include a machine shop, sawmill and other structures.

The smelter has a Mitchell water-jacket blast furnace of 750 tons rated daily capacity. A reverberatory furnace was partly completed when the mine closed down in 1913.

The power house has a 15,000 cu. ft. Nordberg air compressor, and a Connersville blower direct-connected to a Hamilton Corliss compound engine. Slags are handled by a Jeffrey electric locomotive. The smelter building is of structural steel. The converted department has 2 stands and 9 shells, rotated electrically, with a 40-ton electric crane, having 2 auxiliary hoists, and a silica mill, with electric motor, for linings.

The mines and works are connected with the Santa Fé, Prescott & Phoenix Railway by a 21-mile line, known as the Arizona & Swansea Railroad, operated, but not owned by the company. The property is an example of enthusiasm run wild, coupled with reckless stock selling and the foolish construction of surface works before the development of enough ore to keep them busy.

UNITED MINES COMPANY OF ARIZONA

ARIZONA

Address: Russ M. Hess, supt., Bouse, Ariz.

Officers: J. C. Denton, pres.; George D. Christy and L. M. Hart, v. p.'s;

A. G. Halm, treas.; E. A. Goodrich, sec., with H. E. Woods and Geo. Tisdale, directors.

Inc. May, 1916, in Ariz. **Cap.**, \$1,750,000; shares \$1 par; 900,000 in treasury.

Property: 30 claims, 600 acres near Bouse, Ariz., including former holdings of Little Butte Cons. Mines Co., the Arizona Pride and Bullion groups.

Geology: the holdings are in an extensive district of pre-Cambrian schists, quartzites and limestones, cut by intrusive granites and other igneous rocks, and covered by recent volcanic flows. The ore deposits of the country, though varied in nature, carry gold, silver or copper ores. The typical copper ores of the region contain specular red hematite, and the deposits worked at Planet, Mineral Hill and the Clara are largely replacements of limestone beds.

The **Little Butte** claims cover an area of sedimentary rocks running E. W. and dipping at 50°, including a 1,500' belt of brown limestone in part overlaid by an old rhyolite breccia. These rocks are faulted against a coarse granite, the fault being mineralized, though nearby, the limestone caps and covers the granite. The vein outcrop shows an interlacing network of quartz-hematite stringers forming a wide lode. The underground workings show irregular lenticular bunches of oxidized ore on and above the 120' level, and close to the granite hanging-wall, with 75' or so of altered andesite (rhyolite) between the lode and the limestone. Shipments of 388 tons yielded \$8,040, or \$20.72 per ton. The lode is in part leached below these residual masses of ore, and former development was stopped at 388', below which the richer ore probably lies. The association of chlorite, specularite and quartz indicates that the mineralization will extend downward to very considerable depth, and the ores will be chalcopyritic.

Development: a 700' incline shaft with 1,000' of levels at depths of 75, 120, 210 and 310'. Water was encountered at 200', but the lowest limit of oxidation has not yet been reached. The 120' level shows ore bunches for 600' along the drift. The 210' level shows mainly leached vein matter with occasional bunches of copper ore, but the leached material is said to average \$7 per ton for 200' along the drift. Similar conditions obtain at 300', but the best ore in the mine is said to have been found on this level. Crosscutting was under way at 650' depth in June, 1916.

The **Arizona Pride Group** claims cover part of the granite area in which gold-bearing quartz veins occur. Development includes 50' and 60' shafts, both showing ore.

The **Bullion Group** covers a sedimentary area, cut by intrusions of diorite and andesite, with veins following the intrusive contacts. A 205' shaft on one vein has not yet reached water level, the filling being leached.

Production: under former owners the Little Butte mine shipments produced 73,400 lbs. copper, the ore averaging \$7.60 per ton gold, 9.4% copper, 29% iron and 32.4% silica.

In April, 1917, property was examined by Henry C. Carr, who considered the gold-bearing vein of secondary consideration without a treatment plant. Copper ore will probably be found in commercial quantities at greater depth—predicted at 750'. Work is being done systematically.

The property has merit and warrants carefully planned development, as conditions promise extensive bodies of chalcopyrite ore in depth.

CASA GRANDE, PINAL COUNTY

ATLAS DEVELOPMENT CO.

ARIZONA

Office: 1025 People's Gas Bldg., Chicago, Ill. E. P. Ryan, supt., Casa Grande, Ariz.

Officers: Potter Palmer, Jr., pres.; H. L. Hollis, v. p.-managing director; E. F. Bryant, treas.; A. Hunter, sec.

Had an option on the Lake Shore mine, about 30 miles from Casa Grande, from Frank M. Leonard and associates for \$500,000, owners to retain a $\frac{1}{8}$ interest. A payment due July 15, 1917, not being made, the mine reverted to owners in August, and present status of company is unknown. Company shipped about \$50,000 worth of $5\frac{1}{2}\%$ ore from Jan. 1-July 15, 1917.

BROWNELL-ARIZONA MINING & SMELTING CO. ARIZONA
Mine office: Casa Grande, Pinal Co., Ariz.

Property: formerly held by Producer Mining & Smelting Co., is supposed to include the Jack Rabbit mine, 80 acres, in Pinal Co., together with the Producer and Century-Chief group of 320 acres, and Index group of 220 acres, in Pima county, all in the Quijotoa Mountains. Company sold stock, 1910, on the strength of a clever brochure, written by Alfred Henry Lewis, the talented writer, whose statements are not hampered by a knowledge of copper mining. Company not favorably regarded.

COBRITA MINES CO. ARIZONA
 Salome, Ariz. Inc. 1916.

Property: the Cobrita group of 14 claims, at Salome. Has 900' tunnel and 200' shaft, with good copper-gold ore in tunnel.

KEYSTONE DEVELOPMENT CO. ARIZONA
 Operating the Isabella mine, 20 miles from Casa Grande, Pinal Co., Ariz., at last accounts. Reported to have some 7% copper ore.

LAKE SHORE MINE ARIZONA
Address: Frank M. Leonard, mgr., 312 E. 2nd St., Tucson, Ariz. **Mine address:** Casa Grande.

Property: 35 claims, 3 patented, 50 miles W. of Tucson and 35 miles S. of Casa Grande, carries a contact deposit in granite and andesite. The ore channel runs N.-S. and dips 45°. Over one million tons of 3% ore being developed above water level.

Development: by 285' vertical shaft bottomed in copper sulphide ore, Property has been examined and reported on by Frank W. Royer, A. J. Waters and Thos. H. Leggat. Property promising, but being 30 miles from a railroad, must develop reserves big enough to warrant building one.

Mine was optioned to Atlas Dev. Co., but option was forfeited Aug., 1917.

CHLORIDE, MOHAVE COUNTY

ARIZONA BASE ORES MINING & MILLING CO. ARIZONA
Address: c/o C. R. Harris, Kingman, Ariz.

Inc. 1917, in Ariz. **Cap.,** \$100,000; shares 10 cts. par.

Property: in the Wallapai Mtns., is to be developed in 1917, shaft sunk to 200', and compressor installed.

ARIZONA BUTTE MINES CO. ARIZONA
Office: Kingman, Ariz. H. M. Crowther, pres. and mgr.

Inc. Feb., 1916, in Arizona. **Cap.,** \$150,000; shares 10 c par.

Property: 27 claims, 17 patented, 250 acres; includes the Banner mine and 5 other one-time producers, 10 miles south of Chloride. Development by 2,300' Banner tunnel, which is being driven 7,500'. The De la Fontaine mine in the Chloride district is opened to depth of 400' by incline shaft.

Ore: mainly silver-lead, occurs in 8' vein said to average \$15 per ton.

Equipment: 200-ton mill, reported to make a saving of from 75-95%, at an average milling cost of 65c per ton. 40 men employed.

Production: totaled \$350,000 to end of 1916.

ARIZONA CHLORIDE MINING CO.**ARIZONA**

Officers: John B. Hughes, pres. and treas.; Edw. B. Hughes, v. p.; I. M. Thompson, sec.; F. W. Jacques, supt.

Inc. in Arizona. Cap., \$200,000.

Property: 138 acres, in the Wallapai district, near Chloride, Mohave Co., Ariz. The Windy Point mine is developed by a 145' shaft in gneiss. Ore is mainly pyrite, arsenopyrite and chalcopyrite, occurring in a fissure vein, 2-4' wide, with strike N. 42° W. and dip 77° N. E., said to run 3 oz. gold, 486 oz. silver and 21.5% copper p. t. The Bobby Burns group of 7 claims in the same district, acquired in February, 1917, is developed to depth of 250' by tunnels said to have proved copper ore of commercial value. Sinking new shaft.

Production: totaled \$300,000 to end of 1916.

ARIZONA COPPERFIELDS, INC.**ARIZONA**

Office: Care Wm. B. Ridgely, pres., 40 Exchange Place, New York City; R. W. Gnekow, sec.; Geo. Z. Médalie, v. p.

Is holding company for Copperfield Porphyry Copper Mining Co.

Address: Kingman, Ariz. J. J. Beeson, geologist.

Inc. 1916, in Del. Cap., \$5,000,000; share \$1 par; 3,000,000 issued.

Property: about 200 acres, 4 miles from Chloride in Wallapai mining district, Mohave Co., Ariz., 22 miles north of Kingman. Ground covers high bluffs, called Ithaca and Goat Peaks, of old turquoise mines, which were drilled some years ago and very low-grade copper ore found. Copperfield group covers lower slopes where waters leaching bluffs would gather. Surface for 1,000' across said to show copper stain.

Development: by 200' shallow tunnel, reported to show 2% copper, both as native and sulphide, and 3 shallow (50') churn drill holes. Property is not a new discovery, and the 4-drill-holes used to "indicate" tonnage showed values too low to be of commercial interest. Control of the Copperfield Porphyry company was acquired July, 1916, by the Arizona Copperfields, Inc., which took over more than 89% of the capital stock. Was a promotion of George Graham Rice, New York.

In 1917 work comprised necessary amount for assessment requirements, mostly by 2 crosscuts at bottom of 58' shaft on Oakland No. 1 claim. This work showed the rock to carry 1.2% copper, according to the company's report.

Property evidently contains an undetermined amount of low grade copper bearing material. Actual legal ownership apparently still held by Copperfield Porphyry.

BULLION HILL MINES CO.**ARIZONA**

Controlled by Knight Investment Co., Provo, Utah.

Mine at Chloride, Ariz.

Officers: J. Knight, pres., Provo, Utah; A. M. McDonald, v. p., Eureka, Utah; W. L. Mangum, sec.-treas., with J. W. Knight and M. C. Godbe, directors; H. M. Eakin, supt.

Cap., 1,000,000 shares, par value 10c; all issued. Annual meeting 2nd Wednesday in February.

Property: 4 claims, near the Tennessee mine. One old shaft on property is being re-timbered. Property is in prospective state.

CERBAT SILVER MINES CO.**ARIZONA**

Office: Kingman, Ariz.

Officers: M. S. McEniry, pres.; E. W. Hokom, sec.-treas., with W. L. Hokom and J. M. Sheridan, directors.

Property: the old Imperial and White Elephant claims in the Wallapai mining district, 12 miles from Kingman and 3½ from Cerbat, Ariz.

Development: White Elephant claim has a 285' shaft. The Imperial claim is being developed on the 125' level, using a 15 h. p. hoist.

Company organized to lease property with option privilege.

Production: the White Elephant has yielded \$100,000.

CHARCOAL CANYON MINING CO.

ARIZONA

Address: J. P. Ryan, pres.-sec., Chloride, Ariz.

Property: 5 claims, near Cerbat, 9 miles S. of Chloride, Mohave Co., Ariz.

Development: by open cut that exposed ore 50' wide and 200' long. Thirty tons of this yielded \$27 gold per ton. Exploratory work is underway.

CHLORIDE MINING CO.

ARIZONA

Address: F. C. Smith, mgr., Chloride, Ariz.

Officers: J. C. Callaghan, pres.; C. R. Bone, sec.; G. A. MacDonald, treas.; all of Phoenix, Ariz.

Property: the Hidden Treasure group of 8 claims, 2½ miles S. of Chloride, Mohave Co., Ariz. Country rock is granite, traversed by 3 parallel veins, said to be traceable for 3,000'. The most northerly pair include a parallel dike of rhyolite. A fourth vein parallels the S. vein for 1,000' then junctions with it. The whole formation is 100' wide. Ore carries pyrite, with silver-gold values, and galena and blende.

Development: by 500' crosscut tunnel.

CHLORIDE QUEEN MINING CO.

ARIZONA

Office: Phoenix, Ariz. J. C. Wilson, supt., Chloride.

Officers: C. C. Thompson, pres.; R. C. Sanfley, v. p.; R. A. Jarret, sec.; W. S. Goldworthy, treas.; all of Phoenix, Ariz.

Property: 5 claims and 2 fractions, better known as Sunday School and Silver Mtn. groups, near Chloride.

Developed by 6 shallow shafts and 220' tunnel.

CHLORIDE SAMOA MINES CO.

ARIZONA

Office: 715 Higgins Bldg., Los Angeles, Cal. **Mine office:** Kingman, Mohave Co., Ariz.

Officers: L. Hoffman, pres.; A. B. Seelye, v. p.; J. H. Hoffman, sec.-treas., with C. Hoffman and R. Mangold, directors.

Inc. Feb. 26, 1917, in Arizona. Cap., \$1,500,000; shares \$1 par; non-assessable; 1,019,050 issued.

Property: the Samoa mine, formerly owned by Chloride Gold Mining Co., consists of 6 claims, 1 patented, 125 acres, in Wallapai district, 3½ miles E. of Chloride, Ariz., said to show vertical quartz vein in granite, 8 to 36" wide and 400' long. Ore is a sulphide said to carry gold, silver, lead and iron worth \$40 per ton. Lead content is given as 8% and iron 24%.

Development: by 300' shaft and 3,500' of workings. Crosscut tunnel being driven 1,664' to open deposit to depth of 710'. Six veins are expected to be cut, all widening in depth, according to a cross section published.

Equipment: 15 h. p. Witte hoist and 2 compressors.

Production: 96 carloads of ore in 1903-1908, the last of 30 tons assaying 1.2 oz. gold, 11.5 oz. silver, 3% lead, worth \$28.79 per ton. Total yield about \$250,000.

Prospectus states that the 6 parallel fissures are substantially identical in character with the Granite Mountain mine of Montana, and that there is proven calculative ore estimated at \$5,000,000, which is interesting if true.

CHLORIDE X-RAY MINING CO.

ARIZONA

Main office: 33 N. First Ave., Phoenix, Ariz. **Mine at Chloride, Ariz.**

Officers: T. A. Barker, pres.; S. Chittick, v. p.; A. W. Galpin, sec.; W. H. Mann, treas.; J. Spargo, mine mgr.

Inc. in Arizona. **Cap.**, 1,500,000 shares, par \$1, issued 700,000 fully paid non-assessable; no bonds.

Property: Hillside group of 6 claims, in the Chloride district near base of Rainbow Mountain. Developed by a tunnel 643' long in May, 1917, reported to have 400' of vein 3½' wide carrying \$30 per ton. Tunnel is being driven to intercept the X-Ray vein. Property is a prospect that is to be listed on N. Y. Curb and which company says "will thus give our stock-holders a chance to realize speculative profits."

C. O. D. MINING CO.

ARIZONA

Merged 1917 with Rico Consolidated Co. **Address:** R. M. Wilde, Kingman, Ariz.

Property: idle for several years and credited with a production of \$1,300,000, was reopened 1917. Mine has 400' shaft and two others, 150' deep.

COPPER FAME MINING CO.

ARIZONA

Address: P. O. Box 692, Kingman, Ariz.

Officers: S. E. Barron, pres.-treas.; R. L. Gray, v. p.; E. L. Betsworth, sec.; above with F. L. Rogers and C. W. Herndon, directors.

Inc. 1917 in Ariz. **Cap.**, \$1,500,000; shares \$1 par; 250,000 shares offered the public at 10c to raise funds for development and equipment. Company paid 700,000 shares of stock to the Gold Cliff Exploration Co. for its property.

Property: 10 claims, 153 acres, in the Cerbat range, Wallapai mining district, Mohave Co., Ariz., 16 miles N. of Kingman. Claims adjoin the Union Basin Mining Co. property and show quartz bearing fissure veins in igneous rocks, with ore in shoots.

Development: by many shallow shafts, deepest 60', and a 110' tunnel with 15' crosscut. All openings reported to expose ore, assays being given as \$4 to \$20 gold, 10 to 20 oz. silver, 3 to 30% zinc and 5 to 23% copper, higher values undoubtedly from picked samples.

COPPERFIELD PORPHYRY COPPER MINING CO.

ARIZONA

Controlled by the Arizona Copperfields, Inc., which see.

Idle. **Address:** 40 Exchange Place, New York City.

Cap., \$1,000,000; shares \$1 par; 500,000 in treasury; 100,000 offered at 25c.

Property: 200 acres, in Grand, Wash, Mineral Park section, Wallapai mining district, Mohave Co., Ariz., about 4 miles from Chloride and 22 miles north of Kingman. Ground covers high bluffs, called Ithaca and Goat Peaks, of old turquoise mines, which were drilled some years ago and very low-grade copper ore found. Copperfield group covers lower slopes where waters leaching bluffs would gather. Surface for 1,000' across said to show copper stain.

Development: by 200' shallow tunnel, reported to show 2% copper, both as native and sulphide, and 3 churn drill holes. Property is not a new discovery, and the 4-drill holes used to "indicate" tonnage showed values too low to be of commercial interest. Control of the company was acquired July, 1916, by the Arizona Copperfields, Inc., a promotion of George Graham Rice, which took over more than 89% of the capital stock.

DISTAFF CHLORIDE MINING CO.

ARIZONA

Address: J. R. Evans, Chloride, Ariz.

Officers: J. R. Evans, pres.; D. L. Parham, v. p.; B. W. Evans, sec.-treas.

Inc. 1916 in Arizona.

Property: 4 claims, 70 acres in Chloride district, Mohave Co., Ariz.

Ore carries silver, with some gold and lead. Work resumed in October, 1916.

Development: by 285' shaft with 5 levels. All work on the Distaff vein up to 1917 had been done by lessees.

Equipment: includes 25 h. p. gas. engine, compressor, etc.

Production: totaled \$200,000 to end of 1916.

ELKHART MINES CO.

ARIZONA

Address: Chloride, Ariz.

Property: 8 claims, 3 fractions and millsite, in Chloride district, Mohave Co., Ariz. In November, 1916, was taken over by R. E. Whitcomb and others of San Francisco. Ore is said to be rich and similar in character to that of the Tennessee.

Development: by 1,000' shaft. Mine has yielded ore from surface to 500' level.

Equipment: includes 150-ton mill, employing flotation.

Production: totaled \$1,150,000 to end of 1916.

EMERALD ISLE COPPER CO.

ARIZONA

Address: Robt. Jacobson, cons. engr., Chloride, Ariz.; A. J. Brawly and C. W. Gould of St. Paul, directors.

Operating about 3 miles S. of Chloride. Reserves said to be 200,000 tons of 2.85% copper ore.

Equipped with 70-ton experimental leaching plant and crusher, producing 2,300 lbs. electrolytic copper daily (Aug., 1917). Mine has electric power, compressor, etc.

EMERSON MINE

ARIZONA

Address: E. M. Bind, mgr., Chloride, Ariz.

Property: 6 claims, 5 patented, in Chloride district, Mohave Co., Ariz., has an 18" vein said to carry 19% copper, 3 oz. silver and \$2.80 gold per ton.

Development: by 175' shaft and 3 tunnels, 100 to 142' long, also 108' winze below one tunnel. Reopening was started in December, 1916. Ore carries gold and a little silver. In April, 1917, 18" of rich copper-silver ore had been opened at 200'.

Equipment: 80 h. p. gas. engine, 6-drill compressor, etc. Shipments were started last Spring.

ENTERPRISE MG., REDUCTION & IMPROVEMENT CO.

ARIZONA

Kingman, Mohave Co., Ariz. Maj. W. A. Mensch, pres. and gen. mgr., 1729 29th St., San Diego, Cal.

Property and equipment reported sold at sheriff's sale for a debt of \$2,169 in 1914. Described Vol. XI, Copper Handbook.

FRISCO GOLD MINES CO.

ARIZONA

Office: Jas. A. Roberts, sec., 257 Broadway, New York City; Ray L. Dimmick, mine supt., Kingman, Ariz.

Officers: C. S. Merrill, pres.; Chas. A. Lindsley, v. p., with P. G. Bartlett, directors.

Inc. 1913 in Maine. **Cap.**, 3,000,000 shares; 2,920,000 issued.

Property: shows gold-silver ore in veins in rhyolite. Closed down 1916-17.

GENERAL METALS CO.

ARIZONA

Address: G. W. Peer, mgr., Chloride, Ariz.

Officers: G. W. Peer, pres.; R. M. Martin, v. p.; B. M. Brown, sec.

Property: the Copper Age group of 7 claims, 2 miles S. E. of Chloride, Mohave Co., Ariz.

Control of this company is held by the Arizona Ore Reduction Co. of Chloride, which also controls the Immediate Ore Reduction Process, which

intended late in 1916 to erect 6 or 8 custom plants in Arizona, using the "Immediate" process.

Development: by shafts, 20 to 250' deep; a main 500' shaft and over 2,000' of workings. Considerable copper ore is said to have been opened.

Equipment: includes 150 ton "Immediate" plant.

GEORGIA MINING CO.

ARIZONA

Head office: 210 Judge Bldg., Salt Lake City, Utah. **Mine office:** Chloride, Arizona.

Cap., 1,000,000 shares, 10c par.

Officers: A. O. Jacobson, pres.; A. H. Godbe, v. p.; John Pingree, treas.; E. H. Matson, sec.; above with H. M. Eakin, supt., F. W. Price, L. R. Eccles, G. S. Holmes, G. S. Holmes, Jr. and P. O. Perkins, directors; W. T. Beardsley, asst. sec.

Property: 2 claims between the Tennessee and Payroll mines, both large producers. Ore carries zinc, lead, copper and gold values.

Development: main shaft down 300'. Good ore was cut at 100' and 200'.

Equipment: gasoline engine, hoist, compressor and machine-drills. Employs 14 men. Considered promising.

GLADSTONE UNITED METALS CO.

ARIZONA

Address: Phoenix, Ariz. F. C. Smith, supt., Chloride, Ariz.

Officers: F. C. Smith, pres.; W. B. Twitchell, v. p.; W. T. Smith, sec.-treas.

Inc. 1916 in Arizona. **Cap.,** 150,000 shares, \$1 par.

Property: 7 claims, 3 miles east of Chloride, Mohave Co., Ariz. Idle several years. Claims show igneous rocks, which at surface show much alteration and subsequent mineralization. Rhyolite dikes run into one main dike, in which are the veins. The Gladstone vein 15' thick with 6' of quartz ore on hanging wall side, and altered prophyry between this and narrow foot-wall quartz streak.

Development: by shaft 140' deep, drift, and tunnel. Said to show a strong vein at 120', assaying \$35 per ton in gold, silver, zinc, copper and lead. Surface showings on Gladstone and Longfellow claims regarded as good.

Equipment: hoist, blacksmith-shop, bunk-house.

Work will be continued on the main vein. A mill is contemplated.

GOLCONDA CONSOLIDATED

ARIZONA

A. W. Clapp, mgr., Golconda, Ariz.

Inc. Dec., 1915, in Ariz. **Cap.,** \$1,250,000; \$1 par.

Has a lease and bond on the Fredonia and Fredonia No. 2 lode claims, owned by the Ryan Cattle Co., and situated N. of Kingman, in the Wallapai mining district. Company is promoted by a Mr. Wills and was chiefly advertised as a neighbor of Mr. Amster's Golconda mine.

GOLCONDA EXTENSION MINING CO.

ARIZONA

Idle. Address: O. D. M. Gaddis, Kingman, Ariz.

Officers: J. E. Perry, pres.; C. Metcalfe, sec.-treas.; O. D. M. Gaddis, directors.

Cap., 1,000,000 shares, all issued, 85% held by Messrs. Gaddis and Perry.

Property: 19 claims, 3 patented, adjoining the Golconda mine on the N., 16 miles N. of Kingman. A number of mineralized veins run through property.

Development: by main shaft, down 354', and considerable openings. Lessees extracted 2,500 tons of \$80 ore. At 280' there is said to be 4' of gold-silver ore.

Production: totaled \$500,000 to end of 1916.

Regarded as promising but needs development.

GOLCONDA MINE**ARIZONA**

See Union Basin Mining Co.

GOLD BACK MINING CO.**ARIZONA**

Address: Edw. Copley, mgr., Chloride, Ariz.; S. S. Wold, pres., Pasadena, Cal.

Property: 2 claims owned and 2 under option, 2 miles south of Mohave Co., Ariz., showing fissure vein carrying complex, gold-silver-lead-copper-zinc ore. Development on 150' level said to show 7' of ore assaying \$5 gold and silver, \$20 lead, \$15 copper, and \$9 zinc (June, 1917).

Larger hoist and compressor to be installed.

GRAND GULCH MINING CO.**ARIZONA**

Office: 503 McIntyre Bldg., Salt Lake City, Utah.

Officers: Wm. H. McIntyre, pres.; Frank R. Snow, v. p.; W. P. Jennings, sec.-treas.; preceding officers, Jas. E. Jennings, W. Little, Jos. A. Jennings, directors; W. P. Jennings, mgr.; S. R. Calloway, supt. St. Thomas, Clark Co., Nev.

Inc. Sept. 15, 1874, in Utah. **Cap.**, \$30,000; shares 10c par; issued 240,000.

Dividends: total \$47,935 to June, 1917. Annual meeting, first Monday in February.

Property: 9 claims, 1 patented, 180 acres, in the Bentley district of Mohave county, Ariz., but more easily accessible from Nevada than from southern or central Arizona, owing to the barrier to access presented by the Grand cañon of the Colorado river. Property shows sandstone and limestone carrying an apparently circular zone of copper impregnations, also having copper in the bedding planes. Ores occur as cuprite, melanconite, malachite, azurite and chalcocite, estimated by management to assay 35% copper and 4 oz. silver per ton.

Development: by a 500' shaft. Mine is 45 miles from St. Thomas, Nev., railroad terminal on the Salt Lake Route. The mine has been in practically continuous operation since 1899.

Equipment: includes a 22 h. p. gasoline hoist, good for 800' depth, and a 2-drill air compressor. There are 9 buildings and a small and antiquated smelter, of no present value.

Production: in 1916 amounted to 3,277 tons of ore containing 10 to 39% copper. To June, 1917, 339 tons of 15% ore were shipped. Employs 70 men.

GRANITE POINT SILVER-LEAD MNG. DEV. CO.**ARIZONA**

Operating an old-time silver-lead mine in the Wallapai range, Mohave Co., Ariz., near the Leviathan molybdenum mine. Property is being reopened by E. Hausman and W. D. Kinsey, of Jerome, Ariz.

Development: by 300' tunnel which is to be driven 1,800'. Average sample of the main ledge is reported to assay \$16.40 in gold-silver-lead.

HACKBERRY CONSOLIDATED MINING CO.**ARIZONA**

Address: Hackberry, Ariz.

Officers: G. S. Holmes, pres.; Chas. E. Green, sec.; Wm. Neagle, supt.

Inc. March, 1917. **Cap.**, \$1,000,000; shares \$1 par. Took over the old Hackberry mine, located in 1874 by W. B. Ridenour, in the Peacock district, 26 miles N. W. of Kingman, Ariz.

The mine is credited with a production of \$2,000,000 in high-grade silver ore. In the early days a 500' incline shaft, giving a vertical depth of 360, was sunk on the vein. At this depth water stopped operations, but not before all ore above water level had been stoped out. Ore is said to have occurred in a 2½' vein. In later years a vertical shaft was sunk to the water level, a small amount of exploratory work done and the mine allowed to fill with water. In July, 1917, drifting was reported to have disclosed a

9' body of ore averaging \$60 a ton. Management plans to build a mill. Hoist and compressor have been installed and mine unwatered.

Shipping to Needles and Selby smelters, 1917.

HOLMES MIDNIGHT MINES CO.

ARIZONA

Reported sold in 1916 to G. H. Holmes, Salt Lake City, Utah, for \$250,000 and transferred to company; 85% of stock held by Mr. Holmes and by Jim Murray of Butte, Mont.

Property: 6 claims, 1½ miles S. of Chloride, Mohave Co., Ariz., said to have 25,000 tons of gold-copper ore developed above 300' level. Ore-body on 100' level, 56' thick, averages 10% zinc and \$7 gold.

Equipment: includes 10-stamp mill and concentrator, with hoist good for 1,000'.

Production: totaled \$100,000 to end of 1916.

HUGHES ARIZONA COPPER CO.

ARIZONA

Office: Continental Sec. & Inv. Co., 607 McIntyre Bldg., Salt Lake City, Utah. John B. Hughes, pres., Chloride, Ariz.

Inc. 1916.

Property: 5 claims known as the Copperhill and Alma mines, 2½ miles S. E. of Chloride, Ariz. Also has a 2-year lease on the Bay State mine of the Arizona-Bay State Co., providing for a 15% royalty on all ore extracted. Veins are well defined, 10' to 20' wide and traceable 3,000' across claims.

Development: by 500' tunnel said to be driven on the vein, and for about half this distance, in ore. A shaft has been started and was 100' deep, May, 1917.

Lessees working on the Bay State claim that the ore carries antimony besides copper, silver, lead and zinc values.

JEMISON MINES CO.

ARIZONA

Head office: Wallace, Idaho. **Mine office:** Chloride, Ariz.

Officers: G. W. Kays, pres.; Henry Kehoe, v. p.; Charles McKinnis, sec.-treas. and gen. mgr., with C. G. Crook and J. P. Smith, directors.

Inc. 1917 in Arizona. **Cap.**, \$1,500,000; shares \$1 par; non-assessable.

Property: 4 claims and fractions, 17 miles N. of Kingman, in the Wallapai district, Mohave Co., Ariz., ½ mile from the well-known Golconda mine at Chloride.

Development: main tunnel 500' long, being extended E. 350' to connect with old workings above. Ore-shoot has been proven continuous for 300' and is from 3 to 7' wide, with \$25 to \$48 per ton in gold, silver and copper values. A shoot carrying arsenopyrite on the foot-wall contains as high as 10 oz. gold per ton. Near this shoot a shaft is being sunk in ore from the main tunnel, hand-sorted ore paying half the expenses.

Equipment: 25 h. p. Fairbanks-Morse hoist, 5-drill compressor, pump, houses, etc.

One of the promising prospects of this district.

JUNO MINE

ARIZONA

Address: Wm. Miller or Mrs. Sophy Loy, Long Beach, Calif.

Property: one of the earliest locations in the Chloride district, Mohave Co.

Development: by 570' shaft and 2,000' opencut. **Production:** totaled \$500,000 to end of 1916.

Stated late in 1916 that mine was to be taken over by Eastern capital.

KEYSTONE CONSOLIDATED MINING CO.

ARIZONA

Address: Chloride, Ariz.

Officers: G. S. Holmes, pres.; W. O. Kay, v. p.; T. H. Fitzgerald, sec.; John Pingree, treas., with C. G. Greene, directors; F. W. Sherman, mgr.

Property: the Keystone mine, 4 claims, in Mineral Park, Cerbat Range, formerly owned by Ross D. McCausland of Kingman.

Ore: silver-zinc-copper bearing, containing 2 to 4% copper, 12 to 24% zinc and over 30 oz. silver per ton, as sampled from dumps. Past production said to be \$150,000.

Development: shaft 300' deep, with three levels. Vein has been opened for 750'.

Equipment: includes a 250-ton mill using the Fields process, which was started in May, 1917, but proved a failure. In July re-modeling was started, installing another flotation system and accessories to treat dump ore and if successful, mine will be re-opened.

Probably a fair mine, but had a wrongly-designed plant rushed up before it was needed. Company was consolidated with the Silver Keystone Co., in 1917.

Production: totaled \$150,000 to end of 1916.

LA ANOZIRA GOLD MINING CO.

ARIZONA

Office: 248 Colorado Bldg., Denver.

Officers: Walter C. Williams, pres.; Thos. B. Everett, v. p. and engr.; J. C. McDowell, sec. and mgr.

Inc. Oct. 27, 1914, in Ariz. **Cap.**, \$1,000,000; shares \$1 par; non-assessable.

Property: 2 claims in the Cerbat Mtns., Mohave county, about 12 miles from Kingman, said to carry a 4' vein of free gold, running from \$6 to \$80 per ton. In a stock selling campaign to raise funds for a mill, the president stated, Dec. 14, 1914: "The mine is developed by 640' of tunnels, 230' of shafts, all in ore. Shafts have been sunk to connect tunnels with surface and, in fact, a mine is fully proven by the thousands of dollars of work done. The property has been thus developed and is now ready for a mill."

In Oct., 1915, the public was notified that, "Our mines are well located; producing properties all around us. We have large development, large tonnage of high-class ore, and everything at hand for grand success, only awaiting the time when we have our 50-ton mill (which is ordered) paid for. Our directors will not incur debts. We go on the policy of 'Safety First.' We have not much money to raise to pay for this mill and get it installed. This should attract the attention of investors because this company agrees to return your full invested money within one year from date of certificate and you to retain the stock. The physical value of the property is such that the company feels justified in making this liberal offer. The lowest estimated earnings will return all the stockholders' money as promised, with a large dividend in addition." To date, Sept., 1917, no further report of development, mill or profits has reached us.

The above is enough to warn the wary investor.

LEVIATHAN MINES CO.

ARIZONA

Office: 1508 Pioneer Bldg., St. Paul, Minn. **Mine office:** Yucca, Ariz.

Officers: Theo. Hollister, pres.; A. J. Brawley, v. p.; G. H. Prudden, sec.-treas., with A. A. Nystrom, Ola Hakason, C. E. Bernhardt and W. C. Gould, directors; I. C. Stricker, supt.

Inc. Oct. 14, 1914, in Ariz. **Cap.**, \$1,000,000; shares \$1 par; 759,402 shares issued. Annual meeting first Tuesday in Dec.

Property: the Whale & Copper Canyon mines, 7 claims, about 120 acres, in the Copper canyon, Cedar mining district, Mohave Co., Ariz., shows copper-molybdenite-silver-lead ore in 2 quartz veins traversing an altered granite. The main orebody said to be 7' wide and proven for 3,000' in length, runs N. 8° E. and dips 80° E. Ore said to average 2-4.5% molybdenum, 2-3% copper, 2-6 oz. silver, 60c-\$1 gold. Vein reported to be 14' wide at 100' level.

Development: 115' shaft and 2 tunnels 60' and 400' long with 200' and 400' drifts. Shaft being sunk to 250' level.

Ore reserves: estimated at 40,000 tons averaging 2-4% molybdenum and 2½% copper.

Equipment: includes 100 h. p. and 50 h. p. oil engines, with complete concentrating plant of 50-70 tons daily capacity.

LOS ANGELES GEM CO.

ARIZONA

Office: Los Angeles, Cal. **Mine office:** Kingman, Mohave Co., Ariz. E. E. Peck, pres. and gen. mgr. C. W. Morrell, sec.-treas.

Property: includes a variscite mine in Esmeralda Co., Nev., but the principal property is the George Washington group of 6 claims in Mineral Park, near Kingman. This property carries a vein of 18 to 24" width, developed by a 143' upper tunnel and a 370' lower tunnel, said to show ore assaying up to 4% copper, 200 oz. silver and \$4 gold per ton. The company mined turquoise from the claims for some years, before developing copper.

Equipment: includes gasoline hoist.

MERRIMAC MINE

ARIZONA

Owned by Geo. Cleland of Philadelphia, Pa., but bonded to J. C. Rankin in June, 1917.

Property: a mile west of Chloride, is developed by 400' incline shaft and new shaft sunk in 1917. The vein is said to be 22' wide, and cuts through porphyry and diorite. Ore carries gold, silver, lead and zinc.

Production: totaled \$175,000 to end of 1916.

MIDDLE GOLCONDA MINES CO.

ARIZONA

Address: Golconda, Ariz.

Officers: John Mulligan, pres.; J. E. Suits, v. p.; J. B. Speed, sec.-treas.; C. B. Bell, gen. mgr., with J. Winchester, directors.

Inc. in Arizona. Cap., \$1,000,000; shares \$1 par; 660,385 issued.

Property: 4 claims, fractional, adjoining Golconda mine on N. and crossed by Golconda vein, 3 to 10' wide.

Geology: zinc ore, with small amount of lead, occurs in shoots, or expansions of the vein, 6 to 20' wide.

Development: by tunnels, upper one showing good ore, and lower one mill ore only. Silver ore reported opened in upper level in July, 1917.

Intermittent shipments of high-grade ore being made. Property lacks water and camp-site. Funds needed for development. Erection of a mill contemplated in August, 1917.

MINNESOTA-CONNOR MINING & MILLING CO.

ARIZONA

Address: P. S. Virgin, mgr., Chloride, Ariz.

Officers: H. B. Hanford, pres.; J. T. Jackson, v. p.; J. S. Freemann, sec.; J. O. Kerbaugh, treas.; the first three at Philadelphia, Pa.

Property: 13 claims, 1½ miles S. of Chloride, Mohave Co., Ariz., said to carry the outcrops of 17 distinct veins.

Development: by 725' vertical steel-lined shaft, also 4 inclines from 100 to 530' deep. At 600' depth the main vein is 15 to 25' wide, but of low grade. At 700' it is 38' wide, also poor. West of the shaft is a 20' vein, the Pluto, which is expected to join with the Minnesota below 700'.

Equipment: three 100 h. p. boilers, 75 h. p. hoist, 900 cu. ft. compressor, lighting plant, mill engine and 150-ton concentrator.

Production: totaled \$1,150,000 to end of 1916. Work was suspended late in 1916 for want of funds.

MOLLY GIBSON-CHLORIDE MINES CO.

ARIZONA

Address: W. J. Sims, Chloride, Ariz.

Property: 3 claims, 1,000', S. W. of the Tennessee mine, Chloride

district, Mohave Co., Ariz. Ore carries silver and lead, with some gold and copper as far as opened to 200' depth.

Production: totaled \$100,000 to 1916.

Property: being promoted by W. B. Twitchell and others in March, 1917.

NEEDLES MINING & SMELTING CO.

ARIZONA

Is a subsidiary of the U. S. S. R. & M. Co., which see. **Mine office:** Chloride, Mohave Co., Ariz. **Works office:** Needles, San Bernardino Co., Calif. A. P. Anderson, gen. mgr.; D. R. Muir, mgr., of this and the Gold Roads Mines Co., Needles, Calif., and Gold Road, Ariz.

Inc. 1909, in Me., as successor of Arizona-Mexican Mng. & Sm. Co. **Cap.**, \$5,000,000; shares, \$5 par; entire stock issued is owned by United States Sm., Ref. & Mng. Co. Company does not publish a separate report.

Company owns the following properties:

First: the Tennessee mine, at Chloride, Ariz., the terminal of a branch line from Kingman on the main line of the Santa Fe R. R. The mine consists of the Empire No. 2, Tennessee, Great Lead and Tennessee South patented claims. The group has been operated since 1909 under a bond and lease running ten years.

The ore contains gold, silver, lead and zinc in varying proportions and occurs in a fissure vein between pegmatite and schist, striking north and south. The ore shoot averages about 300' in length and 6' in width and has been followed down to the 1,170' level. The ore is being extracted through a shaft which up to date has reached a depth of 1,400'. Indications are that the ore shoot will be followed in undiminishing strength to a much greater depth than has been yet achieved.

The mine is equipped with hoists run by steam power and is well supplied with shops, compressors and all necessary accessories.

The output is about 200 tons of ore a day, carrying 5% lead and 10% to 14% zinc, shipped to the company's plant at Needles where two products are obtained, a lead concentrate carrying gold and silver which is shipped to the company's smelters at Midvale, Utah, and a zinc concentrate which is shipped to Kansas and Oklahoma smelters of the U. S. S. Co. The present output is about 800 tons of lead concentrates and 1,200 tons of zinc concentrates per month.

Early in 1916, the Empire mine was unwatered and the shaft deepened as exploration at the Tennessee has shown that the orebodies are persistent downward. The company is also operating the Comanche and Durango mines, the latter showing 7' of zinc ore in the bottom of a 70' shaft.

Second: Champion mines, 12 miles north of Kingman, consists of the following unpatented claims: Champion, Champion No. 2, and Primrose, 52.75 acres. These claims, like the Banner group, were acquired as a prospect and some development work was done which yielded a small tonnage of gold, silver, lead and zinc ore, which was shipped to the company's mill at Needles. They are now being worked by lessees.

Champion is shipping about one car daily to Needles.

Third: the Stockton Hill group of mines, at Stockton Hill, Mohave Co., Ariz., 290.5 acres. No work is being done on this group at present.

Fourth: the milling plant at Needles, Calif., a concentrating plant of 125 tons daily capacity, equipped with crushers, jigs, tables and a flotation plant, the latter for the recovery of zinc values from tailings. This plant treats mainly the ore from the above-mentioned Tennessee mine. It also treats small tonnage of custom ores. The plant is thoroughly modern and well-equipped for economic work.

Production: the Tennessee mine yielded over \$18,000,000 to the end of 1916, and the Champion over \$200,000.

NEW JERSEY MINING CO.**ARIZONA****Address:** Ed. Mingle, mgr., Chloride, Ariz.**Property:** 2 claims, $\frac{3}{4}$ mile E. of the Tennessee mine, Chloride district, Mohave Co., Ariz.**Development:** by tunnel and winze, opening the vein to a depth of 320'. At 300' is 6 to 8" of gold-silver-lead ore.**Equipment:** hoist and 30-ton mill. Production to the end of 1916 totaled \$50,000. Shipments averaged \$31 per ton.**PAYROLL MINE****ARIZONA****Address:** A. W. Henning, mgr., Chloride, Ariz.; T. B. Scott, New York, owner. Reported under 10-year lease to F. L. Martin.**Property:** $1\frac{1}{2}$ miles E. of Chloride, Mohave Co., Ariz.**Development:** by 400' vertical shaft. On the bottom level over 290' has been driven in ore, the shoot being from 1 to 8' wide. At 200' the vein was 12' wide for 290'. Minerals are mostly zinc, with a little gold and silver.**Equipment:** electric hoist, compressor, etc.**Production:** totaled \$50,000 to end of 1916.

Shipping 35 tons of lead-zinc ore per day, Sept., 1917, to mill at Needles.

POLARIS MINING CO.**ARIZONA****Office:** 520 Lyceum Bldg., Duluth, Minn.**Officers:** W. A. Eaton, pres.; J. O. Davis, v. p.; G. L. Maycroft, sec.-treas.; above with A. E. Fritz, G. A. Eaton, O. E. Dahly, B. P. Wheeler and G. D. Tulian, directors.**Inc.** 1916 in Minn. **Cap.**, \$1,000,000; shares \$1 par; 294,281 issued. Company is successor of the Summit Gold Mng. Co., which in turn succeeded Summit Copper Co. Stockholders of Summit Gold Mng. Co. were offered stock in Polaris, share for share with payment of 25c a share.**Property:** 21 claims, 5 patented, known as the Klondyke mine, about 400 acres and a mill site, adjoining the Golconda mine on the south, in the Virginia district, Mohave Co., Ariz., about 22 miles N. W. of Chloride, the nearest railway station.**Geology:** of district is described in U. S. Geol. Survey Bull. No. 397. Claims said to show Golconda, Tub and Blackfoot veins, and 5 others.**Ore:** gold-bearing quartz occurs in a vein up to 50' in width. In 1897 a 10-stamp amalgamation mill was erected near the property and mine is credited with production of 3,000-4,000 tons of ore running from \$8 to \$37 per ton. Gold is finely disseminated and as only a 32% extraction could be made, operations were suspended.**Development:** by 300' tunnel.

Transportation, water, etc., are some of the difficult problems confronting the company.

Is a prospect which development alone can prove.

RAINBOW MOUNTAIN MINING CO.**ARIZONA****Address:** 702 Gas & Elec. Bldg., Denver, Colo. Mine at Chloride, Ariz.**Officers:** C. E. Walker, pres.; G. E. McCarn, v. p.; B. F. Williams, sec.; H. L. McCarn, treas. and gen. mgr.**Inc.** 1907, in Arizona. **Cap.**, \$1,000,000; shares \$1 par.**Property:** 9 claims, unpatented, on Rainbow Mt., 2 miles E. of Chloride, Wallapai mining district, Mohave Co. Claims said to show a vertical vein containing gold-silver-lead-zinc ore.**Development:** work totals 3,000' including 780' of tunnels and 450' shaft, with 4 levels opened up. Company claims to have 10,000 tons of ore partly blocked out, May, 1917, mostly on "South" oreshoot.

Equipment: includes an 80 h. p. hoist and 2-mile aerial tram, 300 cu. ft. compressor, Cornish pump.

Management plans driving a 3,000' crosscut tunnel to cut vein at 1,000', in 1917-18.

Production: shipments to Needles smelter, totaling 3,000 tons, of silver-gold-lead ore, have yielded \$140,000 to end of 1916.

RATTLESNAKE MINE

ARIZONA

Address: F. E. Braly, supt., Chloride, Mohave Co., Ariz.

Property: developed by shallow shaft, showing gold-silver-lead ore. Shaft is being sunk to 200', in 1917.

RED GAP GOLD MINES CO.

ARIZONA

Officers: C. C. Ward, pres.; C. W. Hernden, v. p.; C. M. Pedley, sec.-treas.

Inc. 1917, in Arizona. Cap., \$1,500,000; shares \$1 par.

Property: a group of claims in the Weaver district, 25 miles N. W. of Chloride, developed by tunnels and drifts said to expose veins from 10-12' wide, showing gold-silver values. A prospect.

REDEMPTION COPPER MINING & MILLING CO.

ARIZONA

Dead. Lost its property, 1914.

The mine near Chloride, Mohave Co., Ariz. was sold to Dr. M. Taylor Uhler, Philadelphia, in 1917. See Vol. XII.

RICO CONSOLIDATED MINING CO.

ARIZONA

Address: R. W. Wilde, Desert Power & Water Co., Kingman, Ariz. W. J. Hennessey, supt.

Property: the Rico and C. O. D. mines, 12 miles N. of Kingman, Mohave Co., Ariz. The C. O. D. was acquired in Sept., 1917. It has produced \$1,500,000 of silver and gold, and has been unwatered to 400' depth.

Equipment: hoists and mill, the latter being overhauled.

Production: from the C. O. D. mine totaled \$1,300,000 to the end of 1916.

SCHUYKILL MINING CO.

ARIZONA

Address: T. J. Torpey, supt., Chloride, Ariz. H. A. Broughton, pres., San Francisco, Calif.

Property: 2 patented claims, on the S. adjoining the Tennessee mine, Chloride district, Mohave Co., Ariz.

Development: by 800' incline shaft and levels at each 100'. The vein is almost vertical, dips slightly E. and strikes N. 9° W. At 500' the shoot is 5' wide. In a tunnel connected with the 200' level, the shoot is 8' wide. Mine has an ore pile of \$23 mill ore, value being in gold, silver, lead and zinc. Reserves above 500' were estimated at 70,000 tons of \$45 ore.

Equipment: 100 h. p. steam hoist, 108 h. p. gas. engine, 460 cu. ft. Sullivan angle-compound compressor, lighting plant, etc. A flotation plant was planned in 1917.

Production: totaled \$125,000 to end of 1916.

SILVER HILL MINING & MILLING CO.

ARIZONA

Address: H. M. Henning, mgr., Chloride, Ariz.

Officers: H. M. Henning, pres.; Geo. Cunningham, v. p.; H. G. Benson, sec.-treas.

Property: 3 patented claims and millsite, ¼ mile S. W. of Chloride, Mohave Co., Ariz.

Development: by 1,000' vertical shaft, also 5 inclines from 75 to 250' and a 600' tunnel. Good ore is said to have been opened at several points. Dumps contain over 12,000 tons of \$10 ore.

A 200-ton mill, employing gravity and flotation concentration was contemplated.

Production: totaled \$100,000 to end of 1916.

SILVER KEYSTONE CO.**ARIZONA****Address:** F. W. Sherman, supt., Chloride, Ariz.

Consolidated with Keystone Consolidated Mining Co., whose mill is treating ore from both mines.

SILVER KNIGHT MINE**ARIZONA****Address:** Chas. Parisia, mgr., Chloride, Ariz. T. N. Barndall, Pittsburgh, Pa., owner.**Property:** 2 claims, said to be on the S. extension of the Tennessee vein, Chloride district, Mohave Co.**Development:** by vertical shaft, reported to have opened good lead ore.**TELLURIDE & CHLORIDE LEASING, M. & M. CO.****ARIZONA****Address:** H. L. Heath, supt., Chloride, Ariz.; G. R. Harkness, v. p.; J. M. McMillan, sec.-treas.**Property:** the Schenectady mine, 3 claims and a millsite, in Chloride district, only 585' north of Tennessee mine, has 5' fissure vein, crossed by Genevieve vein.**Development:** sinking a shaft to 400' depth in June, 1917, with good silver ore reported at 225'.**Production:** totaled \$10,000 to end of 1916.**TENNESSEE MINE****ARIZONA**

Chloride, Ariz. See Needles Mng. & Sm. Co.

TINTIC MINE**ARIZONA****Property:** 1½ miles W. of Chloride, Mohave Co., Ariz.**Development:** to 100' depth. Vein is from 3 to 5' wide, and considered promising.**Production:** totaled \$100,000 of gold to end of 1916.**TOWNE MINING CO.****ARIZONA****Address:** J. E. Shank, sec., Chloride, Ariz.; S. S. Jones, pres.; Dan Murphy, v. p.**Property:** the Towne mine, 1½ miles S. of Chloride, Mohave Co., developed by 225' vertical shaft.**Production:** totaled \$1,300,000 to end of 1916, mostly silver ore. Smelter returns show carloads assaying 7 oz. gold and 600 oz. silver per ton. For this production the ore was selected, but systematic operations are now being pursued.**UNION BASIN MINING CO.****ARIZONA****Office:** 67 Milk St., Boston, Mass. **Mine office:** Golconda,, Mohave Co., Ariz.**Officers:** N. L. Amster, pres.; C. R. Jeffers, v. p. and sec.-treas., with Otto Sussman, directors; J. D. Wanvig, supt.**Inc. in Ariz. Cap.,** \$700,000; shares 70c par; 835,350 outstanding. Annual meeting, third Tuesday in March.

Initial dividend paid in Dec., 1916, amounting to \$85,000.

Property: the Golconda zinc mine, at Golconda, near Chloride and 16 miles N. of Kingman.**Development:** by 1,400' shaft. At this depth the vein is reported to be 1,000' long and 5' wide. The rich shoot is 4" wide, assaying 12% zinc and \$8 per ton in gold and silver.**Production:** totaled \$8,000,000 to end of 1916.**Equipment:** includes a 200-ton flotation mill, being overhauled. Electric power is obtained from the Desert Power & Water Co. at Kingman. Property is an important producer.**UTAH-ARIZONA GOLD & COPPER MINING CO.****ARIZONA****Idle. Office:** 625 Dooly Bldg., Salt Lake City, Utah.**Officers:** Heber S. Cutler, pres.; J. F. Shelley, v. p. and gen. mgr.

Shelley, Idaho; John W. Geiger, sec.-treas.; preceding officers, W. J. Burton, Geo. F. Shelley and M. Thomas, directors.

Inc. Nov. 11, 1907, in Arizona. **Cap.**, \$1,000,000; shares \$1 par; assessable; issued 961,023. Annual meeting, second Tuesday in September.

Property: 60 claims, unpatented, about 1,200 acres, and a 20-acre mill site, in the Weaver district, 18 miles N. W. of Chloride, Mohave Co., Ariz., the nearest rail point. Claims show quartz veins traversing granite and mica-schist, carrying gold-copper ore. Property includes the Golden Gate mine, developed by 2 incline shafts of 125' and 135', on parallel veins, and several short tunnels, with total of about 2,000' of workings.

Equipment: includes a 5-stamp mill, idle since 1914.

WESTERN ORE CONCENTRATION CO.

ARIZONA

Address: F. E. Steffy, gen. mgr., Chloride, Ariz. Company operates a 250-ton custom plant including a 9x15" Blake crusher, two 14x30" Reliance rolls, Marcy ball mill, Hancock jig, 10 Wilfley tables and Kraut & Kohlberg (K & K) flotation unit.

CHRISTMAS, see Hayden District

CLIFTON, see Morenci District

COPPER CREEK, see Mammoth District

COURTLAND, see Gleeson District

CROWN KING DISTRICT, YAVAPAI COUNTY

ALGONKIAN MINES CO.

ARIZONA

Office: Room 1000, No. 85 E. 41st St., New York City. **Mine address:** A. C. Wardle, supt., Crown King, Ariz.

Officers: John B. Frioh, v. p.; John L. Schellenberg, sec.; J. Edward Michel, treas.; together with Geo. F. Shurtleff and Ralph H. Cameron, directors.

Property: 17 claims, 5 patented, 335 acres, in Crown King section of Bradshaw mountains, 4 miles east of Crown King, Yavapai Co. Claims cover 4 miles along a diabase dike traceable 10 miles N. W.-S. E., cutting Yavapai schist. The schist is intruded by several porphyry dikes, or sheets parallel to the schistosity. Mineralization is said to occur in the porphyry at the diabase contact.

Development: by tunnels and shaft totals 2,400'. The lower or Algonkian tunnel, 1,100', runs along the dike contact, on the Anaconda claim. For 350' it is reported to follow the apex of an ore shoot; a 200' raise run from the tunnel to the surface at 322', is said to be on the orebody. This air shaft continues as a 50' winze below the tunnel and a drift N. from the bottom shows galena with occasional bunches of glance and chalcopyrite. This will be made the working shaft and sunk for 1,000' depth.

The Algonkian tunnel is being extended 300'-500' farther south to cut another indicated orebody at a depth of over 500'.

On the Gold Lock claim a small cross vein, recently discovered by new work, shows 8-10" of high-grade silver ore, one sample carrying 180 oz. per ton. Property examined by Jas. P. Harvey.

Equipment: includes Western Oil 60 h. p. hoist and air compressor.

Company officers report ample funds on hand for a year's development work and no debts.

BIG SEVEN GROUP

ARIZONA

Near Harrington, Yavapai Co., Ariz. Mine, developed by 1,200' tunnel, shows a well-defined vein with high values in gold-silver-copper. Ten men employed at last accounts.

BLACK ROCK (LTD.) MINING & MILLING CO. ARIZONA

Address: Constellation, Ariz. Inc. in 1910 in Arizona.

Property: 3 patented claims, about 12 miles east of Wickenburg. Developed by 360' shaft, drifts and crosscuts, on a vein from which some ore is reported to have been extracted.

Equipment: includes hoist and 2 Huntington mills.

BRADSHAW REDUCTION CO. ARIZONA

Office: Crown King, Ariz.

Officers: F. S. Vielé, pres. and treas, Prescott; D. B. Gemmill, sec. and mgr., Crown King; J. F. O'Brien, F. W. Stehr, G. D. Morris, directors; Mark Gemmill, supt. Transfer office: Prescott, Ariz.

Inc. Aug., 1916, in Arizona, to take over properties of the Yavapai Cons. G. S. C. Co., and to establish a custom mill at Crown King and Old Tiger mines. Cap., 1,000,000 shares; \$1 par; non-assessable; 400,000 shares outstanding; no bonds. Annual meeting in August.

Property: 78 claims, 34 patented, about 1,500 acres, includes the Wildflower and Crown King mines.

Development: company is reopening Crown King mine and development of further stoping ore in the Wildflower.

In 1916 the 480' Crown King shaft was retimbered. Two upraises, 40' and 60', have been made on the orebody 600' from the shaft on the 480' level, blocking out 20,000 tons of \$20 ore. According to old reports there is between 40,000 and 60,000 tons of similar ore blocked out.

Equipment: company has rebuilt 150-ton Crown King mill and a 2-mile tramway between it and the Wildflower mine and will remodel the mill at the Old Tiger mine.

Company has made considerable money treating the old tailing dumps of the district and has evolved a process which promises to be equally successful with the Wildflower ores. It is the only important producer of the district; has very capable management, and directors able to finance the company's undertakings.

GOLD KING MINING CO. ARIZONA

Address: Crown King, Yavapai Co., Ariz.

Inc. Mar. 11, 1904, in Arizona. Cap., 1,000,000 shares; \$10 par; 450,000 outstanding. Bonds authorized, \$100,000; \$10,000 outstanding.

Officers: Everett Moffitt, pres.; G. A. Brownlee, sec.-treas., of Muncie, Ind., with W. E. Toohey, W. R. Conklin, F. Harrod, D. Fisher, A. McDill, W. Purcell and I. N. Godden, directors.

Property: 22 claims in Peck district, Bradshaw mountains, Yavapai Co., Ariz.

Development: by tunnels 1,500', 1,100', 800' and 600' long which open a vein in schist and porphyry to 600' depth. Workings total 6,000'. Ore contains gold, silver, copper.

Expenses in 1916 were \$10,000. An air-compressor is to be installed.

Considered an over-capitalized company doing but little work.

LAKE SUPERIOR & WESTERN MINING CO. ARIZONA

Office: 208 Glencoe Bldg., Duluth, Minn.

Officers: A. Hagberg, pres.; A. Bjorkman, v. p.; A. Borgquist, sec.; A. Johnson, treas., with Magnus Olson, John Peterson, A. R. Norman, Ed. Falk and A. Kolstad, directors.

Inc. 1912, in Ariz. Cap., \$1,000,000; shares \$1 par; \$250,000 issued; assessable, subject to calls from 60c-\$1. Authorized bond issue \$300,000; \$134,000 bonds outstanding. Annual meeting, first Tuesday in February. Is a holding company, owning a 1/2 interest in the Big Pine Cons. Mng. Co., which see.

Company owned the Mascot gold mine and a 100-ton cyanide plant at Crown King. After expenditure of \$250,000 on the mine and mill, ore proved to be too low-grade to pay and property was abandoned. In 1915 a consolidation was effected with the Big Pine Cons. Mng. Co., a \$500,000 corporation, on the following basis: 200,000 shares of the 500,000 shares of capital stock were issued for the Big Pine properties and 200,000 shares and \$32,150 in cash was paid the Lake Superior & Western Co. for its mill, which has been moved to the Big Pine ground.

MONTEZUMA MINING & MILLING CO.**ARIZONA**

Address: Crown King, Ariz.

Officers: J. P. Waldron, pres.; Phillip Nohe, v. p.; P. Fink, sec.; A. Waldron, treas., with F. Fink and M. Devaul, directors.

Inc. in Arizona. Cap., \$1,000,000; shares \$1 par; non-assessable.

Property: 7 claims, 5 patented, 120 acres, in Pine Grove district, 4 miles from Crown King. Shafts and tunnels reported to have opened some high-grade ore.

In March, 1917, property was leased to H. K. Kinsiman, who will extend the 700' tunnel in the Bear claim.

NELSON MINING CO.**ARIZONA**

Office: 609 Land Title Bldg., Philadelphia, Pa. **Mine office:** Crown King, Yavapai Co., Ariz.

Officers: Henry Kirst, pres.; E. T. Gillespie, v. p.; Paul R. Brown, sec.-treas.; G. P. Harrington, gen. mgr., with N. P. Bishop, A. J. Pusey and Solomon Fuld, directors.

Property: between town of Crown King and mine of that name. Has fissure vein 3' wide, developed by 2 adits, 225' apart vertically, the lower one 3,000', the upper 1,000' long, and 300' incline shaft on vein.

Numerous assays show gold-silver values in commercial quantities; also some lead, zinc and copper. Development is underway. Ore is being sent to the new flotation mill of the Bradshaw Reduction Co. at Crown King, adjoining the Nelson mine. The zinc-content, a detriment in the past, is now valuable, forming by flotation an iron and a zinc concentrate desired by smelters.

Equipment: includes 25 h. p. gasoline hoist and air compressor. Company is reported to employ an average force of 15 men.

ORO BELLE DEVELOPMENT CO.**ARIZONA**

Address: Crown King, Yavapai Co., Ariz.

Inc. in 1915 by C. C. Cowan to operate the Oro Belle and Gray Eagle gold mines, which see, under lease.

Forfeited lease, 1916, after shipping 56 tons of ore to the Humboldt smelter.

ORO BELLE & GRAY EAGLE GROUP**ARIZONA**

Address: Mrs. Hattie Barnes, owner, care Theron Davis, 170 Broadway, New York. Mine formerly owned by Tiger Gold Mng. Co.

Property: 10 patented claims, 172 acres, 5 miles S. E. of Crown King, Arizona, shows pyrite and chalcopryrite in fissure veins, 2-15' wide. Veins strike N., dip 60° W. Ore is said to assay \$20 gold, 2 oz. silver and 1% copper per ton.

Development: by 8 tunnels, longest 1,000', and a 600' shaft.

Ore reserves: estimated April, 1916, at 5,000 tons of \$20 ore.

Equipment: includes a 50 h. p. steam hoist, compressor and 20-stamp, 60-ton mill.

Production: 19,010 lbs. fine copper, 9,937 oz. silver and 4,313 oz. gold in 1907; 3,639 oz. silver and 1,823 oz. gold in 1908; 4,802 lbs. fine copper,

2,725 oz. silver and 1,226 oz. gold in 1909. Property was idle until Oct., 1915, when leased to Oro Belle Dev. Co. Again idle, 1917.

Mine credited with total production to date of \$700,000.

PACIFIC COPPER MINING CO.

ARIZONA

Office: 415 Board of Trade Bldg., Kansas City, Mo. **Mine office:** Crown King, Yavapai Co., Ariz. John Kelley, pres.; W. J. Morse, sec.

Inc. Feb. 8, 1907, in Arizona. **Cap.**, \$3,000,000; shares \$1 par; non-assessable; issued, \$2,397,616.67.

Property: 30 claims, 10 patented, 600 acres, including a mill and smelter site, 4 miles from Harrington and 9 miles from a railway, in the Silver Mountain district of the Bradshaw mountains. Claims show a hornblende phase of Yavapai schist, with an intrusive porphyry dike of 50 to 150' width, carrying contact deposits of 9', of 14' and of 25' estimated average width, traceable 3,000', with N.-E. strike. Gossans are much leached, carrying honeycombed hematite and limonite, with occasional copper carbonates.

Ores: malachite and azurite, succeeded at 50' by secondary chalcocite, bornite and chalcopyrite. The management estimates ore to range from 3 to 15% in copper, with good silver and gold values.

Development: consists of 1,500' of work, with a 500' shaft and several prospect workings.

Equipment: includes a 120 h. p. plant, with an 80 h. p. 3-cycle vertical engine, connected to a 4-drill Sullivan air compressor, a 20 k. w. triplex pump, and a 40 h. p. gasoline hoist. Presumably idle.

RANDOLPH-GEMMILL DEVELOPMENT CO.

ARIZONA

Addresses: Crown King, Ariz., and Prescott, Ariz.

Officers: M. P. Randolph, pres.; F. S. Viele, v. p.; David B. Gemmill, engr.

Property: the remodeled Crown King mill, in which 70-80 tons per day of the old tails from the mill are retreated. These tails are complex, carrying 0.3 oz. gold, 4½ oz. silver, 11% zinc, 0.8% copper, 10% iron, 53% insoluble; they are tabled, and treated by oil flotation making a 4 to 1 concentrate. The bulk concentrate is retreated making 15 tons zinc and 7 tons iron concentrate from each 100 tons tails. Zinc product carries 43% zinc, 10% iron, 4½% copper, 15 oz. silver and 0.6 oz. gold; the iron product carries 1½ oz. gold, 10 oz. silver, 2½% copper, 12% zinc, 30% iron and 5% insoluble. These products yield a net profit of about \$4 per ton of tails treated after paying \$1.50 per ton royalty.

SARATOGA MINING CO.

ARIZONA

Crown King, Yavapai Co., Ariz. J. L. Deming, mgr. According to report the company was reorganized in 1915, and in Dec., 1915, completed a 75-ton mill to treat Saratoga ore and also the dump ore of the adjoining Crown King mine, belonging to the Yavapai Consolidated Gold-Silver-Copper Co. The shaft will be deepened to the 250' level.

TIGER GOLD MINING CO.

ARIZONA

Formerly owned the Oro Belle & Gray Eagle mine, Crown King, Ariz.

TUSCUMBIA MINING & MILLING CO.

ARIZONA

Jas. H. Sullivan, supt., Crown King, Ariz.

Inc. March, 1916, in Arizona. **Cap.**, \$1,000,000; shares \$1 par.

Property: the Tuscumbia mine, in the Bradshaw Mtn. district, carrying a lode with silver ores, said to be like those of Tonopah. A shoot opened May, 1916, is reported to show 3.8% copper and 115 oz. silver per ton in a shoot 50' long and 4' wide.

In March, 1917, ore was coming from 4 adits to a depth of 300'.

YAVAPAI CONS. GOLD-SILVER-COPPER CO. ARIZONA

Office: Prescott, Ariz. **Mine office:** Crown King, Yavapai Co., Ariz.

Officers: T. G. Norris, pres.; A. W. Edwards, v. p.; G. D. Morris, sec-treas.; L. B. Mulhearn, asst. sec-treas.

Lands: 18 claims, partly patented, including the Old Reliable mine, 3 miles from Crown King; the Wildflower group, in Pine Grove district; the Tiger group, in the Bradshaw mountains, and the Crowned King mines, in the Bradshaw mountains. The last named group, 18 claims, bought from B. A. Turner, receiver of the old corporation, for \$75,000, half in cash and half in shares, has been a considerable producer, mainly of gold.

Property: is leased to the Bradshaw Reduction Co.

Development: by several thousand feet of old workings on a contact vein, between porphyry and syenite, carrying slightly auriferous and highly argentiferous copper ores, opened by a 170' shaft.

Equipment: includes steam power, compressors, 10-stamp mill and 200-ton concentrator. About 20,000 tons of old tailings were sold in 1915 and are being treated in a flotation plant.

DOUGLAS, INCLUDING PARADISE, COCHISE COUNTY**HILLTOP MINES (not Inc.) ARIZONA**

Principal owners: J. O. Fife, Kansas City; P. J. Kasper, Chicago; R. O. Fife, trustee. Dos Cabezos, Cochise Co., Ariz.

Property: 50 unpatented claims, 1,000 acres, in California mining district, Chiricahua Mountains, Cochise Co., Ariz., said to show copper, lead, zinc, silver ore in quartz veins and contact deposits; strike N. W.-S. E., dip 60° S. W. Ten shoots reported opened up on 800' level, 2' to 10' wide and 30' to 110' long, said to show assays of 20 to 40% lead, 1 to 3% copper and 6 to 10 oz. silver.

Development: by 2 tunnels, one 1,100' long, the other 2,600' long; greatest depth of working 800'. Total underground workings, 5,000'. No ore blocked out and has been cut on one level only. No shipments made in 1916.

Equipment: includes a 70 h. p. Snow-Diesel engine and an Ingersoll-Rand-compressor, capacity 385 cu. ft. Management is planning to drive 2 more tunnels.

MANHATTAN DEVELOPMENT CO. ARIZONA

Office: Post Office Blk., Houghton, Mich. **A. O. Koppes, supt.;** J. H. Rice, pres.; W. G. Rice, sec-treas.

Inc. March, 1905, in Arizona. Cap., \$200,000; shares \$10 par; \$5.50 paid in.

Property: 37 claims, 600 acres, owned in fee, in the California district, near Paradise, Cochise Co., Ariz., carries upwards of 2 miles of the outcrop of a mineralized zone lying W. and N. of the holdings of the Chiricahua Development Co.

Development: by several shallow shafts, deepest 80', and a 450' cross-cut tunnel, latter showing leached ore and a little high-grade ore, with indications of persistent values at greater depth.

In 1913, company purchased the Arnold Mining Co. property, near Santa Cruz, Sonora, for \$88,000. This property is developed by a 300' shaft and has shipped 12% ore to the Cananea smelter. The company's previous operations have been mainly in the Yaqui region of Sonora.

PARADISE MINING CO. ARIZONA

Paradise, Cochise Co., Ariz., is controlled through ownership of 60% of stock, by Bisbee-Sonora Development Co., which see.

SAN SIMON COPPER CO.**ARIZONA**

Idle. **Office:** Marquette, Mich. **Mine office:** Paradise, Cochise Co., Ariz.

Officers: Nathan M. Kaufman, pres.; Hon. Norman W. Haire, v. p.; S. R. Kaufman, sec.-treas.; preceding with Thos. F. Cole.; John A. Duncan, Wm. G. Rice and Thos. H. Collins, directors.

Inc. 1907, in Arizona, as a reconstruction of the Chiricahua Development Co. **Cap.**, \$2,500,000; shares \$10 par.

Property: 40 claims, 7 patented, about 750 acres, 16 miles from nearest railway, at Rodeo, previously operated by Capt. Thos. Burns as a silver mine.

Development: a 750' crosscut tunnel with a 100' winze 700' from the portal, cutting 50' of leached ore, apparently the apex of a sulphide orebody. Also the 400' Mars shaft, bottomed in chalcopyrite ore of 2 to 4% copper tenor. The 400' Planet shaft has drifts on the 4th level.

Equipment: includes two 150 h. p. boilers, two 2,000' Lake Shore double-drum hoists, and a 16-drill Sullivan air compressor. Only assessment work done in recent years.

SIGNAL POINT MINING CO.**ARIZONA**

Office: 40 First National Bank Bldg., Douglas, Ariz.

Officers: G. E. Hemphill, pres. and gen mgr.; E. G. Richards, v. p.; Z. T. Phillips, sec.-treas., with E. A. Hemphill and Charles Stephens, directors.

Inc. July 10, 1915, in Arizona. **Cap.**, \$600,000; shares 50c par; 800,000 issued.

Property: 19 claims, 12 miles E. of Douglas, near International Boundary.

Development: one shaft 120', another 150' deep, equipped with gas-line hoists. No. 1 shaft was sunk on an iron dike, showing traces of copper and silver, and up to \$3 gold per ton. This shaft is to be sunk to 300', followed by crosscutting. No. 2 passed through 40' of gold, silver, copper, lead ore into a leached zone. Churn drills are to be used for prospecting other areas.

SULLIVAN COPPER DEVELOPMENT CO.**ARIZONA**

Office: care P. H. Nelson, pres., 610 Lonsdale Bldg., Duluth, Minn.

Mine office: Paradise, Cochise Co., Ariz. Geo. H. Crosby, sec.-treas.

Property: 14 claims, 6 patented, 4 miles west of San Simon, Chiricahua Mts., has opencuts, showing leached copper ore and a little very rich ore, and has a 60' tunnel showing lead ore. Management considered good and property promising. Idle, except for annual assessment work.

*FLORENCE, PINAL COUNTY***ARIZONA-HANCOCK COPPER CO.****ARIZONA**

Idle seven years. **Office:** Hancock, Mich. **Mine office:** Florence, Pinal Co., Ariz.

Officers: John D. Cuddihy, pres.; Alfred C. Sieboth, v. p.; Henry L. Baer, sec.-treas.; preceding officers, C. D. Hanchette, F. C. Mayworm and Philip Carroll, directors.

Inc. in Arizona, as successor to Arizona-Hancock Consolidated Mining Co.

Property: 4 claims, patented, 2 miles south of Superior, showing a vein traversing 2 claims, parallel to the vein of the Lake Superior & Arizona, with diabase footwall and limestone hanging, opened by a short

tunnel and a winze of 55', with drifts on 2 levels, showing lead above and copper below.

MAVERICK COPPER CO.

ARIZONA

Florence, Pinal Co., Ariz. Geo. Lobb and Eugene Woodbury, managers.

Property: known as the Iron Spring mine, shows a strong outcrop, carrying finely disseminated chalcocite, estimated to average 3% copper.

Development: by a shallow shaft and a number of prospect pits and shafts. Annual assessment work only has been done since 1910, when the Copper Queen Co. relinquished its \$100,000 bond on the group.

NEWBURY MNG. CO.

ARIZONA

c/o Makeever Bros., 170 B'way, New York.

Property near Cochran, on Ariz. Eastern R.R., east of Florence. To save property from sale, Makeever Bros. of Boston put up \$10,000, but after their engineers had examined it, the firm abandoned the property.

*GLEESON, INCLUDING COURTLAND AND PEARCE,
COCHISE COUNTY*

ARIZONA GOLD & COPPER MINING CO.

ARIZONA

Clerk's office: Burlington, Vt. **Mine office:** Gleeson, Cochise Co., Ariz. L. V. Hastings, v. p.; Hamilton S. Peck, sec.

Inc., July 28, 1911, in Vermont. **Cap.,** \$100,000; shares \$5 par; as successor of the Vermont & Arizona Copper Co.

Property: 11 claims, 220 acres, 4 miles from Gleeson, in the Turquoise district, on the western slope of the Dragoon mountains, show 2 gold and silver veins and several copper veins, giving average assays of \$6 gold and 3% copper per ton.

Development: a 230' main shaft and 2 tunnels, longest 125'. Company claims to have developed a large body of low-grade milling ore.

Equipment: includes steam power and 12 h. p. hoist. Property idle owing to lack of funds.

COMMONWEALTH EXTENSION MINING CO.

ARIZONA

J. S. Metcalf, supt., Pearce, Ariz. C. W. Hicks, pres. Control held in Bisbee, Ariz.

Property: a tract adjoining the Commonwealth mine on the E. and S. E. shows a mineralized contact that carries high-grade ore in the adjacent mine.

Development: a 250' shaft sunk in andesite with 230' level, equivalent to 7th level of the Commonwealth and corresponding to the water level of the district.

Equipment: includes steam plant, hoist and compressor.

COMMONWEALTH MINING & MILLING CO.

ARIZONA

Property: the Commonwealth silver mine, at Pearce, Cochise Co., Ariz., closed down permanently in 1917, and complete 350-ton equipment being sold. Although some rich shoots were found at depth, none persisted, and operations became unprofitable. See Vol. XII for description and other data.

COPPERROX MINING COMPANY OF ARIZONA

ARIZONA

Office: 96 Harris Ave., Providence, R. I. Mine near Courtland, Cochise Co., Ariz. T. F. Gilbane, pres.; Geo. F. Wordley, 1st v. p.; Thomson E. Going, 2nd v. p.; Hon. G. W. Esterbrooks, sec.-treas.

Inc. Jan. 17, 1910, in Arizona, as successor of the Arizona Copper Syndicate of Providence. **Cap.,** \$1,000,000; shares \$1 par.

Property: 28 claims, 18 patented, and 2 mill sites, patented, in the Dragoon Mountains, 3 miles from Courtland. Property is slightly developed, hav-

ing a 236' shaft and about 500' of tunnels on a contact said to be traceable 3 miles, with surface ores carrying gold, copper and manganese, said to assay up to 16.5% copper. President reports, 1916, that a manganiferous "Mother-lode" has been opened up by recent work. Company is merely a holding concern and will lease or sell controlling interest.

GREAT WESTERN COPPER CO.

ARIZONA

Courtland, Cochise Co., Ariz. Wm. J. Young, Jr., pres.; Edw. A. Young, sec.; C. H. Young, treas., all of Clinton, Iowa; F. J. Gibbons, gen. supt.

Inc. Oct. 22, 1900, in Arizona. Cap., \$1,000,000; shares \$10 par; non-assessable; fully issued.

Property: 23 patented claims, 407 acres, in the Turquoise district, acquired 17 years ago. Limestone is intruded and altered by monzonite and quartz-monzonite porphyry. The Humboldt, first opened, yielded high-grade ore from the surface to 150', where it apparently ended. Nothing has been proved definitely at depth, and diamond-drilling is proceeding to 1,000' or more. Pay ore is still being extracted from this claim by lessees. In 1908, good ore was opened in the Mary to 200', and high-grade ended here also, but drilling is under way. So far, it cannot be said to be either encouraging or otherwise for chances of striking commercial ore at 1,200' or deeper. Lessees are mining ore from the Mary. Sulphide ore was opened in the Mame in 1909, and produced until 1914.

Development: 25,000' of workings from 4 shafts, 310', 300', 430' and 200' deep, respectively.

Equipment: includes a 150 h. p. electric plant driven by steam power and having one 150 k. w. generator, a 600 cu. ft. air compressor, 2 electric hoists, electric pump, etc.

Production: in 1916 was 1,197,920 lbs. Ore averaged nearly 6% copper.

LEADVILLE MINING CO.

ARIZONA

Courtland, Cochise Co., Ariz.

Officers: Wm. Holmes, pres.-gen. mgr.; W. D. Monmonier, sec., Pearce, Ariz.; Calvin Glenn and W. A. Stilson, directors.

Inc. 1905, in Arizona. Cap., \$600,000; shares \$1 par.

Property was bonded, June, 1916, to the Needles Mining & Smelting Co. for \$600,000, but was relinquished.

Property: 13 claims, 199 acres, patented, in the Turquoise district, includes the Leadville and Maid of Sunshine mines, showing contact deposits between monzonite and limestone. Ores are mainly malachite, azurite and chrysocolla, with some chalcopryrite, and pyrite showing in the Maid of Sunshine mine. The orebodies, under development, carry an average of about 8% copper. Company is developing the Lower group on the 300' level. There are 5 shafts, deepest 365', and a 60' tunnel.

Equipment: includes a 250 h. p. steam plant, 2 hoists and air compressor. Company resumed active operations, Oct., 1915.

Shipments: about 15 tons of 8% copper ore daily, and management estimates 100,000 tons ore in sight.

Property was under bond, 1916-17, to U. S. Smelting Co. interests, and extensively churn drilled, but bond given up in July, 1917.

LEONARD COPPER CO.

ARIZONA

Gleeson, Cochise Co., Ariz. J. W. Bennie, Clifton, Ariz., mgr.; J. E. Penberthy, supt., Gleeson.

Inc. 1910 by interests closely connected with the Shannon Copper Co., and property is under lease to that company.

Property: the Copper Belle mine, 8 claims, in the Turquoise or Courtland district, is opened by a vertical shaft and about 1 mile of underground workings, developing several orebodies on 3 different contacts. Ore is nearly solid pyrite, with considerable chalcopryrite and some bornite.

Equipment: includes steam plant with 2 hoists, compressor, repair shop, etc. Output 150 tons per day, loaded directly into railway cars at mine and shipped over the A. E. & S. P. Railroad to Clifton.

MASCOT MINING CO.**ARIZONA**

Last address: 1318 Majestic Bldg., Detroit, Mich. Company not favorably regarded. See Copper Handbook, Vol. XI, for full description of properties. Letters neither answered nor returned.

TEJON MINING CO.**ARIZONA**

Office: Bakersfield, Calif. L. I. Thiers, supt., Gleeson, Cochise Co., Ariz.

Inc. in Arizona. Cap., \$1,000,000; shares \$1 par.

Property: 8 patented claims, 150 acres, at Gleeson, in the Turquoise or Courtland district, Arizona, adjoining the Copper Belle mine of the Leonard Copper Co. mine, shows heavy bedded limestone dipping steeply eastward into the mountain ridge and cut by intrusive bodies of monzonite and later quartz porphyry. Ore occurs as a contact deposit. Average assays reported at 5% copper, 6 oz. silver, 0.07 oz. gold per ton.

Development: by the 500' Tejon shaft, and by several old tunnels with extensive drifts and stopes in oxidized ore.

Equipment: modern and complete, includes electric and steam power, compressor, etc. Railway is close at hand. Property appears meritorious and management good.

GLOBE AND MIAMI, GILA COUNTY

(See Miami District)

HAYDEN, CHRISTMAS AND WINKELMAN, GILA COUNTY**ASH CREEK GOLD MINING & MILLING CO.****ARIZONA**

Address: Winkelman, Ariz.

Officers: E. W. Childs, pres.; J. H. Pool, v. p. and mgr.; F. M. Pool, sec.-treas., with Dr. P. M. Butler and E. Rargel, directors.

Inc. in Arizona. Cap., \$1,000,000; shares \$1 par; 150,000 shares outstanding.

Property: 10 claims, 200 acres, 5 miles E. of Winkelman, Gila Co., Ariz.

Ore: occurs in fissure vein, 4' wide, in andesite, diorite and diabase, said to show a 30' shoot of sulphide ore, assaying .42 oz. gold and 2.13% copper.

Development: by tunnels and shaft, totaling 600'. Property reported on by R. W. Hollis, Phoenix, who recommends development at depth and erection of a small mill.

BALL COPPER CO.**ARIZONA**

Office: 723 Title Ins. Bldg., Los Angeles, Cal. **Mine office:** Winkelman, Pinal Co., Ariz. Chas. E. Finney, pres.; Edward W. Brooks, v. p.; Robt. J. Simpson, sec.-treas.; preceding officers, C.-T. Joslin, Jos. Ball, H. L. McNair and C. E. Finney, Jr., directors.

Inc. Feb. 1, 1908, in Arizona. Cap., \$3,000,000; shares \$10 par; \$1,250,000 issued. Bonds, \$50,000 outstanding, at 6%. Annual meeting, third Tuesday in January. Company owns 40,000 shares of the London Arizona Consolidated Copper Co., and has transferred its mineral claims to that company; they are described under that title.

CHOLLA COPPER CO.**ARIZONA**

Office, Winkelman, Ariz.

Officers: E. R. Rice, J. F. Shaw, D. R. Williamson, R. J. Rice and A. Williamson.

Inc. Jan., 1917, in Arizona. Cap., \$1,000,000; shares \$1 par.

Property: Henry Owen group of 12 claims, about 18 miles from Hayden. Values are in copper and gold.

COPPER STATE MINING CO.

ARIZONA

Office: 936 Plymouth Bldg., Minneapolis, Minn.

Officers: Martin E. Tew, pres.; John A. Nelson, 1st v. p.; E. E. McCarthy, 2nd v. p.-treas.; S. H. Hudson, sec.; preceding officers, Geo. P. Douglas, A. M. Anderson and Walter De La Hunt, directors.

W. C. Steubing, mgr.; Geo. S. Croyle, supt. and electrician; Gilbert O. Tew, store mgr. Mine address: Copper Creek, Ariz.

Inc. 1915 in Ariz., as a successor to the Calumet & Copper Creek Mining Co., the Old Reliable Copper Co., the Copper Creek Mining Co. and other companies. Cap., \$7,500,000; \$2,000,000 issued. All stock certificates held in trust under a pooling agreement until Jan. 1, 1918, or until the financing of the company has been completed.

Property: 7 claims, unpatented, including 100 acres mill and smelter sites, and 100 acres miscellaneous lands; also 28 patented claims under option, making total area 2,000 acres in the Copper Creek, or Bunker Hill, district, Graham and Pinal counties, Ariz. Properties are in the Copper Creek basin, on the western slope of the Galiuo Mountains, 31 miles S. E. of Winkelman and Hayden, on the Arizona Eastern R. R.

Claims include the Sycamore Flat, Cumberland, Sioux Chief, Silver Reef, American Eagle, Copper Giant and Old Reliable groups. Country rock in lower basin is diorite, with porphyry intrusions, showing a large number of ore bodies, there being several different breccias and oxidized zones carrying mineral, ore bodies usually being elliptical, but sometimes occurring in chimneys. Outcrops, of which there are more than 50, are very prominent. Oxidized ores, including chrysocolla, are found at and near the surface, sometimes in commercial quantities, giving place, at shallow depth, to sulphides, chalcopryrite, bornite and chalcocite, associated with pyrite, in altered and brecciated diorite, some native copper showing in flakes and grains along shear zones. Company reports that one orebody 300' wide and 420' long has been developed to 342' depth, in a porphyry breccia.

The Old Reliable mine has an orebody with the second largest outcrop in the district, same having a sectional area of 147,000 square feet, or about $3\frac{1}{2}$ acres. Development is by an upper tunnel, with back of 775' and 13 cross-cuts, and a lower tunnel 800', with about 3,800' of workings, estimated by manager to show 250,000 tons of 3% ore ready for stoping, and an additional 350,000 tons of 2.25% ore partly blocked out.

The American Eagle group has 3 prospect tunnels, a 1,025' working tunnel, and a 300' three-compartment shaft, with about 3,500' of workings, showing oxidized ores at surface, with an orebody reported to be developed for about 50x100'. This mine is estimated by company to have developed about 60,000 tons of ore, averaging 3.78% copper and 8 oz. silver, with a trace of gold. The mine has electric lights underground, and equipment consists of a 75 h. p. electric hoist good for 500', 3-drill and 1-drill electric air compressors and a smithy.

The Prince mine, under option, is developed by a 300' shaft and drifts on 3 levels. Company claims 300,000 tons of ore averaging 3.56% copper in this mine. On the Globe mine a shaft has been sunk 650' and 100,000 tons of 3.08% ore are said to be blocked out on the 150', 250' and 450' levels. The Copper Giant mine, said to have an outcrop of nearly 4 acres, has a 200' shaft connecting at depth of 124' with a tunnel from which 2 drifts several hundred feet in length have been driven into the ore breccia. In the Silver Reef, Kimbro, Copper Reef, Sioux Chief, Rough Rider and several other claims belonging to the company, copper ore has been exposed by short tunnels and shallow shafts.

Hand-sorted ore from these workings has been shipped to smelters, giving returns of 12% to 30% copper and \$5.50 to \$27 gold and silver per ton. From the Cumberland and Lead Carbonate mines, in which veins of galena have been exposed, several carloads of ore netting \$45 per ton and upward in gold, silver, copper and lead have been shipped.

A 180-ton concentrating mill was built several years ago. Power plant consists of two 100 h. p. boilers, a 200 h. p. Corliss engine, a 160 k. w. 2,300-v. G. E. dynamo. A 3-phase transmission line, 4 miles long, supported by steel towers, connects power plant with mill and 3 of the mines. Water supply system includes 5 miles of 2½" pipe, and a concrete dam 26½' high and 131' across the canyon, creating a reservoir holding 8,000,000 gals. of water. Company also owns and operates a 2¼-mile narrow gauge railroad, connecting the Old Reliable mine with the mill, equipped with 18-ton Porter locomotive and 8 cars; a 31-mile telephone line connecting the mine with Mammoth, Winkelman and Hayden, and a store, used as a commissary and office building. A 60 h. p. distillate engine and 4-drill air compressor are installed at the Old Reliable mine. Other improvements are a machine shop, assay office, ice-making plant and 25 buildings for employees. Additional equipment of the past year includes a 285 h. p. McIntosh & Seymour Diesel engine with direct-connected generator, a 5-drill air compressor, a 5'x6' Marcy ball mill and Callow flotation cells.

Production: by former owners in 1914 was 8,400 tons of ore, making 758 tons of concentrates averaging 28.26% copper, or a total of 428,421 lbs. copper. Production from Nov., 1916, to June, 1917, was 362 tons of concentrates, averaging 24% copper, from ore extracted in development work. Company plans further systematic development, the building of concentrating mill in the San Pedro Valley and the extension of the narrow-gauge railroad to this point.

Property has merit if handled for ore and not as a stock-selling proposition.

GILA CAÑON CONSOLIDATED COPPER CO. ARIZONA
Office: c/o R. W. Hollis, mgr., Phoenix, Ariz. **Mine office:** Chilito, Pinal Co., Ariz.

Inc. 1916 in Ariz. **Cap.**, \$750,000; shares 50 c. par.

Officers: J. C. Callaghan, Phoenix, Ariz., pres.; R. W. Hollis, E.M., v. p.-gen. mgr.; R. A. Lewis, treas.; Norman McMillan, sec., above, with C. H. McArthur and F. S. Dawson, directors.

Property: 17 claims, known as Schneider group, adjoins that of London Arizona on west, in Banner district, Gila County, 4 miles from Ariz. Eastern R.R. and only 6 miles from A. S. & R. smelter at Hayden.

Development: principal work done from crosscut tunnel 1,800' long at depth of 350' to 400', with total of over 3,500' underground work. From Aug., 1916, to May, 1917, new work totaled 1,200', exclusive of surface work. Net yield from surface or smelted past years, \$150,000.

Property shows ore at many places, but gives no indication of disseminated or porphyry ore, such as those of Miami and Ray, and though it is a contact metamorphic deposit, it is quite unlike that of Christmas. The geologic character observed and the presence of commercial ore at many points is indicative of diffused mineralization, with workable concentrations of ore in one marked bedding horizon, where cut by fractures. Deep development work to date disappointing, ore not going down to tunnel level, but several very promising veins are practically undeveloped as yet. Can be operated at a profit if development expenses were eliminated, shipments having paid for all development to date. Forty men employed. Company derives revenue from lessees' production. Much surface ore is too low grade to ship and experiments have been made with leaching, but owing to lime content, acid treatment cannot be

used; the Benedict ammonia process, used by Calumet & Hecla Co. in Michigan, is applicable.

Production: from Aug., 1916, to May, 1917, 94 railway cars of about 4,700 tons of ore were shipped to the Hayden smelter, netting \$54,279.

Regular shipments of 2 cars weekly being made, 1917. Examined and reported on by W. H. Weed in 1917.

GILA CANYON COPPER CO.

ARIZONA

Dead. Property sold to Gila Cañon Consolidated Copper Co., which see Described, Vol. XII.

GILA COPPER SULPHIDE CO.

ARIZONA

Office: Room 514, 49 Wall St., New York. **Mine office:** Christmas, Ariz. **Officers:** B. P. Cheney, pres.; G. D. Morris, sec.-treas.; L. B. Mulhearn, asst. sec.-treas.; preceding, with N. W. Jordan, C. S. Gleed, F. L. Stoessel, R. E. Sloan and W. G. Bushnell, directors.

Inc. 1909, in Ariz., by the Development Co. of America, which bought the property from the Saddle Mountain Mining Co. **Cap.**, \$2,500,000; shares \$10 par, non-assessable. In treasury for bond conversion, \$1,000,000. To June 1, 1917, company had retired \$168,600 of its \$1,000,000 outstanding 1st mtge. 5-yr. 6% convertible bonds.

Company spent over \$500,000 developing its property at Christmas, which is now being operated under a smelting contract by the American Smelting & Refining Co. Mines still belong to the Gila Co., which can resume direct management at will.

Property: 2 groups, comprising 53 claims, 817 acres, 49 patented, and 640 acres coal land. Holdings include Christmas mine and claims in Banner district, Gila County, and coal, gold and copper claims in the Saddle Mountain district, Pinal county, all within a radius of 6 miles.

The Saddle Mountain group of gold and silver claims, patented, 265 acres, with 3,450' of workings, shows base dry ore, with little lead and zinc and traces of copper, an average of 300 assays showing \$13 per ton in gold and silver values.

There are also 640 acres of patented coal lands, in the lower basin of Deer Creek, showing two veins of dirty bituminous coal, developed by a 175' incline shaft and 800' of workings, equipped with a small steam hoist and pump. There is a bee-hive coke oven for testing the coal.

The Christmas mine is at the junction of Christmas canyon with the Gila River, on the north side of the stream, 8 miles from Winkelman. The mine was opened, 1883, but closed, 1884, because found to be located on the San Carlos Indian Reservation, and remained idle until the lands were restored to the public domain, by executive order of the President, Dec. 2, 1902.

Geology: property shows heavily bedded white and gray carboniferous limestone, in various stages of alteration, near a granite porphyry contact. Ore occurs mainly as replacements in limestone, with garnetiferous gangue, carrying sulphides, mainly chalcopyrite, but with bornite and some copper glance. The contact zone has shown copper ore wherever opened and the porphyry also carries copper ore. Four main orebodies are under development, ranging from 4 to 135' in width. Orebody contains nuclear blocks of undigested limestone, surrounded by ore, hence it is difficult to measure tonnage developed. Ore mined gave average assays of about 3% copper and 30 to 40 cts. per ton in combined gold and silver values.

Development: at Christmas is by 4 shafts, to depth of 850', all showing oxidized and sulphide ores. The mine has open cast workings of 30,000 sq. ft. area, showing carbonate ores. Much new and important work and equipment is being added. Improvements on the property include the construction of an

aerial tram, connecting the mines with the Arizona Eastern Railroad, and production began early in 1916.

Production for 6 months ending June 30, 1917, 357,736 lbs. copper, netting \$245,231. Employs 175 men.

LAVELL GOLD MINING CO.

ARIZONA

Office: Woodbury & Co., fiscal agents, 44 Pine St., New York.

Officers: G. B. Leighton, pres.; C. P. Woodbury, v. p.; St. John Smith, sec.-treas., 66 Broadway, N. Y.; E. C. Jacobs, supt., Winkelman, Ariz.

Cap., \$2,000,000; shares \$1 par; 400,000 offered at par, Oct., 1917.

Property: the Apex group, 19 claims, 386 acres, elevation 4,300', in the Banner district, 6 miles N. of Hayden Junction and 21 miles S. of Globe, Gila Co., Ariz. South of the property is the London & Arizona, S. W. is the Gila Canyon Copper and N. E. is the Copper Belt group of mines, all adjoining.

Examined in 1917 by J. M. Boutwell, C. H. James, E. H. Dawson and E. C. Brown.

Geology: the claims show diabase overlain by pre-Cambrian quartzite, capped by limestone. The diabase in places intrudes the upper formations. The sedimentary series has been distorted, faulted and intruded by a series of quartz porphyry and rhyolite porphyry dikes. Ore is gold and copper bearing and occurs as flat lenses or beds, replacing limestone and shale mainly along a bedding plane, but also as veins along contacts of quartz porphyry dikes and in places along fissures in limestone near dikes. The usual ore is gold-bearing, next in importance being copper-lead-silver ore.

Development: by 12 tunnels, from 40 to 320' long, and 6 shafts from 10 to 35' deep, on the Apex claims. No. 3 is in 320', and is said to have opened ore 250' long and 60' at the widest point. Forty samples ranged from 0.25 to 9 oz. gold, 2 to 10 oz. silver, and 7 to 35% lead. Above No. 3 tunnel is a 100' raise and below it a 200' winze. Shipments to El Paso totaled 365 tons, valued at \$10,004.

Property seems to have merit and the promotion to be conservatively handled.

LONDON ARIZONA CONSOLIDATED COPPER CO. ARIZONA

Office: 723 Title Insurance Bldg., Los Angeles, Calif. **Mine office:** Chilito, Gila Co., Ariz.

Officers: Chas. E. Finney, pres.; Herbert L. McNair, v. p.; Edw. W. Brooks, v. p.; Robert J. Simpson, sec.-treas., with F. B. Pugh, B. P. Cheney, D. Karl Kurtz, John E. Coffin and E. L. Finney, directors. Edward W. Brooks, cons. engr. and geologist. Harry Scott, supt.

Inc. Sept. 18, 1913, in Maine, as a merger of the London Arizona, London Range, London Shamrock and Ball Copper companies. **Cap.,** \$12,000,000; shares \$5 par, fully paid and non-assessable; 920,500 shares outstanding. **Bonds:** \$303,000 6% outstanding. Commercial Trust & Savings Bank, Los Angeles, trustee. Citizens' Trust & Savings Bank, Los Angeles, registrar. Annual meeting, first Tuesday in Oct. Company started out with a treasury fund of \$500,000.

Property: 132 claims, 2,300 acres, in the Banner mining district (Ray quadrangle), 5 miles N. of Hayden. Claims form a compact group covering an extensive, well-mineralized area.

Geology: the tract shows a series of 1,500' of well-bedded limestone, quartzite and shales resting on a laccolithic mass of diabase; these rocks are broken, faulted and later intruded by dikes and sheets of diorite porphyry, presumably the offshoots of an underlying batholithic mass of granite material. The ore occurs in contact metamorphic deposits and replacements, especially in the limestone. Much of the ore consists of garnet (andradite, the lime and iron species) intergrown with specular hematite copper sulphides

and a variety of iron-magnesian lime silicate minerals. The copper ore occurs largely in "blanket" deposits, but also in fissures and vertical contacts. The main ore outcrop is 10 to 30' wide and about three-fourths of a mile long, lying between beds of limestone and quartzite.

Silver-lead ores do not occur in the contact deposits, but are found in limestone along the dike contacts where contact alteration is not noticeable. Some 2,000 tons of lead carbonate ore shipped, 1913, averaged 28% lead, 40c gold and 3 oz. silver per ton.

Development: includes the 300' Curtain shaft, 182' Arizona, 190' Red Bird and 90' O'Carroll shafts, the 200' Roberts tunnel and 250' Johnson tunnel, total underground development amounting to 2,500'. The Roberts tunnel is developing what appears to be a large body of copper sulphides, carrying from 3-6% copper. Shipments of copper carbonates being made to Hayden smelter carry 5-8% copper, 1-5 oz. silver and from 20-40c gold.

Management plans development work on a comprehensive scale. The company has a strong directorate, an experienced management and promises to become an important producer.

In 1917, cons. engr. Brooks reported ore reserves of 200,000 tons, averaging about 4.5% copper, in the O'Carroll vein.

OVERLAND MINING CO.

ARIZONA

Mine near Winkelman, Ariz., adjoins the London Range mine of the London Arizona Copper Co. and "79" mine on the south and west. Claims carry an extension of the main dike system of the London range, showing metamorphic contact orebodies. Hayden Junction is the nearest railway point. Mine reported under lease to M. H. Murphy and W. E. Dunlap, of Kingman, in 1915.

Company has hoist, boilers, etc. No recent returns.

PINAL DEVELOPMENT CO.

ARIZONA

Address: 1401 No. 3rd St., Phoenix, Ariz.

Officers: J. C. Devine, pres., treas. and mgr.; E. A. Tovrea, v. p.; C. T. Carpenter, sec.; E. M. Blake, J. H. Robinson, E. P. Palmer and Arthur Luhrs, directors.

Inc. Dec., 1915, in Ariz. Cap., \$1,500,000; \$1 par; non-assessable; 700,000 shares issued.

Property: 47 claims, 940 acres, known as the Renfro group, near Hayden, Ariz., adjoins the Troy-Manhattan at Troy, nearly due E. of Ray, Pinal Co., Ariz. Ore occurs on plane between limestone and shale, as irregular replacements on bedding plane. Ore horizon, 15' thick. Ore carries oxidized copper minerals, no sulphides being found; also carries low gold-silver values and 10 to 20% copper.

Development: by several tunnels, main one 1,600' long, with about 2,500' of workings to depth of 600'. In June, 1917, a 3' streak of high-grade copper ore was struck, and a raise and winze were driven on it. Production started Sept., 1917.

Property is under excellent management, and is regarded as a legitimate mining venture.

SADDLE MOUNTAIN MINING CO.

ARIZONA

Office: 902 Chapel St., New Haven, Conn.

Officers: Frank M. Travis, pres.; C. M. Robinson, sec.-treas.

Inc. 1902, in Arizona. Cap., \$2,500,000, increased from \$1,000,000; shares \$1 par; outstanding, 1,306,585 shares. Bonds: none.

Property: consists only of \$300,000 par value of the capital stock of the Gila C. Sulphide Co., which acquired in October, 1909, the property of the Saddle Mountain Mining Co., subject to the latter's authorized outstanding first mortgage bond issue of \$1,000,000, all of which was ex-

changed for an equal issue, \$1,000,000 first mortgage 6% bonds of the Gila Copper Sulphide Co., due April 1, 1918, convertible at par into stock of the Gila Copper Sulphide Co., at the option of the bondholder. Interest payable April 1 and October 1. Of this issue, prior to December 1, 1917, \$248,600 par value were retired out of earnings, leaving outstanding, December 1, 1917, \$751,400, due, principal and interest, April 1, 1918.

For description of the property, see Gila Copper Sulphide Co.

TROY ARIZONA COPPER CO.

ARIZONA

Address: A. K. Sloan, sec.-treas., 15 Maiden Lane, New York City. **Mine office:** Kelvin, Pinal County, Ariz.

Officers: John F. Galvin, pres.; Calvin Page, v. p.; Brackley Shaw and Henry Rudolph, directors. R. G. Mead, supt.

Cap., \$3,000,000; shares \$10 par. Company is a reconstruction of the old Troy Copper Co., succeeded by Troy-Manhattan C. Co., which in turn was succeeded by the Troy Consolidated Mining Co., fully described in Vol. IX, Copper Handbook. Operations of all these "Troy" companies proved disappointing.

Property: 85 claims, 1,600 acres, 3½ miles N. E. of Erman, on the Arizona Eastern R. R., known as Troy, Climax and Manhattan groups. The Troy group said to have 12 and Manhattan group 6 veins.

Development: reported to aggregate over 5 miles, including several shafts, deepest 500'. Company's engineer stated that while a large tonnage of ore is not blocked out, yet with a moderate amount of work several hundred thousand tons could readily be made available. Examined and reported on by Leo Von Rosenberg, but inspection proves the work very superficial and conclusions, in our opinion, unwarranted.

In Aug., 1917, a 500' shaft was being sunk at the Climax claim, to explore the sulphide zone. Mine is producing and shipping. Teaming costs are high, which makes it necessary to sort ore carefully.

Present management considered good and property promising.

HUMBOLDT, INCLUDING BIG BUG, YAVAPAI COUNTY

ALADDIN MINING CO.

ARIZONA

W. A. Kent, mgr., Prescott, Ariz., writes as follows: "I do not feel at liberty to fill out blank you send. All those entitled to receive the information asked for receive it direct." Company has a 5-year lease on Paymaster mine and 8 other claims, the property of the Oriental Mining Co., in Big Bug district, near Poland. Lottie mine of same group has 4,400' tunnel and 20-stamp mill.

ARIZONA COPPER-GOLD MINES CO.

ARIZONA

Office: 1011 Pabst Bldg., Milwaukee, Wis. **Mine office:** Cherry, Yavapai Co., Ariz. R. H. Burmister, pres. and gen. mgr.

Inc. Oct. 12, 1903, in Arizona, as Arizona Gold Lode Mines Co., and reorganized, April 10, 1906, under present title. **Cap.,** \$1,500,000; shares \$1 par. Company thrown into receivership and property acquired February, 1914, by bondholders, who plan reorganization and continuation of development work.

Lands: 17 claims, 340 acres, in the Cherry Creek district, 15 miles north-east of Humboldt, including the Bugler group of 4 claims. Development includes several short tunnels, and the Leghorn shaft of 600' depth, with about 3,500' of workings, on a 2' fissure vein. The ore apparently averages about 2% copper, with gold values.

Equipment: includes a 40 h. p. hoist, good for 1,000' depth, and a 3-drill air compressor. A 40-ton mill, at the Leghorn shaft, has a 10' Lane slow-speed Chilean mill. For early history, see Vol. XI, Copper Handbook.

ARIZONA NATIONAL MINING CO.**ARIZONA****Address:** Humboldt, Ariz.

Inc. July, 1916. **Cap.**, \$250,000; increased March, 1917, to \$500,000; shares \$1 par.

Operates the Anderson silver-lead mine, about 2 miles west of Humboldt. Has a small mill. Shipping some ore and concentrates in 1917.

ARIZONA SMELTING CO.**ARIZONA**

Merged with Consolidated Arizona Smelting Co. in 1914.

BELCHER MINING CO.**ARIZONA**

Apparently inactive, and letters returned by P. O. from Providence, Ariz. Fully described, Vol. XII.

BLACK CHIEF COPPER CO.**ARIZONA**

Mine near Dewey, Yavapai Co., Ariz. John Milligan, pres.; J. M. Sullivan, v. p.-mgr.; Eugene Milligan, sec.-treas.; preceding officers are the directors.

Inc. 1908, in Arizona. **Cap.**, \$2,000,000; \$1 par; 1,170,000 shares issued. Annual meeting, 2nd Tuesday in July. About \$30,000 expended to date.

Property: 6 claims, 10 miles south of Jerome, known as the Uncle Sam group, has tunnel, 200' shaft, drifts and crosscuts, with a total of 1,300' of underground workings, showing ore said to give assays up to 25% copper, \$4 gold, \$3 silver, 6% zinc and 10% lead. Has a hoist and 2 pumps. Plans doing extensive development work during next two years.

CHAPARRAL MINING CO.**ARIZONA**

Officers: L. W. Smith, Cleveland, Ohio, gen. mgr.; J. F. Rogers, Columbus, Ohio, sec.-treas.; W. H. Jones, Chaparral, Ariz., supt.

Company has a lease on the Little Jessie gold mine, owned by the Ohio Mines Co., at Chaparral, Yavapai Co., Ariz.

Property has not produced much since 1897. Production at that time was \$800,000. Active operations last year were discontinued till the 650' shaft is retimbered to the bottom.

Management states that lack of capital prevented development and production in past, and that operations will be resumed shortly.

CONSOLIDATED ARIZONA SMELTING CO.**ARIZONA**

Office: 15 Broad St., New York City. **Mine offices:** Mayer and Middleton, Yavapai Co., Ariz. **Smelter and works office:** Humboldt, Ariz. G. M. Colvocoresses, gen. mgr.; W. V. de Camp, supt.

Officers: C. A. Kittle, pres.; E. S. Hooley, v. p.; F. A. Dillingham, v. p.; F. W. Thompson, sec.-treas., with R. W. Kelley, H. E. Rogers, J. H. Flagler, C. W. Hill and R. M. Thompson, directors; O. F. Janssen, aud.

Inc. Dec. 22, 1908, in Maine. **Cap.**, \$9,200,000; shares \$5 par; 1,663,000 issued. 177,000 reserved for bond conversion. Bonded debt: \$1,200,000 5% 30-year income bonds authorized, \$885,000 outstanding, and \$1,000,000 6% 20-year gold bonds, \$250,000 outstanding. In June, 1917, it was decided to purchase at par, \$250,000 of the refunding 6% bonds, the full amount outstanding of this issue. Payment will be spread over 3½ years after which the property will be free of mortgage indebtedness.

Dividends: initial dividend of 10c a share was declared June 28, 1917; 5c paid Aug. 15, and 5c on Nov. 15.

Acquired at foreclosure sale the properties of the Cons. Ariz. Sm. Co. (see Vol. X), and the Ariz. Sm. Co. The intricate relationship of the old company and its subsidiaries is fully described in Vol. X.

Columbia Trust Co., trustee of 6% bonds; Equitable Trust Co., trustee of 5% bonds; Guaranty Trust Co., transfer agents; all of New York City.

Balance sheet of Dec. 31, 1916, showed: current assets of \$952,399 which included \$624,819 in cash, bullion, etc.; inventories, \$317,199; current liabilities, \$446,728; leaving \$306,203 as surplus. Total assets, \$10,202,932, in-

cluding property, \$9,250,533; profit and loss account showed net profit of \$859,014 derived from gold, silver, and copper produced, valued at \$3,686,535 at a production cost of \$2,813,770. Interest charges on 6% bonds were \$13,750.

Earnings for nine months in 1917 were \$685,777 compared with \$566,725 for same period in 1916.

Property: 40 claims, 20 patented, 725 acres, near Mayer and near Middleton, Yavapai Co., Ariz. The most valuable mines owned are the Blue Bell and De Soto mines. The smelter is at Humboldt.

The Blue Bell mine, 3 claims, carries fissure veins with quartzite foot and granodiorite hanging wall.

Development: 6 shafts, deepest 1,000' and 2 short tunnels, with about 19,000' of underground workings. Ore contains pyrite and chalcopyrite, all slightly argentiferous and auriferous. The Blue Bell vein was opened for 350' on the 1,000' level, where it is 15' wide, and averages 3.3% Cu. with 1.2 oz. silver and .04 oz. gold per ton. In Oct., 1917, this vein was being opened at 1,200'.

New work in 1916 totaled 4,819' at a cost of about \$13.11 per foot, developing about 319,750 tons of ore. Produced 75,070 tons with average content of \$1.70 in gold and silver and 3.278% copper. Reserves estimated at 479,500 tons carrying 3.3% copper and \$1.50 in gold and silver on Dec. 31, 1916, of which 21,248 tons were broken in the stopes.

Mine is connected with the Bradshaw Mountain R. R. by a tram line, and has electric machinery taking current over an 18-mile transmission line.

The De Soto mine is developed by 4 tunnels, 5,000' in length, to depth of 1,000', with total workings of 13,000'. New work, in 1916, totaled 1,814', at a cost of \$9.53 per ft. Ore reserves amounting to 72,882 tons were developed of about the same average grade as the Blue Bell ore. Reserves estimated, Dec. 31, 1916, at 103,500 tons. Production in 1916 was 34,382 tons, carrying \$1.58 silver and gold and 3.375% copper.

Ore reserves: for both the Blue Bell and De Soto mines are given as 583,000 tons.

Equipment: the reduction plant, well placed for custom business, includes sampling, concentrating, roasting, smelting and converting departments, with a machine shop and smithy. All buildings are of structural steel frame, with brick walls or corrugated-iron sheathing, floored with cement. This plant was reconstructed in 1914, and is described by G. M. Colvocoresses, in the Eng. and Min. Journal, Sept. 5, 1914, p. 425. It consists of one 22½', 7-hearth Wedge roasting furnace, 2 reverberatory furnaces, one blast furnace and 2 converter stands with basic lined converters. The blast furnace has treated 10 tons per sq. ft. of hearth. (See Mng. & Sci. Press, July 21, 1917.)

A 250-ton Minerals Separation flotation plant was installed in 1913. The concentrator has two 200-ton units, each having one 10x20" and two 7x10" Blake crushers, 1 centrifugal crusher, 3 elevators, 2 sets of rolls, one 25' Hancock jig, 10 Wilfley tables, 8 Overstrom tables, 8 vanners, 4 trommels, 8 Callow tanks and Richards, Johnson and Anaconda classifiers. The mill has a large slime pond, and overflow water is returned to the mill for re-use.

During 1916, \$359,482 was expended for new construction. The concentrator was largely rebuilt; the crushing and sampling plants, destroyed by fire, were rebuilt; blast furnace was reconstructed to treat 250 tons daily; new roasting plant should be completed in 1917.

During 1916, 80,304 tons of ore and old tailings were treated, making

an average recovery of 92.5% copper; 80.3% gold and 79.9% silver values. The ratio of concentration was 3.28 to 1; the mill produced 24,514 tons concentrates, containing 9.68% copper. Management plans to increase capacity from 220 tons in 1916 to 500 tons in 1917, erecting new crushing and receiving plant, in 2 sections, 1 for concentrating and 1 for smelting ores. Average cost of milling, including flotation royalty was \$1.51 per ton in 1916, as against \$1.20 in 1915. See Concentration at Humboldt, Ariz., E. & M. J., July 14, 1917.

The first unit of the remodeled smelter is a 7-hearth Wedge roaster, 22' 6" diam., fitted with auxiliary oil-burners and supported on step bearings instead of trunnion. There are two reverberatory furnaces, burning oil and rated at 400 tons daily capacity. Matte from the reverberatory furnaces is tapped into a launder, which delivers it to a ladle in the converter room. Production averages 1,000,000 lbs. blister copper per month from company ore and custom material. The blast-furnace department has both lead and copper stacks, with a 200-ton 48x60" lead furnace, and a 250-ton water-jacket blast furnace for copper. Slags are granulated. The stack is of reinforced concrete, 180' high, 18' in diameter at the base and 11' at the top.

The converter department has 2 stands, with shells of barrel type, rotated electrically. Equipment includes a 40-ton Whiting electric crane with a 15-ton auxiliary crane, cranes also taking hot slag from the converters and pouring same into the reverberatories and delivering shells.

The power plant has four 345 h. p. Stirling water-tube boilers, burning waste gases from the reverberatories, steam being sent therefrom through a 10" pipe line, under 150-lb. pressure. Machinery includes 2 Connersville blowers, a Nordberg duplex cross-compound air compressor, with 40x42" air cylinder and 18x36x42" steam cylinders. There are two 300 k. w. 480-volt 3-phase 60-cycle generators, direct-connected to two 16x32x36" Nordberg cross-compound engines, and an electric turbine pump. Electric power is furnished the Blue Bell mine, 18 miles distant, current being transmitted at 15,000 volts, stepped down to 440 volts, at the Blue Bell transformer station.

The smelter treated 103,748 tons of ore and concentrates in 1916, producing 11,989,139 lbs. copper; 150,012 oz. silver; 5,972 oz. gold, which is double the production of 1916. Shipments averaged 6.68% copper and .062 oz. in gold and 1.55 oz. in silver per ton. Total cost per pound copper produced was 13.901c as compared with 13.32c in 1915, and average price received was 28.87c. Total cost of milling, including flotation royalty was \$1.51 per ton as compared with \$1.20 in 1915, and smelting cost was \$3.94 per ton as against \$3.34 in 1915.

Production:

	Tons Mined	Copper lbs.	Silver Oz.	Gold Oz.	Profit
1917*	107,077	5,969,300	124,294	4,894	\$685,777
1916	109,452	7,242,347	127,228	4,858	859,015
1915	90,531	5,473,740	100,682	3,174	194,943

* From Jan. 1 to Sept. 30.

Management is working along sound and progressive lines.

FORD MINING CO.

Probably dead. Described, Vol. XII.

ARIZONA

HUMBOLDT CONSOLIDATED COPPER CO.

Formerly Shill Gold Mining Co., and name changed, 1917.

Address: c/o Salt River Valley Bank, Mesa, Ariz.

ARIZONA

Officers: F. J. Davis, pres.; G. W. Silverthorne, sec.-treas.; M. G. Shill, Frank Griffin and W. J. Lempke, directors.

Inc. 1914, in Ariz. **Cap.**, \$1,200,000; shares \$1 par. Company offered 50,000 shares at 50c in Jan., 1917.

Property: the Mesa Copper Group, one mile south of Humboldt smelter, shows veins in Yavapai schist belt.

Development: two shafts with levels at 100' and 200', said to block out 12,500 tons of \$12 to \$75 ore.

HUMBOLDT ORE CO.

ARIZONA.

Controlled by Consolidated Arizona Smelting Co.

MOUNTAIN DRIVER & CALAMITY JANE MINES

ARIZONA

Address: Alex Denny, Chaparral, Yavapai Co., Ariz.

Property: two claims, 40 acres, near Henrietta, in Big Bug district, 8 miles from Humboldt smelter. Ore occurs in quartz-porphphy and carries copper and gold.

Development: consists of 150' shaft. Not working at present.

OHIO MINES CO.

ARIZONA

Office: 614 Outlook Bldg., Columbus, Ohio.

Officers: H. W. Whitaker, pres.; J. M. Rittenour, v. p.; J. F. Rogers, sec.-treas.; preceding officers, R. S. Barbee, Thos. M. Murphy, W. G. Brossman, H. W. Whitaker, J. D. Brown, L. W. Smith and J. S. Jones, directors.

Inc. Jan., 1909, in Arizona. **Cap.**, \$2,500,000; shares \$1 par; in \$200,000 preferred and \$2,300,000 common stock; issued 1,810,837 shares; \$250,000 first 7% mortgage notes, \$50,000 issued. Annual meeting, third Monday in January.

Property: 14 claims, partly patented, 400 acres, with a 5-acre mill site, and water-rights on the Agua Fria River, 6 miles from the mine, in the Big Bug district. Property was bought of the Jessie Mines Co., whose promoters managed to escape jail.

Ore: gold, with small silver values, occurring in granite.

Development: by 3 shafts, 659', 206' and 200' deep, with 7,000' of workings, and the mine is said to have produced upwards of \$750,000 in gold, under an ownership previous to that of the Jessie Mines Co. Property under lease to Chaparral Mining Co., which has been doing development work only since Jan., 1916.

SHILL GOLD MINING CO.

ARIZONA

Name changed, 1917, to Humboldt Cons. Copper Co., which see.

WOLF ARIZONA COPPER CO.

ARIZONA

Office: Carl H. Wolf, 26 Cortlandt St., New York. **Mine office:** McCabe, Yavapai Co., Ariz.

Officers: Carl H. Wolf, pres.; H. C. Wolf, sec., and W. J. Woestendick, treas. Above are the directors.

Inc. in Delaware. **Cap.**, \$1,000,000; shares \$1 par; non-assessable. Expenditures in 1916, \$15,000.

Property: 7 claims, 6 patented, 85 acres, in Big Bug district, Yavapai Co., Ariz., includes the McCabe and Gladstone mines. Examined by O. Longacre and W. C. Thomas. Claims said to show a vein in quartz diorite, dipping 75° and pitching E.-W. Ore shoots are from 10" to 5' wide. Ore carries zinc, lead, gold, silver and copper; first class averaging \$35 and second class \$15 per ton.

Development: by 800 and 1,100' incline shafts, workings totaling about 5 miles. Reserves blocked out are given as 4,000 tons first class and 40,000 tons second class ore.

Equipment: includes steam hoist, compressor, pumps, 10-stamp mill and 100-ton Callow flotation plant.

Company is said to have a dump containing 20,000 tons of \$6 tailing available for treatment.

JEROME (VERDE) DISTRICT, YAVAPAI COUNTY

This list includes several companies operating at Payson, in the Tonto Basin country.

ARIZONA VERDE COPPER MINING CO.

ARIZONA

Mail returned from the advertised post-office address: c/o W. M. Lazenby, P. O. Box 814, Phoenix, Ariz.

Property: 26 claims, near Clarkdale, a $\frac{3}{4}$ interest in 16 claims in the New River district and 41 claims in the Cave Creek district. Company also has a 2-year option on 1,700,000 shares of stock in the Golden Reef Mining Co., owning the Golden Reef mine, 35 miles from Phoenix. Offering stock at 50c a share, May, 1917, solely on the prospective value of its holdings, calling itself "a corporation, with the possibilities of another Guggenheim Exploration Company," which is interesting, if true.

ARKANSAS & ARIZONA COPPER CO.

ARIZONA

Office and mine: Jerome, Yavapai Co., Ariz. John F. Boyle, pres.; H. P. Tear, v. p.; J. E. Leeper, mgr., Jerome, Ariz.; H. N. Jasper, sec.-treas., Little Rock, Ark.; preceding officers and W. D. Tickner, directors; W. H. Galligan, supt.

Inc. June 25, 1906, in Arizona. **Cap.**, \$1,500,000; increased Jan., 1912, to \$3,000,000, and 1916 to \$6,750,000; shares \$1 par. Company refinanced in 1915 and bond issue of \$150,000 authorized for further development work; \$68,800 issued.

Property: the Royal Irish group, 14 claims, 280 acres in the Verde district. Claims show felsite porphyry and diorite cut by olivine basalt dikes running north and south and dipping 60° to the east. Orebodies lie on each side of the basalt in the porphyry and quartz schist. Orebody said to be 85' wide where encountered on 1,400' level and shows chalcopyrite and some bornite. Extent of shoot not yet determined. Company acquired the adjoining claims, 230 acres, of the Mowles Copper Co. in May, 1916.

Development: by 1,650' shaft with about 6,000' of workings.

Equipment: includes three 150 h. p. boilers, 1 hoist good for 2,000', air compressors, machine shop, power house, and a mile of road, connecting with United Verde Copper Co. railroad. Employs 50 men. Controlled by the Goodrich-Lockhart Co., 60 Broadway, New York City.

The property was shut down indefinitely, August, 1917, after spending \$100,000 in a crosscut on the 1,000' level. The pumps are out, but conditions warrant drifting on the pyrite bodies cut in the crosscut, in the hope of getting copper ore.

BALLARD GROUP

ARIZONA

Address: S. S. Ballard, Jerome, Ariz., owner. Formerly owned by United Verde, Jr. Co.

Property: 110 acres, 86 patented, at Jerome, midway between United Verde Copper Co. and United Verde Extension on the north and Copper Chief, Equator and Green Monster on the south. Development work amounts to 1,100'. Ore contains copper, gold and silver.

BIG JEROME COPPER CO.

ARIZONA

Fiscal office: Arizona Securities & Trust Co., Phoenix, Ariz.

Officers: L. L. Wallace, pres.; F. M. Dorsey, v. p.; Fred T. Sheppe, sec.; above, with C. T. Talbert and J. B. Bourne, directors.

Inc. in Arizona. **Cap.**, \$2,500,000; shares 25c par; 5,000,000 shares given in payment for property are pooled, balance are said to be treasury share.

Property: 32 claims, about 640 acres, $1\frac{1}{2}$ miles S. W. of the United Verde Co. and adjoining the Pittsburg Jerome property and the Copper Shoe group in the southern part of the camp, near the Shea group.

BLUE MONSTER COPPER CO.**ARIZONA****Address:** Room 817, 7 Water St., Boston, Mass., and Cherry, Ariz.**Officers:** L. N. Wombacher, pres.; Thos. Sutcliffe, v. p.; Jos. H. Morgan, sec., Prescott; P. J. Keohane, treas., with Jos. Lee, directors.**Inc. Dec. 26, 1916, in Arizona. Cap., \$2,000,000; shares \$1 par.** Property acquired for 640,000 shares, which are held in pool until \$75,000 has been raised for development work.**Property:** 33 claims, unpatented, and a water right on Cherry Creek, in the Verde mining district, Yavapai County, 12 miles S. E. of Jerome, 32 E. of Prescott. The group is said to be located along the great Verde fault, which drops limestones against schist, and in this group is in places covered by conglomerate and lava flows. The crushed zone, 300' or more wide, in this group, iron stained, and shows green copper stains, and on Blue Jay claim 4' of 2% ore. W. B. Fisher reports that he believes valuable ore in commercial quantities will be found by development. Experience at the various Jerome properties shows the faulting to be post mineral and the ore seen in the fault either drag or due to deposition by surface waters.

- Property favorably reported on by W. C. Thomas and Cyril Wigmore. Work had not yet been started, September, 1917.

BOSTON & JEROME COPPER CO.**ARIZONA****Office and mine:** Jerome, Ariz. Contract held by S. F. Valentine and associates, Jerome, Ariz., who bought out J. C. Scott and others in December, 1916, after the mine had been inactive for years.**Directors:** include Richard Kingdon, Supt. U. V. Extension, E. S. Clark, J. S. Acker, L. E. Hesler of Prescott, and E. C. Farrell of Clarkdale.**Inc. 1907, in Arizona. Cap., \$1,500,000; shares \$1 par; increased, May, 1908, to \$2,500,000; shares \$5 par; issued \$129,090. Listed on San Francisco Exchange and New York Curb.****Property:** the Juniper group of 9 claims, 146 acres, 2 miles south of Jerome, north of the Verde King (or Verde Central), and adjoins outlying detached claims of the U. V. Copper Co. There is a limestone cap over much of the property, but copper staining is said to show in some places.**Development:** includes 3 tunnels of 400' aggregate length, and a 130' shaft, sunk on a large porphyry and schist reef carrying copper sulphide in small amount in bottom. Property was idle from Feb., 1908, to 1917. Is a prospect, that is west of the well-recognized mineral belt of the district, though considered to be worthy of exploration.**CALUMET & JEROME COPPER CO.****ARIZONA****Office and mine:** Jerome, Yavapai Co., Ariz.**Officers:** G. W. Avery, pres. and gen. mgr.; C. M. Garrison, v. p.; Geo. H. Avery, sec.-treas.; preceding, with Chas. P. Avery and John Rauber, supt., directors.**Inc. May, 1907, in Arizona. Cap., \$1,500,000; shares \$1 par; issued 600,000. Money on hand May 1, 1917, \$160,000.****Property:** 7 claims, 3 patented, 100 acres, one-half mile south of the United Verde mine, and adjoining the Cleopatra. Claims show schist and quartz porphyry in part cut by basalt and covered by basaltic tuff. Rocks are identical with those of adjacent properties. New shaft going down through basalt, and cutting schist showing scattered particles of iron and of copper sulphides in places.**Development:** includes a main 8' x 15' shaft now 600' deep, several tunnels, one 115', a new main tunnel, now 1,100' long. It was sunk on the N. & S. fault on Remington claim. At 360' it is reported to have passed through the fault into mineralized green schist. Headings on the 600' level

are said to show "schist impregnated with pyrite and chalcopryrite, and similar rock is cut in a winze sunk from the 600' level."

Equipment: a 285 h. p. McIntosh Seymour Diesel engine direct connected to a 200 K. V. A., C.-W. Generator and Exciter with Panel board and G. E. current regulator for 480 volts; a No. 10 Imperial, I.-R. Type, 513 cu. ft. compressor driven by a 75 h. p. Westinghouse motor; Lidgerwood double drum hoist counter balance, driven by a 75 h. p. Westinghouse motor, good for 1,600' depth; No. 17 Buffalo blower driven by 10 h. p. A. C. motor; No. 5 Leyner drill sharpener and oil furnace; 9 I.-R. jack hammer drills; 2 No. 148 Leyner Ingersoll drilling machines; No. 7 Cameron special sinking pump; 2, 4 stage No. 3 electric station pumps, cap. 170 gal. per min. against 540' head, driven by two 50 h. p. A. C. motors. There are 3 cages, 8 mine cars; 40' head frame; two 5,000 gal. cooling towers; two 5,000 gal. water tanks; two 10,000 gal. crude oil tanks.

The market manipulation of the stock and the misleading and often false statements given by various newspapers concerning alleged ore-bodies disclosed by crosscuts and drifts of the mine, have hurt the good name of a promising prospect.

CALUMET & VERDE COPPER CO.

ARIZONA

Address: Jerome, Ariz.

Officers: John Rauber, pres.; H. M. Gibbes, sec.; Geo. S. Avery, Wm. Blue and N. C. McLeod, directors, being Calumet-Jerome interests.

Inc. Nov., 1916, in Ariz. Cap., \$1,000,000; shares \$1 par.

Property: a 2/3 interest in 4 claims, 3 patented, viz., 101, 102 and 103 and the Ohio; 1/3 interest owned by Hon. W. A. Clark. Claims show chalcopryrite and glance ore in black schist.

Development: a 300' tunnel and shallow shafts.

CHERRY CREEK MINES CO.

ARIZONA

Mine office: Cherry, Yavapai Co., Ariz. Main shaft, 115', said to show a vein with 3' paystreak giving assays of about 12.5% copper, 4 oz. silver and \$9.60 gold per ton. Drilling operations reported in 1914.

CLEOPATRA COPPER CO.

ARIZONA

Is controlled by United Verde interests. Jerome, Yavapai Co., Ariz.

Officers: R. E. Tally, pres.; Thomas Taylor, v. p.; S. F. Denison, sec.; preceding officers H. R. Brown and C. V. Hopkins, directors.

Inc. 1901 in Arizona. Cap., \$10,000,000; shares \$1 par, assessable; 8,644,156 shares issued.

Property: 11 patented claims, about 149 acres, south of the United Verde mine in the Verde mining district, shows fissure and gash veins carrying ores assaying 1 to 65% copper and 1 to 500 oz. silver per ton, with fair gold values. Has 6 shafts, of 25 to 150' depth, and 9 tunnels, the Dillon tunnel, 3,200' long, planned to connect with the "1888" shaft.

CONS. KING DEV. & COLUMBIA COP. MG. CO.

ARIZONA

Controlled by United Verde Co.

Office and mine: Jerome, Yavapai Co., Ariz.

Officers: R. E. Tally, pres.; S. F. Denison, sec.; C. L. Nabers, auditor.

Inc. in Arizona. Cap., \$6,000,000; shares \$1 par.

Property: 11 claims, 154 acres, south of the United Verde mine, showing several bodies of oxidized and sulphide ores, carrying fair values in copper, gold and silver. Mine has a 100' shaft and a 750' tunnel, with about one-half mile of workings. Idle since 1913.

COPPER CHIEF MINING CO.

ARIZONA

Worked under lease and bond by Hayden Development Co., Jerome, Yavapai Co., Ariz. W. S. Fulton, pres., Waterbury, Conn. Owned by

the Hayden and Midgeon estates, Torrington, Conn., Franklin Brooks, Colorado Springs, Colo. and Arthur Hendeby. J. F. Matson, supt.

Property: 21 claims, 11 patented, adjoining Senator Clark's Iron King mine in the Black Hills range, $3\frac{1}{2}$ miles S. E. of Jerome. Two isolated claims cover the water supply and mill-site. The claims are in the belt of metamorphosed igneous rocks and schists, forming the southern extension of the United Verde or Jerome schist area. The Copper Chief-Iron King orebody which runs across 3 of the claims, is 60 to 95' wide, and consists of copper-bearing iron oxide carrying gold, silver and a little copper, the total value being from \$8 to \$13 per ton.

Development work on this deposit shows that it extends downward about 315' below the outcrop. Material composing this lens is completely oxidized from the surface down to a depth of 226'. The bottom of the lens consists of massive pyrite with about 5' of enriched ore between the sulphide and the overlying oxidized material. Less than half of the orebody is payable ore in the oxidized zone and about 15% of the lower lying sulphides can be mined at a profit.

Development: by 400' shaft, 2,225' of work on the 100', 160', 220' and 280' levels. The Wonderful shaft now being sunk is 100' deep. A crosscut tunnel is being driven to connect with the bottom of the shaft. Mine reported to have a large tonnage of low-grade oxidized ore, which cannot stand transportation to a distance. Future of the property depends upon development of sulphide ore in quantity.

Ore reserves: 58,000 tons of oxidized ore of \$12 gold and silver content; 8,240 tons of mixed oxide and sulphide, 1,000 tons of \$50 per ton enriched ore and 8,000 tons of other ores running from \$15 to \$25 per ton.

The Wonderful claim has been developed by a 160' tunnel and 4 winzes with ore estimated at \$25,000.

Equipment: includes 200-ton cyanide mill, erected in 1915, electric power, air compressor and hoist. Company employs 30 men; operations having been curtailed more than 50% in June, 1917, because of the high cost of supplies and labor. Mill temporarily shut down.

Production: from Jan. 1, 1916 to Nov. 1, 1916, was 30,148 tons with total net profit of \$48,199. Gross value of ore milled was from \$8.03 to \$13.72 per ton with a recovery of 66% to 79%. Smelter shipments, Sept., 1917, amounted to about 320 tons of 3% copper ore per month.

COPPER LODGE MINES CO.

ARIZONA

Address: care Industrial Dev. Corp., 608 South Dearborn St., Chicago, Ill.

Mine in the Cherry Creek district between Jerome and Mayer, Ariz. H. P. Dickinson, managing director and supt. in charge.

Inc. Feb., 1917 in Arizona. Cap., \$1,500,000. Controlled by Industrial Development Corp.

Property: Leghorn mines of 8 patented claims held on 4 year bond and lease for \$100,000. Former operators sunk an inclined shaft to 640' with drifts at every 100', and are reported to have opened up gold bearing ore on each level averaging \$20. The vein $1\frac{1}{2}'$ to 4' wide is a true fissure in granite. A Lane mill was built and \$80,000 in bullion recovered. Internal dissension closed the property. Present company have renovated the mill and resumed operations, July, 1917.

Development: 640' shaft, unwatered June, 1917, and now being sunk to 1,000' level. Copper ore occurs on 400' level. It is said that in bottom of shaft stringers of solid copper sulphides assaying 40% have been encountered.

DUNDEE-ARIZONA COPPER CO.**ARIZONA**

Phoenix, Ariz.

Officers: Alex. Mackay, pres.; W. C. Foster, v. p.; A. J. Smith, sec-treas., with L. H. Chalmers and F. S. Stephen, directors.

Inc. March 21, 1916, in Arizona. **Cap.**, \$500,000; shares \$1 par; -out-standing 425,000 shares, of which 225,000 belonging to F. S. Stephen and Alex. Mackay, former owners, were in escrow until Sept. 20, 1917. Equitable Trust Co., New York, transfer agent. U. S. Corporation Co., New York registrar. Listed on New York curb as a prospect.

Treasurer's statement of Jan. 31, 1917, shows assets, \$726,446, which includes cash, \$55,309; accounts receivable, contracts sale treasury stock, \$40,875; mining property, \$512,495; buildings, machinery, \$13,088; mine development and office expenses, \$29,680.

Property: 2 claims, the Greenup and Greenflower, lying between United Verde Extension on the east and Jerome Verde on the west, at Jerome; also a half interest with the United Verde Extension Co. in Jerome Tunnel Co., consisting of 5 claims and tunnel rights.

Claims show a blanket deposit of 6% conglomerate ore on the surface, 900' long and 5' wide, now being mined and shipped and reported to net the company about \$20 a ton.

Bottom of shaft is in cherty limestone with 40' to 75' of sandstone below it and above the ore bearing schist.

Development: main shaft is 475' deep; main tunnel, 220' long, with total underground workings of 984'.

Equipment: includes 80 h. p. gasoline engine and 500 cu. ft. compressor. New pumping plant installed, 1917, will permit resumption of shaft sinking.

EQUATOR MINING & SMELTING CO.**ARIZONA**

Idle. Office: 20 Exchange Place, New York, N. Y. **Mine office:** Jerome, Yavapai Co., Ariz.

Officers: Hon. Wm. A. Clark, pres.; Jas. A. MacDonald, v. p.; Harry H. St. Clair, sec.-treas.; preceding with Chas. W. Clark and Jas. H. Anderson, directors.

Inc. March 19, 1900, in West Virginia. **Cap.**, \$500,000; shares \$5 par; issued, \$250,000. Annual meeting, third Monday in February.

Property: the Iron King mine, on Equator hill, adjoining the Copper Chief, 6 miles by wagon road, south of Jerome, shows a lenticular, canoe-shaped body of pyrite ore in schist near a granite porphyry contact. Mine owns North half of the Copper Chief orebody.

Closed down since 1904.

EUREKA GOLD AND COPPER MINING CO.**ARIZONA**

Address: Jerome, Yavapai Co., Ariz. Dr. A. J. Murietta, pres.; A. A. Macpherson, sec.-treas.

Property: 8 claims, 7 miles south of Jerome, near the Iron King mine, is opened by 2 tunnels, showing a 30' vein with an 8' paystreak carrying bornite and chalcopryrite, with occasional visible gold, but has not developed ore in commercial quantities. Mainly idle, for some years, excepting annual assessment work.

GADSDEN COPPER CO.**ARIZONA**

Address: Jerome, Yavapai Co., Ariz. J. K. Hooper, supt.

Officers: M. S. Cunningham, pres., Bisbee; Fred Sutter, sec.

Inc. in Dela. **Cap.**, \$1,000,000; shares \$1 par; 300,000 issued for property. Control is held by the Calumet & Arizona Mining Co., which has an option on 70% of the stock, agreeing to spend \$100,000 on the property, or about \$10,000 monthly.

Property: 35 claims, including the Monster, News Mining Co., Walker-Larrimore and Howe groups. Land lies between the United Verde Extension and Green Monster properties.

Development: sinking a 3-compartment shaft to 1,000' depth was started, Jan., 1917. Work was retarded by bad ground and much water, but a depth of 740' had been reached by Oct. 21st, 1917.

The site selected for the shaft is in the limestone covered area, north of the great Verde fault and about $\frac{3}{8}$ mile from the Verde Combination shaft. Although this site shows no mineralization whatever, it is calculated by C. & A. engineers to reach underlying geological conditions of promise. Schist was cut at 400' and quartz and jasper at 700' in depth.

Equipment: one of the best in the camp, includes electric hoist and pump. Average flow of water is from 40-45 gal. per minute. Employs 32 men.

GILA COUNTY EAST VERDE MNG. & SMTG. CO. ARIZONA

Address: Payson, Gila Co., Ariz., in Tonto Basin, East of Jerome.

Inc. 1917 in Ariz. Cap., \$750,000; shares \$1 par.

Directors: W. W. Brooker, E. R. Oliver, F. H. Gardner, T. S. Rush, O. L. Scribner, E. R. Lindsey and F. W. Washichek.

The articles of incorporation show the usual preamble, but specify no special property to be developed as yet.

GRAND ISLAND MINING CO. ARIZONA

Address: Jerome, Yavapai Co., Ariz. Jas. P. Rice, supt.

Officers: R. E. Morrison, pres.; P. Smily, v. p.; E. Rucker, sec.; D. J. Shea, treas., with W. W. Elliott, directors.

Inc. 1908 in Ariz. Cap., \$1,500,000; \$1 par; 1,424,395 shares issued.

Property: 14 claims, in the Jerome Copper district, adjoining the Copper Chief and Shea mines on the south. Idle since 1912, until company secured funds during the boom of 1916. Claims show a quartz vein in porphyry schist and diorite, carrying copper ore with gold-silver values.

Development: by 208' shaft with S. W. crosscut on 200' level, in jasper and schist, expected to cut ledge at 285' from shaft. Miners' strike in district during May resulted in temporary shut-down. Fourteen men employed. Diamond-drilling underway. Small hoist, compressor, etc., installed.

Considered a fair prospect.

GREAT VERDE EXTENSION COPPER CO. ARIZONA

Address: Shea Bldg., Jerome, Ariz. J. W. Hubbard, supt.

Officers: W. P. Geary, pres.; O. S. Wakeling, v. p. and gen. mgr.; H. H. Major, sec.-treas.

Inc. 1916 in Arizona. Cap., \$750,000; shares 25c par.

Property: 9 fractional claims, adjacent and E. of the United Verde Extension, at Jerome.

Development: by 3-compartment shaft, down 53', Oct., 1917, in sand stone and limestone and reported to show carbonates, chalcopryite and some copper glance. A hoist will be installed Oct., 1917.

One of the many new speculative promotions, during the boom at Jerome.

GREEN MONSTER MINING CO. ARIZONA

Jerome, Ariz. D. R. Finlayson, supt.

Officers: Neill E. Bailey, pres., Prescott, Ariz.; David Morgan, v. p., Jerome, Ariz., with T. A. Riordan, Flagstaff; W. W. Lawhon and W. S. Humbert, of Phoenix, directors; G. G. Fuller, sec., Jerome; Walter Harvey Weed, cons. engr.; Le Roy Anderson, gen. counsel.

Inc. Dec. 8, 1915 in Ariz. Cap., \$750,000; shares 50c par; 300,000 shares in treasury, and cash balance in bank Nov. 1, 1917, \$208,066.

The financial statement of Oct. 31st, 1917 shows cost of properties, \$365,116; buildings, machinery, etc., \$54,119; cash, Liberty bonds, etc., \$208,066; accts. receivable, and supplies, \$27,065; development expense, \$102,259; taxes paid, \$941; deferred operating expenses paid, \$46,594; total, \$804,162.

Property: 37 unpatented and 32 patented claims, all but two in one group, situated 3 to 4 miles S. E. of Jerome; the 2 other claims adjoin the Calumet & Jerome and the Verde Combination. The group includes the Cliff mine, once the property of the Geo. A. Treadwell Mining Co.; also the Brookshire mine. The tract shows several large jasper outcrops, that of the Cliff claim showing commercial ore at the surface.

Development: work for 1916 comprised about 1,500' of underground work besides road and camp building, and installation of electric equipment. The Gorge tunnel of the Cliff claim was extended and extensive exploration work, mostly by tunnel, was done at both the Revenue and Amazon properties.

In 1917 company started a deep exploratory shaft called the Dorothy May (505' in Oct.), on the Revenue claim and began extensive development by shaft, winze and crosscut on the Cliff claim, where a small body of chalcopryite ore of commercial tenor was cut in the Gorge tunnel. The new Cliff shaft was sunk 192' to connect with the Gorge tunnel, and drifts started both east and west on a mineralized quartz porphyry-diorite contact. The work shows two white intrusive, or water course dikes, the alleged ore enrichers of the Jerome district.

In Nov., 1917, the east drift of the Gorge tunnel workings on the Cliff claim, encountered an orebody showing 2' of chalcopryite ore that assayed 5% to 9% copper.

Property contains very promising surface outcrops, perhaps the best seen in the district. The first year's development work and the equipment of the property, were carried out with great skill and economy, under the direction of W. S. Humbert. The property is regarded as the best of the undeveloped tracts in Jerome and the company's operations are supervised by expert financial legal and technical men who compose its board of directors.

HAYDEN DEVELOPMENT CO.

ARIZONA

Operating the Copper Chief mine of the Copper Chief Mining Co., which see.

HAYNES COPPER CO.

ARIZONA

Succeeded 1916, by Jerome-Victor Extension Copper Co., which see.

HULL COPPER CO.

ARIZONA

Jerome, Yavapai Co., Ariz.

Officers: Robt. E. Tally, pres. and gen. mgr.; Thos. Taylor, v. p.; S. F. Dennison, sec.; C. L. Nabers, aud., with H. R. Brown and C. V. Hopkins, directors.

Inc. 1906, in Arizona. Cap., \$10,000,000; shares \$1 par, fully issued; non-assessable.

Suit filed, July, 1917, at Prescott, Ariz., against S. F. Dennison, sec., administrator of the estate of G. W. Hull, by minority stockholders, for the purpose of forcing the surrender and redistribution of 7,521,727 shares of stock for cancellation; also requiring an accounting and a temporary

injunction to stop the "levying, seizing or selling" of Hull Copper Co.'s property or assets.

Property: 21 claims, partly fractional, patented, 249 acres, shows syenite, diorite and slate, a continuation of the formation of the United Verde, adjoining, reported by company to show 21 orebodies, carrying some oxidized ores, but mainly sulphides, as developed. The "1888" shaft, of 475' depth, has produced a small amount of ore, but not at a profit.

Development: the Hull property and that of the Cleopatra Copper Co. have been developed by a 5,200' adit driven from Deception gulch, through Cleopatra ground into the Hull property. A winze has been started on the lode at 5,000' from the portal.

The Dillon tunnel extends completely around two sides of the United Verde ground. There are many drifts branching out from the tunnel and these usually follow a fracture plane in the rock showing 1 or 2' of fractured country rock, which usually shows pyrite and may be slightly copper-stained. These drifts twist and turn in a manner showing lack of system and finally branch out like a tree, each branch following a fracture plane, some of which show 2 or 3" of copper ore, and some are not even copper-stained. These fracture planes are described as being "leaders" from the big orebodies below, and because the country rock contains a small amount of pyrite disseminated through it, these ragged workings were stated to block out low-grade concentrating ore.

On the Silent claim a drift from the tunnel exposed an irregular body of excellent chalcopyrite from which 2 shipments were made, the ore assaying 8½% copper. The stope is about 60' long, in places is 12' wide and of irregular height. A 160' raise shows it to branch into 2 seams of 2' and 3' wide. An inaccessible winze was said to show 13' of ore, but inasmuch as shipments had ceased, this seems questionable. Beyond this orebody the tunnel turns the southwest corner of the United Verde property and follows along its western boundary to the "1888" shaft. For part of this distance the tunnel follows a lens of quartz devoid of copper. Aside from the 1 lens of chalcopyrite mentioned the showing in the tunnel is exceedingly discouraging. The mine has upward of 2 miles of openings, but the manager states that these old workings are not deep enough to develop the extension of the main orebodies of the United Verde.

Equipment: includes a 94 h. p. steam plant and a gasoline engine, with 2 hoists, one being a steam hoist, installed 1909, at the "1888" shaft. There also is a small air compressor.

JEROME COPPER MINING CO.

ARIZONA

Is controlled by the General Development Co. (A. Lewisohn).

Address: A. L. Johns, supt., Jerome, Yavapai Co., Ariz.

Officers: E. A. Kastner, pres. and treas.; H. Brinkenmeyer, v. p.; G. N. Hoffman, sec., all of Prescott, Ariz.; Homer King, F. M. Burdick, Gus Zorke, B. M. Orde, F. Wellington Hay, Geo. A. Gilbert and H. E. Crawford, directors.

Inc. Nov. 25, 1916, in Arizona. **Cap.**, \$2,000,000; shares \$1 par.

Property: 5 patented (one fractional) claims, N. and W. of the Green Monster at Jerome, and long known as the Hooker Ewing group.

Development: 480' tunnel being driven to cut a diorite-schist contact exposed in 98' shaft at 860' from portal; it should be cut by Jan. 1st, 1918.

Work started in Sept., 1917, after construction of a road and erection of machinery.

JEROME DAISY COPPER CO.

ARIZONA

Address: Box L, Jerome, Ariz.

Officers: J. F. Mowles, pres.; R. Kingdon, v. p.; A. J. Kisselburg, sec.; J. J. Cain, treas., with J. F. Hubbard, H. D. McVay and A. G. Dulmage, directors; J. F. Mowles, supt.

Inc. Oct. 5, 1916, in Arizona. **Cap.**, \$1,000,000; shares 50c par; 1,129,975 issued, non-assessable.

Property: 22 unpatented claims at Jerome, Ariz., said to show a copper bearing contact vein between quartz, porphyry, schist and diorite with limestone capping.

Development: by 235' shaft, to be sunk to 500', followed by lateral work. The present bottom is in sandstone, making 70 gal. water per min. Crosscutting underway on 230' level said to have exposed a gossan body 17' wide, on which a winze is sunk.

Equipment: 500 cu. ft. Sullivan compressor, 75 h. p. engine, 25 h. p. hoist, Cameron pump, etc.

A prospect whose shares are offered at 50c, 1917.

JEROME DEL MONTE COPPER CO.

ARIZONA

Office: Room 1018, 50 Congress St., Boston, Mass. **Mine office:** D. D. Homer, supt., Jerome, Ariz.

Officers: F. E. Young, pres.; A. B. Ewing, treas.; above with Thomas S. Woods, E. P. Thompson, Fred Sutter, E. S. Armstrong, Tasker L. Oddie, directors; E. S. Armstrong, managing director; D. D. Homer, supt.

Inc. in Arizona. **Cap.**, \$2,000,000; \$1 par; 800,000 in treasury.

Property: 41 claims and fractions, about 700 acres, in the Verde mining district, Yavapai Co., Ariz. Property being developed by 3-compartment shaft, down 500' in Sept., 1917, and sunk in limestone; much water encountered.

Equipment: electrically-driven hoist of 1,500' capacity, Ingersoll-Rand compressor, 400-gallon Cameron centrifugal pump.

A prospect.

JEROME GRANDE COPPER CO.

ARIZONA

Address: Jerome, Ariz.

Officers: S. J. Cain, pres.; J. W. Hubbard, v. p.; J. C. Scott, sec.-treas., with C. G. Lagstrom and W. Hales, directors.

Is a re-organization of the Verde Grande Copper Co., whose property in the Jerome district has been idle since 1909. See Vol. XII. for description of mine, which is considered to be favorably situated. Bondholders and old shareholders offered 200,000 shares at 25c each. If financed, the mine will be unwatered, plant erected and roads built.

Treasury stock offered under Corporation Commission permit at 25c, Sept., 1917.

JEROME NEW YORK COPPER CO.

ARIZONA

Address: Jerome, Ariz.

Inc. June, 1917, in Arizona. **Cap.**, \$2,000,000; shares \$1 par.

Property: 2 claims in the Verde district with reported good surface indications. Stock 25c asked, Oct. 20, 1917.

JEROME-PACIFIC EXTENSION MINING CO.

ARIZONA

Address: Jerome, Ariz.

Being organized in July, 1917, by N. Schutz, J. M. Layman, R. E. Moore and T. F. Shea of Jerome, with a capital of \$750,000, to develop an area S. of the Jerome-Pacific.

JEROME-PACIFIC MINING CO.

ARIZONA

Address: Jerome, Ariz.

Officers: Mrs. C. V. Hopkins, pres.; J. B. Harper, v. p.; foregoing with T. C. Mulcaire, I. M. Sutton, C. W. Small and H. F. Ashurst, directors.

Inc. Sept. 16, 1916, in Arizona. Cap., \$750,000; shares 50c par; 750,000 issued; non-assessable.

Property: 36 unpatented claims in Verde district, 5 miles S. E. of Jerome, on the E. slopes of the Black Hills.

Geology: replacement bodies in schists, dipping 80° N. and pitching E.-W. Surface conditions are similar to those at the United Verde and United Verde Extension mines, that is, they carry large jasper outcrops, and show oxidized ore which assays up to 18% copper, 8 oz. silver, and \$6.80 gold per ton.

Development: by 2 vertical shafts, 35' and 65' deep; also 6 tunnels from 35 to 270' in length. These are to be sunk and extended. Expenses in 1916 totaled \$9,000, covering 2½ miles of road and assessment work.

The property has been favorably reported on by W. H. Weed and when enough money has been obtained, development will be resumed.

JEROME PORTLAND COPPER CO.

ARIZONA

Address: Jerome, Ariz. A. B. Frame, pres. and mgr.

Property: in Jerome district, Ariz., at site of old Equator smelter, near the Copper Chief mine.

Development: shaft down over 500' cutting diorite at 515'. Motor-driven pumps cope with fairly heavy flow of water. Drifting both ways at 500' level started in July, 1917.

In 1917 a suit was filed by J. M. Mahoney, Geo. Moore et al, against the president of the company, alleging fraud in acquiring some additional claims and selling them to the company for a large block of stock issued to himself and for selling other shares he was not entitled to. Also alleged, that shaft sinking has cost about \$222 per foot when similar work in district has been done for \$55 per foot.

JEROME-ST. LOUIS COPPER MINING CO.

ARIZONA

Address: W. P. Burke, pres., Jerome, Ariz.

Officers: A. Brockman, v. p.; J. M. Sullivan, sec.; G. Brookshire, treas., J. E. Burke, E. E. McFarland and J. H. Sontag, directors; J. Riley, supt.

Inc. Nov. 13, 1916, in Arizona. Cap., \$750,000; shares 50c par.

Property: 8 unpatented claims, 3 miles S. of Jerome, on Copper Chief road, crossed by great Verde fault.

Development: shaft-sinking in limestone under way. Encountered water at 100' stopping all work until pumps are secured. Has 25 h. p. hoist.

About \$10,000 said to have been spent to mid-year, 1917.

JEROME SUPERIOR COPPER CO.

ARIZONA

Address: G. D. Case, mgr., Clarkdale, Ariz., or 644 Title Insurance Bldg., Los Angeles, Cal.

Officers: Melville T. Frasier, pres.; T. Ford, v. p.; G. D. Case, sec.-treas.; foregoing, with Geo. Mitchell and C. E. Selby, directors; Geo. Mitchell, managing director.

Inc. May, 1916, in Arizona. Cap., \$750,000; shares 50c par.

Property: 106 unpatented claims in Verde district, 1 mile N. of Jerome and 1 mile N. W. of Clarkdale includes Sutcliffe and Stanridge groups.

Development: new 100' shaft, and roads, etc., that cost \$25,000 in 1916. Low-grade copper, silver-gold ore is said to have been opened by 3 shafts, deepest 265'. Ground is being tested by churn-drilling.

Equipment: includes gasoline hoist and 6-drill compressor.

The new Verde Tunnel and Smelter R. R. crosses the property for 2½ miles.

JEROME VERDE COPPER CO.**ARIZONA**

Office: 223 Security Bldg., Los Angeles, Cal. **Mine office:** Jerome, Yavapai Co., Ariz.

Officers: E. O. Holter, pres.; W. R. Barbour, v. p.; I. M. Sutton, sec.-treas., with T. E. Campbell, Heath Steele, H. F. Osborne and V. W. Henshaw, directors; J. B. Harper, supt.; H. P. Henderson, cons. engr.

Inc. Dec., 1906, in Arizona. Cap., \$5,000,000; shares \$1 par; non-assessable; issued May 31, 1916, \$4,952,545. Registrar & Transfer Co., New York, transfer agent and registrar. Listed on New York Curb. Was organized as successor of Verde Queen Copper Co., giving old shareholders \$2,501,000 in stock, which is held by the old company in a single certificate, and is practically escrowed; 1,000,000 shares of this stock will be distributed on and after July 3, 1916.

In May, 1917, capital was increased from \$5,000,000 to \$5,500,000, by issuing 500,000 shares, which were offered at \$1.50 each; 240,000 were sold; total shares in treasury, 280,783, Oct. 15, 1917. Company had \$175,308 cash and \$200,894 in Liberty bonds, and interest, Oct. 1st, 1917.

Expenses, for year ending Oct. 1st, 1917 were \$233,359 including \$178,264 for mine development.

Property: 28 claims, patented, 486 acres, lying E. of the United Verde and adjoining the Little Daisy mine of the United Verde Extension, shows an iron gossan with outcrops of copper ore on the Verde and Columbia claims.

Development: by 1,043' two-compartment Columbia shaft, with about 4,000' of workings, showing mainly copper carbonates, with small quantities of oxide and silicate ores, also some sulphide and a little native copper, all slightly auriferous and argentiferous. Average assays were reported, by former management, at 8.4% copper. Up to June, 1916, no pay ore had been developed. The mine is wet, and has electric pump, with capacity of 175 gals. per min., working against 500' head.

Equipment: includes a new hoist, good for 1,500' depth, and 1,500 cu. ft. air compressors. Commercial current is taken from the Arizona Power Co. There are a number of mine buildings, and a 35-ton smelter.

The promising disclosures on the Little Daisy mine of the United Verde Extension, adjoining this property, resulted in an option being given on the Jerome Verde property until June 15, 1915, to the United Verde Extension Co. This option provided for the payment of \$500 per month and that 100' of work per month should be performed. Under the option 935' of drifting and crosscutting was done on the 800', 775' on the 1,200', and a little work done on the 1,400 level. Results were unsatisfactory and option was relinquished after an expenditure of \$50,000. In April, 1916, an agreement was made with United Verde Extension under terms of which said company is to do 150' of development work per month, to be paid for by Jerome Verde on the basis of the company's working costs, plus 15% royalty; the work is being done on the 1,400' level of Jerome Verde. This is the only interest United Verde Ext. has in Jerome Verde. Company plans enlarging Columbia shaft to 3 compartments and sinking 330', equivalent to 1,400' level of United Verde Extension.

Diamond-drilling from the U. V. Extension 1,400' level passed through a shear zone with some native copper. A crosscut is being driven from the 1,400' level of the Edith shaft of the U. V. Extension, in Jerome Verde ground, to open this zone. Drilling proceeds E, from 1,400' in the U. V. Extension, and is in quartz-porphry.

Shares rose to \$3 on report that diamond drill had cut 2' of 27% ore, which proved untrue. Mine shows geological conditions similar to those

of the United Verde Extension and the stock is therefore a good gamble, although the capitalization is considered excessive.

In October, 1917, company became a regular shipper, the ore coming from a small orebody on the 1,200' level (United Verde Extension side) of the Maintop claim. Ore is about 13½' wide, but total amount is not large. To Oct. 23, seven 40-ton cars had been shipped, running nearly 10% copper with about \$4 in gold and silver. Revenue from shipments is expected to pay all operating expenses.

Employs 30 men.

JEROME-VICTOR EXTENSION COPPER CO. ARIZONA

Property sold in Oct., 1917, to the West United Verde Copper Co., which see.

JEROME YEAGER COPPER CO. ARIZONA

Address: Jerome, Ariz.

Officers: J. W. Hudgeons, pres.; H. Wilson, v. p.; F. Hawkins, sec-treas.; also directors.

Cap., \$1,000,000; shares 50c par. Of the 2,000,000 shares, 800,000 are pooled, being given to the owners of the property, subject to complete financing.

Property: 360 acres in Yeager canyon being developed by shafts. Only a small crew employed at mine, which is a prospect. Stock 25c asked, Oct., 1917.

MAZATZAL MINING CO. ARIZONA

Office: Globe, Ariz. Mine office: Payson, Ariz., in the Tonto Basin country, 120 miles N. of Globe.

Officers: W. C. Stanley, pres. and mgr.; A. J. Crossley, sec-treas., with G. B. Peart and W. Thomas, directors; J. F. Hatrick, supt

Inc. Jan. 25, 1917, in Arizona. Cap., \$3,900,000; shares \$1 par; 1,029,000 issued; non-assessable.

Property: 65 unpatented claims, 1,300 acres in Mazatzal district, Gila Co., Ariz., said to show gold-silver-copper deposits in granite, schist and porphyry. Veins dip 70° N. E., and pitch N. W. Ore is both oxide and sulphide. Disseminated ore said to assay 5% copper and 80c gold per ton; vein, 10% copper and up to 130 oz. silver per ton.

Development: 5 tunnels from 80 to 600' long. Total workings 2,300', to depth of 300'. Reserves reported to be fairly large. A 2,400' tunnel is to be driven. Ore shipments expected to start, Sept., 1917.

MICHIGAN VERDE COPPER CO. ARIZONA

Address: Jerome and care of Western Copper Syndicate, P. O. Box 325, Phoenix, Ariz.

Officers: L. B. Eaton, pres.; A. M. McLellan, v. p. and treas.; E. D. Bowles, sec.

Inc. 1916 in Arizona. Cap., \$2,000,000; shares 50c par; 800,000 shares held indefinitely in pool by Arizona Corporation Commission to enforce its orders.

Property: 29 claims, 535 acres, which according to the company's literature and "ex-geologist" Bethune, contains "outcrops" in a connecting belt of schist and diorite. The property is neither better nor worse than that of the many other Jerome companies who are exploring their tracts.

No development is claimed, but the stock-sellers advertise that the property is owned outright and the money derived from stock sales (offered at 50c in June, 1917) will be used for development.

The Michigan Verde was one of the worst of the many very questionable promotions of the boom days of Jerome in 1916. The manner of its promotion and the character of its sponsors were open scandal in the

camp, and when the company lost its option and the Arizona Corporation Commission ordered the return of its promotion stock and forbade the sale of shares it was thought that the last had been heard of it. It is apparent that a new and different directorate has been successful in getting by the Commission prohibition, since the Western Copper Syndicate, which has a post-office box at Phoenix, Ariz., is advertising stock and sending out the same old hackneyed stories about the United Verde mine and among other misleading statements says, this property end-lines the United Verde Extension property, whose mine workings are $1\frac{1}{2}$ miles away, though an outlying undeveloped group of claims belonging to that company does lie between Michigan Verde and the U. V. mine.

From the known dip and extent of the orebodies of the United Verde and its great neighbor, United Verde Extension, it is certain that the Michigan Verde is entirely outside of any possible extension of those ore deposits. The geologic report published by the company is a rank example of supposedly technical writing.

MINGUS MOUNTAIN COPPER CO., LTD. ARIZONA

Office: 516 Grant Bldg., Los Angeles, Cal. Mine near Jerome, Yavapai Co., Ariz.

Officers: W. W. Thomas, pres.; A. Gleason, v. p.; J. R. Thomas, sec.; above with A. M. McDermott, A. J. McDermott, R. A. Thomas and E. R. Jeffrey, directors.

Inc. June, 1900, in Arizona. Cap., \$3,000,000; shares \$1 par; issued \$2,400,000.

Property: 5 claims, 100 acres, in the Black Hills district, 12 miles south of Jerome, the nearest railroad point, has good surface showings of carbonate ores. Assays from 2,800' vein traversing property, N. E.-S. W., are reported to show .02 oz. gold, \$1.45 silver and 6.39% copper. Orebody claimed to be 45' in width with dip of 60° E. but ore has only been found in bunches and streaks.

Development: by 4 shafts, deepest 430', with several tunnels, giving a total of 4,240' of workings.

Equipment: includes 50 h. p. steam plant, with 2 hoists, good for 1,000' each, and several mine buildings. Out of cash and idle some years.

MONSTER CHIEF MINING CO. ARIZONA

Office: 27 William St., New York. Mine south of Jerome, Ariz.

Officers: Wm. Barret Ridgely, pres.; A. P. Thompson, cons. engr.; G. G. Rice, fiscal agent.

Cap., \$2,000,000; \$1,050,000 issued for property.

Property: 22 claims, 400 acres, adjoining the Green Monster on the southeast and the Jerome-St. Louis on the east. Mine is wholly undeveloped and without camp or equipment.

Is an undeveloped prospect. All available information on the company is from George Graham Rice's house organ. Stock 6c bid, 12c asked at Jerome, Oct. 20th, 1917.

A report by Arthur Perry Thompson, geologist, shows a big vein, called the Green Monster, crossing the Revenue claim of the Green Monster Co., into the Monster Chief group.

NEW MESCAL MINING CO. ARIZONA

Inactive. Jerome, Ariz. Is a reorganization 1914 of the Mescal Mining Co. L. C. Cherry, pres., State Bank Bldg., Little Rock, Ark.

Inc. 1914, in Ariz. Cap., \$1,500,000; shares \$1 par.

Property: Owen & Allison group, 3 patented claims, a mile south of Jerome in Verde district, showing fissure veins in slate and diorite, one 3' average width, traceable 1,600' and workings show 1-2% copper with trace

of gold. Company originally owned 7 claims, but 4 were allowed to lapse and were jumped. The 3 remaining were sold to J. E. Russell of Prescott, who sold them to J. M. Layman, who in turn transferred them to the Verde Combination Copper Co., and they now comprise part of its Jerome holdings.

NEW YORK VERDE COPPER CO.**ARIZONA**

Address: Jerome, Ariz. and care W. W. Lewis, Kingman, Ariz. Is a reorganization of the Victor Copper Co.

Property: at Jerome, consists of 1,100 acres in the Southern Verde district, including 700 acres directly south of and adjacent to the Jerome Pacific holdings.

The Kingman property consists of 580 acres in the Maynard district, covering the Copper King vein. Company is drifting at 400' depth to cut the vein which is said to show 3'-4' of copper ore in places.

PITTSBURGH-JEROME COPPER CO.**ARIZONA**

Office: Commonwealth Bldg., Pittsburgh, Pa. **Mine office:** Chas. Arata, supt., Jerome, Yavapai Co., Ariz.

Officers: Wm. M. McJunkin, pres.; C. A. Cooper, v. p.; E. F. Thompson, sec.

Inc. 1904 in Arizona. **Cap.** increased, March 9, 1906, to \$3,000,000; shares \$1 par; issued, \$2,909,316.

Property: 21 claims, 387 acres, lying 2 to 3 miles south of Jerome, nearly N. W. of the Black Hills property, and about midway between the United Verde and Equator mines.

Development: by main, or 500', and the lower or 900' tunnels and the 900' Pittsburgh shaft, said to show argentiferous and auriferous sulphide ore of about 4% copper tenor at 358' depth.

The 500' or main tunnel 1,279' long connects with the shaft. An east drift on this level shows copper carbonate; the west drift is in diorite. Several veins were cut, said to show leached ore averaging 2%; selected sulphide ore carried from 6 to 30% copper, \$2.50 gold and 75c silver per ton, leading the management to hope for increased values below water level. Crosscutting at 900' depth, 1917.

Equipment: includes a 150 h. p. Fairbanks & Morse hoist, 650 cu. ft. compressor and electric power.

RICHARDS COPPER CO.**ARIZONA**

Out of business. Formerly owned the Black Hills Copper Co. whose property was near the Equator mine, Jerome. Property sold, 1917.

SHEA COPPER CO.**ARIZONA**

Officers: D. J. Shea, pres. and mgr., Jerome, Ariz.; J. P. Connelly, sec-treas., with Nathan Schultz, directors; James Rice, supt.

Inc. 1916 in Ariz. **Cap.**, \$750,000; shares 50c par.

Property: 4 patented claims, south of Copper Chief group, carrying 8 or 9 outcrops with gold-silver-copper values.

Development: by shallow shafts, tunnels, etc., all in ledge matter. In Oct., 1917, the main incline was down 285'. The vein is 50' wide, with schist hanging and diorite foot walls. A selected sample of the rock ran \$4.60 gold, 14.40 oz. silver, 0.7% copper, 1% lead, and 2% zinc.

At 300' depth the ledge will be explored.

SQUAW PEAK COPPER MINING CO.**ARIZONA**

Address: Edison Thacker, Jerome, Ariz.

Officers: J. J. Cain, pres.; H. E. Thacker, v. p.; Edison Thacker, sec-treas., with R. Thacker and A. W. Whitaker, directors.

Inc. in Arizona. **Cap.**, \$2,000,000; shares \$1 par; 100,000 issued; non-assessable.

Property: 21 claims, 420 acres, in Squaw Peak district, 2 miles W. of Verde river and 28 miles S. E. of Jerome, Ariz. Examined in Nov., 1916, by W. E. Defty, whose conclusions were not favorable. Claims said to show copper ore with chalcoppyrite and oxide minerals in quartz, occurring in fracture planes and veinlets in granite, capped to the W. by Cambrian rocks.

Development: 265' main tunnel and several shorter ones, also a 75' shaft.

Equipment: steam boiler and compressor; inadequate for proposed work.

UNITED JEROME COPPER CO.

ARIZONA

One of the companies that employed full page advertisements during the boom at Jerome, trying to sell shares. Cannot locate promoters and letters sent to company are returned by Post Office.

UNITED VERDE CONSOLIDATED CO.

ARIZONA

Address: Clarkdale, Ariz.

Officers: R. W. Wingfield, pres.; Paul McIntosh, v. p.; E. C. Farrell, sec.; D. L. Robinson, treas.; E. M. Barron, mgr.

Inc. Oct., 1916, in Arizona. Cap., \$7,500,000; shares \$5 par; 471,758 issued.

Statement of Aug. 25, 1917, showed receipts amounting to \$67,008 from sale of shares; and expenditures, \$59,781. The latter includes 1st payment on Ballard property, \$10,000; drawn by promoters (Balentine, Farrell and McIntosh), \$8,611; advertising, \$17,898; commissions, \$854; development of Mahurin property, \$3,259; road building, \$850; telegraph and phone, \$1,311; and sundries, \$9,863. There was a balance of \$7,226 unaccounted for. Due on the Ballard claims, \$60,000, and outstanding indebtedness is \$12,850. From these figures it is evident that only \$4,000 was spent on the property, or less than 7% of total expenses; while over \$37,000 went in advertising, commissions, etc., exclusive of promoter's commission.

Property: the Ballard and Mahurin claims, 2½ and 15 miles S. of Jerome, Ariz.

Development: drilling was to be done to 2,000' early in 1917. Three tunnels driven by previous owners, 15 years ago, are said to have exposed good copper ore.

UNITED VERDE COPPER CO.

ARIZONA

Office: 20 Exchange Place, New York. **Mine office:** Jerome, Yavapai Co., Ariz. **Smelter office:** Clarkdale, Ariz.

Officers: Wm. A. Clark, pres.; Jas. A. MacDonald, v. p.; J. H. Anderson, sec.; H. H. St. Clair, treas.; Chas. W. Clark, gen. mgr.; officers are the directors; Robt. E. Tally, asst. gen. mgr. and mine supt.; Thos. Taylor, smelter supt.; Clarence V. Hopkins, chief engr.; Dave Hopkins, purch. agt.; A. L. Reese, chief chem.-assayer.

Inc. 1883, in New York and reorganized Sept. 2, 1899, in West Virginia. Cap., \$3,000,000; shares \$10 par; fully issued and fully paid. Is practically a close corporation, having less than 20 shareholders, and is controlled, through stock ownership, by W. A. Clark. Five hundred shares were sold at auction, March, 1910, for \$70 per share.

Gross sales of copper, silver and gold were \$5,368,672 in 1909, \$5,605,488 in 1910, \$4,736,834 in 1911, \$5,899,457 in 1912, \$6,171,116 in 1913, \$5,186,909 in 1914, \$9,519,419 in 1915, and \$17,185,881 in 1916.

Company's investments at end of 1916 were valued at \$7,404,522, compared with \$2,587,724 in 1915. Cash on hand and in bank totaled \$1,771,961, Jan. 1, 1917, an increase of \$392,917.

Dividends: were begun, 1892, by old company on the basis of 25c per share monthly. Recent dividends have been: \$2,005,000 in 1905, \$2,700,000 in 1906, \$2,700,000 in 1907, \$2,025,000 in 1908, \$2,700,000 in 1909, \$2,700,000 in 1910, \$2,250,000 in 1911, \$1,800,000 in 1912, \$1,575,000 in 1913, \$1,125,000 in 1914, \$1,800,000 in 1915, \$4,050,000 in 1916, and \$4,500,000 in 1917 to October, a total of \$44,372,000.

Property: 13 claims, patented, 230 acres with sundry adjoining property, including the North Venture and South Venture claims, which have produced a little high-grade ore, in the Verde district of the Black Hills range, at an average elevation of 5,500' above sea level, and about 2,100' above the valley of the Verde river.

Company also owns the Copper Giant mine, Wm. Neagle, supt., near Hackberry—acquired in 1913. It is developed by 750' shaft, with various levels which show silicious ore carrying 2-7% copper with small gold-silver values. A concentrating plant will be erected if further development warrants it.

Geology: the property shows granular porphyritic igneous rocks, slate and schist, the ore deposit being connected with intrusions of acidic porphyry in dioritic rocks; the rocks are sheared and schistose, the overlying limestone having no genetic connection with the ore deposit.

The mine is opened on a single large deposit of sulphide ore, in a sheared diorite, about 600' in extreme width and 1,900' length, proven to depth of 1,500'. The orebody consists of more or less irregular masses, in a much broken and disturbed area, the ore-shoot having a dip of 72° and containing a 70' quartz vein that carries about 1% copper and from 0.25 to 0.75 oz. gold per ton, this quartz being used for converter linings. The gossan outcrop, carrying auriferous and argentiferous oxidized ores, extends to a depth of about 160'. The zone of secondary enrichment carries very little chalcocite, with some covellite, and other secondary copper ores, all highly argentiferous. The primary zone carries mainly pyrite and chalcopyrite, with a little bornite. No ore assortment is attempted, and no concentration is made, everything from the mine going to the furnaces, the average of ore from all openings formerly being about 6.5% copper and 15 to 32% sulphur, with considerable gold and silver values in the oxidized zone.

Development: to a depth of 2,000', but production is mainly from the 6th and lower levels. The older portions of the mine are worked pillar-and-stall and timbered with square sets, filled with waste, worked-out stopes being filled with culls and barren rock blasted from the mountain side above the mine and run into abandoned stopes. The oxidized zone is being mined by open cut and the milling system. In the newer workings, and parts of the old mine where the ground will permit, bottom slicing and a modification of the shrinkage system is used.

The ore is very easily oxidizable, owing to its high sulphur tenor, and is therefore liable to spontaneous combustion, while, owing to the more or less shattered condition of the orebody, it is difficult to entirely prevent the access of air, very little of which will keep a sulphur fire burning incessantly. The fire on the 400' level has been burning since 1897, and the mine is on fire in various places, from No. 9 level to surface, fire in stopes not worked being walled off by cement bulkheads. Mining until early in 1917 has been in progress for several years in the fire zone under the Plenum system, introduced by J. J. Shaw. By this method, air under pressure is blown against the face of the stopes by electric fans. The large volume of cold air has a cooling effect on the burning ore, reducing temperatures, and extinguishing the fire in the immediate vicinity of the

working face, at the same time driving back the deadly fumes into the shattered rock mass and permitting extraction of the ore. The fire, while dangerous and annoying, does not destroy the copper, all of which will be recovered eventually, by mining or leaching.

Plans have been perfected for the steam shoveling of the upper levels of the mine, to and including the 300' level and preparatory work has begun. This will relieve the pressure of the underground fire gases.

The mine has one of the most perfect systems of mechanical ventilation known to copper mining. It was developed through the necessity of fire control, and cooling off of the heated parts of the mine, together with a plentiful supply of fresh air to the working faces.

Equipment: the compressed air plant on surface includes a 2-stage compressor, 28 and 52 and 26 and 44 $\frac{1}{4}$ x48" and 3 smaller units, including 2 machines driven by 600 h. p. and 300 h. p. motors, also a compressor driven by a 275 h. p. motor. No. 3 hoisting shaft has a first-motion hoist, good for 2,000'. No. 5 shaft will have an Allis-Chalmers mechanical double-drum hoist, with electrical equipment, speed of 1,900' per minute, and good for 3,000' depth; 7-ton skips operated in balance will be used. This installation is on the 1,000' level, which is the collar of No. 5 shaft. Haulage equipment underground includes nine 4-ton, four 6-ton and three 7-ton locomotives.

Smelter: the old smelter, built on the hanging-wall side of the mine and too close to the orebody, had considerable trouble from caving ground and was closed down and dismantled.

The new 3,000-ton smelter designed by Repath and McGregor has been operating since June, 1915. It is one of the most modern in the world, consists of a crushing and sampling plant, calcining plant, blast furnace, converter, and reverberatory departments, and a power house, together with coke and ore-storage yards and bins with a total capacity of 26,000 tons. Buildings are built of steel and concrete.

The crushing and sampling plant has an Allis-Chalmers 30x18" jaw-crusher, driven by a 50 h. p. motor; product passes up a long incline belt conveyor, capacity 2,400 tons daily, to top of sampling mill. This mill has three 20x10" Blake crushers, three sets of Allis-Chalmers crushing rolls, 54x24", 36x12" and 24x12"; two 4x14" Gates trommels and four Snyder samplers with final sample of 1 to 250. Crusher product goes over conveyor belts to storage bins for fines or to the calcining plant.

As described by T. C. Roberts in the Engineering and Mining Journal, July 21, 1917, the Hopewell crushing plant was built at the mouth of the 1,000' tunnel. It includes storage bins, No. 9 Gates crusher, shuttle conveyor, 42" steel bucket elevator, shaking grizzlies, and 36" belt conveyor, from which the ore goes to the blast furnace bins. Undersize goes to two compound revolving screens 60 and 80" diam., 18 and 15' long, with $\frac{3}{4}$ " and $\frac{3}{8}$ " holes. First reject, 1 $\frac{1}{2}$ ", is crushed by 2 sets of 54x24" Anaconda rolls set to $\frac{3}{4}$ "; the second reject, minus $\frac{3}{4}$ " is crushed by two 24x54" rolls set to $\frac{3}{8}$ "; the third reject, minus $\frac{3}{8}$ ", is taken to storage bins. Product from all rolls is rescreened and recrushed as desired, the screens and rolls being in closed circuit.

The calcining plant has 12 21 $\frac{1}{2}$ ' Wedge furnaces, each with a daily capacity of 96 tons. The 7 hearths, 6 roasting and 1 drying, are lined with concrete. The plant is built so that it can be enlarged when required. Cooling blast is furnished by 1 or 2 No. 6 Sirocco, 3-oz. blowers, each having a capacity of 25,000 cu. ft. of free air per minute, driven by a 30 h. p. motor. Fumes pass to the dust-chamber building, sides of brick and steel, roof of 24-gauge copper equipped with baffle plates, and then to the 400'

stack. Calcines, as well as dust, are drawn into 15-ton cars, drawn by 10-ton electric locomotives.

The reverberatory plant has four 19x100' furnaces, placed at one end of the furnace building. Calcines, with oxidized ores, are fed to these furnaces. Slag is drawn off into Treadwell motor-tilted pots, drawn by an 18-ton electric locomotive, of which there are three.

The blast furnace plant has four 48x320" blast furnaces, designed by Repath and McGregor. Feed consists of mattes from the reverberatories, rich oxidized and sulphide ores, with some calcite. Gases go to a second dust chamber, similar to the other, but with steel plate sides, before going to the 400' stack. Ore and flux for the furnaces is brought by 4 to 6 ton side-discharge cars. Reverberatory matte is poured hot.

The converter plant has four stands with five 12' shells of the Great Falls type, supplied by Allis-Chalmers Mfg. Co. Converters are basic, lined with Harbison-Walker magnesite. Tilting is done by 50 h. p. direct-current motors. Copper is poured into two copper casting machines, each operated by a 20 h. p. direct-current motor. There is a 75-ton reheating furnace in connection with these. Slag is drawn into Treadwell pots and charged hot into the reverberatories together with rich blast furnace slag.

The power plant will generate only part of the electric current used, remainder being purchased from the Arizona Power Co. Current is received at 44,000 volts and stepped down to 2,200 volts. When the reverberatories are in operation waste heat from them will be utilized for 6 Stirling Type M boilers, 713 h. p. each, 2 to each furnace. Three Parker type water tube boilers, using fuel oil, are held in reserve. A pumping station, equipped with 2 pumps, on the Verde river supplies the water. The cooling system of the furnaces, compressors, and the condensing system of the steam units are taken care of by a central cooling plant and pumping station. There are 3 condensers, 2 Weiss and an Allis-Chalmers, and 5 Allis Chalmers centrifugal pumps, driven by motors.

There are 4 blowing engines, supplying the converters; a Southwork-Rateau-Smoot turbo-blower, capacity 24,000 cu. ft. free air per minute at 16 lbs. pressure, 2,500 r. p. m.; a Nordberg, Southwork and an Allis-Chalmers, with capacities of 21,000, 21,000 and 15,000 cu. ft. respectively. A Nordberg 2-stage compressor furnishes air up to 100 lbs. pressure, capacity 3,000 cu. ft. per minute. Air for the furnaces is supplied at 2½ lbs. pressure by 5 Roots blowers, two of 400 cu. ft., two of 300 cu. ft., and one of 224 cu. ft. Blowers are motor driven. A 16x32x36" Allis-Chalmers, tandem-compound engine operates one of the 400 cu. ft. blowers; a 3-cylinder Diesel engine operates one of the 300 cu. ft. blowers.

The electric generating units include 2 Parsons type steam turbines and generators; one is a 500-kva. Westinghouse unit, the other a 1,500-kva. unit made by Allis-Chalmers Mfg. Co., the former delivering current at 440 volts, the latter at 2,200 volts. Two Westinghouse synchronous 1,200 k. w. motor-generator sets take alternating current at 2,200 volts and deliver direct current at 250 volts for the electric locomotives, converter motors, cranes, etc. There are three 300 k. w., three 200 k. w. and three 50 k. w. transformers, also three 30 k. w. transformers.

The United Verde & Pacific railway, controlled by the company, has 28 miles of narrow-gauge line, traversing a very difficult country, connecting the mine and works with the Santa Fé, Phoenix & Prescott railroad at Jerome Junction. A standard-gauge railway, built 1912, by the Atchison, Topeka & Santa Fé R. R. Co., connects the new smelter at Clarkdale with its main line at Cedar Glade. For transportation between the mine and smelter another railroad, the Verde Tunnel & Smelter R. R. Co., has been built; it is operated as a separate organization.

Production:

Year	Lbs. Copper	Oz. Silver	Oz. Gold	Year	Lbs. Copper	Oz. Silver	Oz. Gold
1904.....	29,275,503	668,842	23,754	1911.....	33,167,987	461,145	15,239
1905.....	32,683,951	486,041	15,915	1912.....	31,565,539	484,222	15,082
1906.....	33,827,265	428,317	12,913	1913.....	35,384,694	641,074	20,666
1907.....	33,015,457	356,938	11,733	1914.....	32,448,170	646,572	21,400
1908.....	30,183,089	494,574	20,334	1915.....	45,127,832	902,880	28,221
1909.....	36,694,063	495,480	17,022	1916.....	58,299,573	1,030,850	26,416
1910.....	38,663,880	563,133	19,267	1917*.....	57,600,000	.....	.....

* 10 months.

Up to June, 1917, the monthly yield was over 6,000,000 lbs., but labor troubles reduced the July-Aug. output to 4,250,000 each; yet the total for 1917 will be fully 8,000,000 lbs. above 1916.

In early years the United Verde made copper for 5c or less a pound, if one deducts gold and silver values from the cost. The reported cost per pound of finished copper, after deducting gold and silver values, was 9.17c per lb. in 1904; 9.27c per lb. in 1905; 8.69c in 1906, and 10.54c in 1907. Under average circumstances the cost may be figured as 9 to 10c per lb. The United Verde mine has been lied about more industriously than almost any other mine in the world, especially in the literature sent out by new copper mining companies with stock for sale. The United Verde has erroneously been pointed out, as an example of blind luck, but the mine was taken by Senator Clark, when generally considered worked out, and it was developed, by cash and brains, into a magnificent copper mine, the credit being due to the keen mining sense and business acumen of Senator Clark and not to chance. The mine is one of the best copper mines of the world, with many years of large and profitable production ahead.

To accommodate its employees the company constructed a model town called Clarkdale, at a cost of \$1,000,000. It includes upper and lower sections, with school house, restaurant, rooming house, business area, and residences, all supplied with electric light, water, sewers, and telephones.

UNITED VERDE EXTENSION MINING CO. ARIZONA

Office: 233 Broadway, New York. Operating office: Prescott, Yavapai Co., Ariz. Mine office: Jerome, Yavapai Co., Ariz.

Officers: James S. Douglas, pres. and gen. mgr.; George E. Tener, v. p.; Louis E. Whicher, v. p.; Chas P. Sands, sec.-treas.; preceding with Paul Armitage, H. K. Burch, George Kingdon, Archibald Douglas and Andrew J. Pickrell, directors; George Kingdon, gen. mgr.; H. De Witt Smith, supt.

Inc. 1902, in Maine, as a reconstruction of the United Verde Extension Gold, Silver & Copper Mng. Co. Cap., \$3,000,000; shares \$10 par. Reorganized in Delaware, cap., \$4,000,000; shares \$10 par; and again reorganized 1912, and cap. reduced to \$750,000, shares 50c par. In this reorganization, approximately 360,000 shares were set aside for exchange, on a share for share basis for old shares outstanding; about 40,000 shares were issued in liquidation of debts; 150,000 shares were issued to Jas. S. Douglas for service; 50,000 shares were sold to Mr. Douglas for \$25,000 cash; 400,000 shares were optioned to Mr. Douglas and his associates with the right to purchase all or a part of this block at par value at any time prior to June 15, 1915; and 500,000 shares were reserved for treasury purposes. Federal Trust Co., Boston, registrar; State Street Trust Co., Boston, transfer agt. Shares are listed on the Boston curb, traded on New York Curb. Annual meeting, 3rd Tuesday in Feb.

Gross revenue in 1916 was \$9,981,072; less \$2,334,746 for mine operations, freight, treatment, etc. \$207,809 for taxes, etc.; and \$500,417 for ore depletion and depreciation; leaving \$6,938,100 net. The balance to surplus was \$5,888,100. On July 1, 1917, the cash balance was \$4,793,072, excluding payment on 18,000,000 lbs. of copper

Dividends: an initial quarterly dividend of 50c per share was paid Aug. 1, 1916. Two distributions in 1916 absorbed \$1,050,000. In 1917, to November, four 50c dividends and extras of 85c were paid. Total to date, \$4,042,500.

Property: 1,200 acres, known as the Little Daisy Group, a two-thirds interest in the adjoining Florencia claim, and an option on 19 claims, 300 acres adjacent to the company's property on the S. and S. E. \$130,000 was paid for this tract.

The Jerome Verde option was relinquished June 15, 1915, as the 2,127' of development work from the Daisy shaft failed to disclose ore of commercial importance.

History: original development was by an 800' vertical shaft, the Edith on the Little Daisy claim, about 1,700' from the main shaft of the United Verde mine, with collar 450' lower. This shaft, after passing through 50' of iron stains, encountered copper carbonates, continuing for depth of about 150', succeeded by conglomerate, and from a depth of 425' to 578' passed through schist carrying copper sulphides and manganese. These old workings total about 5,000' but develop only a little ore of about 2% copper, 1 oz. silver and \$3 gold, on the 800' level. A 130' winze below this level was botomed in decomposed schist, showing considerable copper.

The early exploration work of the company was unsuccessful, and an option was taken in 1913 on the Jerome Verde group, and a new shaft, the Edith, started 1,500' farther east, sunk to a depth of 1,200'. Verde Extension's development of the Verde ground was disappointing but in the company's own ground a large body of very rich chalcocite ore was encountered on the 1,200' level, Dec., 1914. This orebody was developed and worked during 1915, and the shaft was sunk to the 1,400' level. Feb., 1916, a drift on this level cut the downward extension of the bonanza orebody found on the 1,200' level.

Development: during 1916 there was 12,193' of work done, with 1,541' in Jerome Verde ground. On the 1,400' level the orebody was fully opened, and has an area of 60,000 sq. ft. on that level. Between the 1,400' and 1,300' levels the shoot was proved by raises. Oxide ore was encountered 60' above the 1,300' level, so no considerable quantity of ore is expected above that point.

Conservative estimates give 1,000,000 tons of 16% ore between these levels. A winze was sunk 200' below the 1,400' level, passing through 114' of 15% ore and 46' of low grade ore. At 160' an intrusion was cut, and at 200 there was chalcopyrite again.

The ore thus far developed lies on the northerly downthrown side of a big fault, with a drop of 650' or thereabouts, as shown by the limestone strata on each side of it.

In May, 1917, work commenced on an 11,000' haulage adit, which will connect with the mine at the 1,300' level. A new 3-compartment shaft is being sunk to 1,700', and was concreted to 225' early in August. It should be complete by April, 1918.

Development to date makes the mine as great as its more famous namesake.

Equipment: is being added to as fast as possible, and includes a new smelter being erected 2½ miles from Clarkdale.

Production: in 1916 was 80,159 tons of ore, containing 36,402,973 lbs. copper, 2,570 oz. gold, and 128,467 oz. silver; equal to 22.7% copper, 0.032 oz. gold, and 1.62 oz. silver per ton. In April, 1917, 11,419 tons yielded 6,203,992 lbs. copper. May and June outputs were lower on account of labor troubles. Up to August the production was only 3,000,000 lbs. behind the whole of 1916; and for 10 months, the total was 46,500,000 lbs., 10,000,000 lbs. ahead of the whole of 1916.

The recent history of United Verde Extension is remarkable, and large profits should continue when its own smelter is reducing lower grade ore. Limits of the orebody are not yet known, but the new work underway should prove them during 1918.

UNITED VERDE, JR., CO.

Property, the Ballard group, reverted to owners. See Ballard Group.

VENTURE HILL MINING CO., THE ARIZONA

Address: W. R. Uber, sec-treas., Prescott, Ariz. **Mine address:** E. L. Bartholomew, supt., Jerome, Ariz.

Officers: Ed. Shumate, pres.; C. T. Jolly, v. p.; E. L. Bartholomew, supt. Inc. 1900, in Arizona. Cap., 3,000,000 shares; \$1 par. In Sept., 1917, \$25,000 was borrowed, for development, on 10% notes, secured by mortgage.

Property: 6 patented claims, 110 acres, 2 miles S. of Jerome, Yavapai Co., Ariz., near the Verde Combination and others. Examined by W. H. Weed in 1916. Mine was idle for years, but was reopened in July, 1916.

Geology: claims show a complex of altered Yavapai schist, quartz porphyry and diorite, cut by fractures and fissure veins. Two veins show some scattered ore in shaft and tunnel, samples assaying 6.96% copper, 6.5 oz. silver and \$4 gold per ton; ore in commercial amount had not yet been disclosed in October, 1917.

Development: by a joint shaft on the Verde Apex line, 265' deep, Oct., 1917, which connects with the 575' Socrates tunnel. The 2-compartment shaft has been in ore almost since the start, the schist showing pyrite and chalcopyrite. Over \$40,000 spent in 10 months, 1916.

Equipment: includes 60 h. p. Foss gas engine, 25 h. p. hoist, Sullivan compressor, bunk and boarding houses, etc.

Is regarded as a good prospect.

VERDE APEX COPPER MINING CO. ARIZONA

Address: J. H. Robinson, sec., Clarkdale, and E. L. Bartholomew, supt., Jerome, Ariz.

Cap., \$3,000,000; shares \$1 par; 750,000 in treasury; 450,000 issued; 1,600,000 in pool, largely under option to E. L. Bartholomew.

Property: 8 claims, 85 acres, in central part of the Verde district, one mile from Jerome, and some distance S. of the open cut of the United Verde mine. The claims are well located. As underground work is limited, the prospective value of the ground is largely a matter of geologic deduction and estimate, based on finding both oxide and sulphide ores in the tunnels, and with full knowledge of the 3 producers in the district.

Development: three veins are exposed in tunnels. The Black Horse is 6' wide, carrying good ore; the Socrates is narrow, but has promise, and No. 3 vein in the upper tunnel shows oxide ore of commercial value. With the Venture Hill Mining Co., which see, a joint shaft is being sunk on the boundary of the two properties. This was 260' deep, Oct., 1917.

Under permit of Ariz. Corp'n Commission, treasury stock is offered at 25c, with option of purchase of 2 shares ownership stock at 12½c., latter pooled one year.

Is a promising mining venture.

VERDE CENTRAL MINES, INC.**ARIZONA****Address:** C. T. Joslin, sec., Prescott, Ariz.**Officers:** W. F. Staunton, pres.; C. T. Joslin, sec.-treas., with J. A. Hope, C. C. Miller, Jr., and L. Spence, directors.**Inc.** Aug. 16, 1916, in Arizona. **Cap.**, \$2,500,000; shares \$1 par; non-assessable; 500,000 issued.**Property:** 20 patented claims, 308 acres, at Jerome, Ariz., in the center of the Verde district. Claims considered well located, and merit development of the known veins and prospecting along shear planes and beneath the limestone cap. Contains extension of the Venture vein, of claims owned by U. V. Extension.**Development:** by 3 old prospect tunnels, probably 1,000' long, on the Venture vein, and a 200' shaft sunk on the northern part of the property. Tunnels show ore. Is regarded favorably.**VERDE COMBINATION COPPER CO.****ARIZONA****Address:** David Morgan, supt., Box O, Jerome, Ariz.**Officers:** J. L. Dyer, pres.; F. P. Jones, v. p.; A. F. Kerr, sec.-treas.; with J. C. Callahan, J. M. Layman, J. S. Eberman and W. N. Richards, directors. O. G. Engelder, asst. supt.**Inc.** in Arizona. **Cap.**, \$1,000,000; shares 50c par; non-assessable; 1,600,000 issued. El Paso Bank & Trust Co., El Paso, Texas, transfer agent and registrar. Annual meeting in October.

Operating expenses from Nov. 1 to Dec. 31, 1916, were about \$15,000; and up to July 30, 1917, totaled \$82,000. On that date the cash balance was reported to be \$395,000.

Property: 33 claims, 550 acres, 15 patented, in Verde district, Ariz. Company's engineers consider it is on the main fissure of the district, and superficially to possess all the favorable attributes for ore deposition.**Development:** recent development is all at the north end of the property, by a new shaft over 700' deep (Oct., 1917), which connects with extensive workings in the Mescal tunnel. This tunnel shows the great Verde fault, the master, and post mineral fault that traverses the Jerome district for 20 miles; also discloses 2' of 5% copper ore, in a fissure vein, on which but little development save a raise has been done; also two promising contacts between diorite with stringers of copper; and a 75' tunnel opening a 3' quartz vein. Shaft, where the contacts and mineralized zones are being explored. The old workings at the south end of the tract include 640' and 500' shafts, showing diorite with stringers of copper; and a 75' tunnel opening a 3' quartz vein.

Shaft has disclosed chalcocopyrite ore in bunches and scattered particles for over 100', but no workable orebody has yet been reached (Oct., 1917).

VERDE GRANDE COPPER CO.**ARIZONA**

Reorganized in July, 1917, as the Jerome Grande Copper Co., which see. Described in Vol. XII.

VERDE HUB COPPER CO.**ARIZONA****Address:** Philip Carroll, pres., 715 Millikin Bldg., Decatur, Ill. W. S. Owens, supt.**Inc.** Nov., 1916. **Cap.**, \$1,000,000; shares 50c par. A reorganization of the Decatur Copper M. Co.**Property:** known as the Decatur, one mile S. of Jerome, Ariz.**Development:** by 284' shaft. Diamond drilling, in charge of Samuel Morthland, was started in Sept., 1917.**VERDE MONSTER COPPER CO.****ARIZONA****Address:** J. J. Fearis, supt., Jerome, Ariz.**Officers:** T. F. Shea, pres.; C. M. Pedley, v. p.; and A. M. McLellan, sec.-treas.

Inc. in Arizona. **Cap.**, \$2,000,000; shares 25c par; non-assessable.

Property: 600 acres, 8 miles N. of Jerome, Ariz. About the end of 1916 ore containing 4% copper was found near the surface.

VERDE QUEEN COPPER CO.

ARIZONA

Reported in Smythe's *Obsolete American Securities*, Vol. XI, 1911, "New Jersey charter void 1906, for non-payment of taxes."

At a stockholders' meeting held in Jersey City, N. J., May 6, 1916, dissolution of the company was approved. It was decided to make a distribution of part of its assets, consisting of 1,000,000 shares of Jerome Verde Copper Co.'s stock; holders of Verde Queen stock to receive in partial liquidation 200 shares Jerome Verde stock for each share of Verde Queen stock.

Property of the company was taken over in 1906 by the Jerome Verde Copper Co.

VERDE SQUAW COPPER MINING CO.

ARIZONA

Address: T. H. Gray, sec., or Wm. Winkelman, supt., Box 682, Jerome, Ariz.

Officers: J. B. MacDonald, pres.; D. W. Barter, v. p.; T. H. Gray, sec.; C. F. Benjamin, treas., with C. C. and G. Reid, directors.

Inc. Jan. 8, 1917, in Arizona. **Cap.**, \$1,500,000; shares \$1 par; non-assessable; 809,910 issued. Annual meeting, second Monday in January.

Property: 15 claims, 275 acres, in Verde Valley, 4½ miles S. of Camp Verde, in Squaw Peak range, 25 miles E. of Jerome, Yavapai Co., Ariz. Examined in 1917 by William Winkelman.

Development: prospected for 17 years by D. W. Barter, and 3 to 40% ore has been exposed in numerous places. Present work consists in extending the Barter tunnel, now in over 400', to cut ore of winze.

Is a meritorious mining venture.

VICTOR COPPER CO.

ARIZONA

Reorganized as New York Verde Copper Co., which see.

Address: W. W. Lewis, Kingman, Ariz.

WEST UNITED VERDE COPPER CO.

ARIZONA

Mine office: Jerome, Ariz.

Officers: C. B. Stranahan, pres.; Brainard Avery, v. p.; Arthur Terry, sec.-treas.; preceding, with R. K. Wehner, Wm. T. James, J. B. Patton and Jas. T. Fisher, directors; John H. Banks, cons. engr., 61 Broadway, New York City.

Cap., \$5,000,000; shares \$1 par; 3,375,000 issued.

In Oct., 1917, company absorbed the Jerome-Victor Extension Copper Co. on the basis of 2,250,000 West United shares in exchange for 450,000 Jerome-Victor shares. If the 1,125,000 shares are sold at 25c. the new company will have \$281,250 cash with which to commence work.

The Jerome Victor Extension C. Co. was a reorganization of the Haynes C. Co., which in turn had succeeded the Jerome Mines Dev. Co.

Property: 8 patented claims, 160 acres, adjoining the United Verde on the N. W., shows lenticular orebodies in dioritic schist, reported to be 3'-19' wide and traceable for 2,000'.

Development: includes 1,200' shaft, with 2,000' drift and crosscut work on 700' level and 160' on the 1,200' level; also a 350' prospect shaft and 248' tunnel. Excessive flow of water encountered in drill holes, 2-300' deep, said to have forced former management to pull the pumps and close down the property in 1914.

The mine had been unwatered to 1,200' in June, 1917, when the miners' strike resulted in suspension of work, allowing the shaft to fill again. Little was being done in August, 1917; but on the present company assuming con-

trol, the mine should be unwatered by middle of November, and sinking continued to 2,000'.

Equipment: includes electric hoist, 10-drill Ingersoll-Rand compressor and 12 buildings. In 1917 a 150 k. w. generator was installed.

JOHNSON AND DRAGOON, COCHISE COUNTY

ARIZONA COPPER SHIPPING MINES CO.

ARIZONA

Mine office: Dragoon, Cochise Co., Ariz.

Officers: E. E. Wiseman, pres.; C. E. Cummings, v. p.; C. F. Elliott, sec.-treas.

Inc. 1910. Cap., \$1,000,000; shares \$10 par; issued \$620,000.

Property: 8 patented claims, 160 acres, 2 miles N. E. of Dragoon. The property shows limestone crossed by numerous veins, averaging 2 to 12' width, said to carry 4 to 7% copper, 1 to 6 oz. silver and a trace of gold.

Development: by several pits and shallow shafts, deepest 130', with about 600' of workings. Is a prospect. Idle.

ARIZONA & MICHIGAN DEVELOPMENT CO.

ARIZONA

Office: Benson, Ariz. **Mine office:** Johnson, Cochise Co., Ariz.

Officers: S. French Hoge, pres.; E. C. McMahon, sec.-treas.; N. T. Trigar, supt.

Inc. 1904, in Arizona. Cap., \$2,500,000; shares \$5 par.

Property: 7 claims, patented, 140 acres, showing porphyry and limestone. Claims said to carry 4 orebodies, 1 opened by vertical and incline shafts and tunnels, showing a 5' vein with poorly defined walls and impregnations in the limestone hanging and porphyry footwall. Has a 450' two-compartment main shaft with 24 openings showing cuprite, malachite and copper sulphides said to give average assays up to 12% copper, 18 oz. silver and \$1 gold per ton.

Equipment: 60 h. p. gasoline engine with double-drum hoist, 200 h. p. boiler and compressor. Company owns a short railroad connecting with the Southern Pacific Railway at Dragoon. Reported Dec., 1916, to be shipping 50 tons of 4% ore daily. About 60 men employed.

ARIZONA UNITED MINING CO.

ARIZONA

Office: 1420 Chestnut St., Philadelphia, Pa. **Mine office:** Johnson, Cochise Co., Ariz.

Officers: Alfred S. Miller, pres.; Alfred C. Harmer, Jr., v. p.-gen. mgr.; David H. Ross, treas.; Alfred H. Miller, sec.; preceding officers, Wm. M. Houston, J. Wesley Allison, Chas. B. Cox, Geo. E. Barnett, Wilson H. Brown, G. M. Jones, Earl P. Mendenhall and Fred J. Petry, directors. F. W. Smith, cons. engr.

Inc. Aug. 12, 1910, in Arizona, as successor to Arizona United Mining Co. of Delaware. Cap., \$5,000,000; shares \$1 par; non-assessable; \$2,500,000 outstanding.

Dividends: 1% quarterly, begun October, 1916. Company is a close corporation.

Property: 45 claims, 30 patented, about 1,000 acres, 7 miles N. E. of Dragoon, in the Johnson mining camp. Land includes the Mammoth, Republic, Copper King and Southern group of claims. Principal development is on the Republic claim, opened by an 820' shaft, with about 6,000' of workings, in ore averaging about 5% copper.

The Mammoth mine has a 350' shaft, with about 3,000' of workings, in argentiferous and auriferous copper ore, giving average values of about 4% copper and 7% zinc.

Equipment: includes power plant, with hoists at the Republic and Mammoth mines; an electric plant, 4 Ingersoll-Temple electric drills and Ingersoll

air compressor. Transportation is by a standard-gauge railway from Johnson to Dragoon, connecting with the Southern Pacific Railway.

Mining operations are conducted by the Cobriza Mines Development Corporation for the account of the Arizona United Mining Co., lessor, and the Goodrich-Lockhart Co., lessee.

Production: was at the rate of 5,000 tons per month during 1916, totaling 65,647 tons, which netted \$699,526.

BLACK PRINCE COPPER CO.

ARIZONA

Office: 640 Gas & Electric Bldg., Denver, Colo. **Mine office:** Johnson, Cochise Co., Ariz.

Officers: Robt. N. Bell, pres. and gen. mgr., Denver, Colo.; F. T. Henry, v. p.; J. B. Wright, sec.-treas.; preceding officers, M. A. Hoag and W. A. Milne, directors.

Inc. May 10, 1901, in Arizona. **Cap.**, \$1,500,000; shares \$1 par, non-assessable; issued 1,320,100 shares. Annual meeting, last Wednesday in May. No indebtedness.

Property: adjoins Peabody mine and comprises 8 patented claims, 147 acres, showing replacement deposits in limestone. Mine has a 950' two-compartment shaft, sunk in limestone and showing copper oxides and carbonates, bornite and chalcopyrite on various levels. Recent exploration includes a 675' crosscut on 900' level.

Equipment: includes two 100 h. p. boilers, 175 h. p. steam hoist, Sullivan compressor, gas engine, 3 Cameron pumps and electric generator.

CENTURION ARIZONA MINING CO.

ARIZONA

Dragoon, Cochise Co., Ariz.

Officers: J. P. Richardson, pres. and gen. mgr.; Samuel Bennett, v. p.; H. A. Morgan, sec.-treas.; preceding officers, J. C. Page, J. W. Angle, W. H. Purdy, M. S. Richardson, E. F. Woodworth and H. E. Dunlap, directors. Willcox Bank & Trust Co., treas.

Inc. July 26, 1906, in Arizona. **Cap.**, \$1,000,000; shares \$1 par; non-assessable; issued, \$575,961.

Property: 23 claims, 430 acres, in two groups, about 2 miles N. W. of Dragoon, in the Dragoon Mountains, shows a contact deposit between pre-Cambrian limestone and altered schist, averaging about 15' in width, and carrying azurite and malachite, associated with hematite. Ores carry an average of 2.7% copper.

Development: is by a 660' incline shaft, several shallower shafts ranging from 40 to 100' in depth, and a 3,000' tunnel, with about 4,500' of workings, estimated by management to show 165,000 tons ore in sight. Work on the 600' level said to be in 8.12% ore for 50'.

Equipment: includes a 15 h. p. gasoline hoist, good for 800', a small air compressor, pump, 70 h. p. boiler, machine shop, smithy and other necessary mine buildings. Water encountered on 660' level has somewhat retarded development, but shaft is to be deepened in 1917-18. Property considered promising.

EMPIRE COPPER & GOLD MINING CO.

ARIZONA

Office: 510 Bradbury Bldg., Los Angeles, Cal. **Mine address:** Dragoon, Cochise Co., Ariz.

Officers: Leon V. Shaw, pres. and treas.; P. E. Woods, v. p.; Chas. R. Van Tilburgh, sec.; preceding, with M. J. Gress, H. Hermanson, C. J. Nordquist, R. W. Pigeon, C. R. Lawrence, directors.

Inc. Jan. 31, 1905, in Arizona. **Cap.**, \$1,500,000; shares \$1 par, non-assessable; issued 953,814. Annual meeting, second Monday in October.

Property: 3 separate groups of claims, near Johnson and Dragoon, on the Southern Pacific Railway. The Empire group, 16 claims, 2 miles S. E. of Johnson, shows limestones and quartzite cut by porphyry and traversed by N.W. fissures carrying ore. Principal development is by the 380' Empire 2-compartment incline shaft, with about 500' of drifts, so wet that it was abandoned, temporarily; also the 125' Bridge, 158' Copper Whale and a 2,000' tunnel shaft started. Mine shows auriferous and argentiferous copper ore.

In May, 1913, machinery and supplies were moved from the Empire group 6 miles south to the Princess group, said to have attractive surface showings of iron gossan and copper carbonate and to be opened only by shallow shafts. Company also owns the Cowboy group of 8 claims, partly developed, showing veins in limestone near porphyry contacts.

Equipment: includes a 25 h. p. hoist and 1-drill Fairbanks & Morse air compressor. Buildings include an engine house, smithy, bunk house and boarding house.

No recent returns.

GREAT WESTERN GOLD & SILVER CO.

ARIZONA

Idle. Dragoon, Cochise Co., Ariz.

Inc. about June, 1908.

Property: in the Dragoon Mountains, show lead and copper ores with gold-silver values.

HAYES & GRACEY SYNDICATE

ARIZONA

M. P. Hayes and T. H. Gracey, Los Angeles, Cal., owners. Succeeds the Dragoon Copper Mining & Smelting Co., now dead.

Property: the Christmas and Eureka claims, carries replacement deposits with silver-lead-copper ores.

Development: by a 550' shaft.

Equipment: includes steam power and air compressor. Presumably idle. No returns secured.

JOHNSON COPPER DEVELOPMENT CO.

ARIZONA

Office: Frankfort, Ky. **Mine address:** J. T. Tong, mgr., Johnson, Cochise Co., Ariz.

Officers: Henry S. Krug, St. Louis, Mo., pres.; Ralph R. Wilson, v. p.; E. H. Elliott, sec.-treas.; preceding, with P. S. Head, Hon. A. A. Hazelrigg, Hon. Baily D. Berry, Hon. A. C. Van Winkle and H. P. Hubbell, directors.

Inc. March 13, 1908, in Arizona. Cap., \$2,000,000; shares \$1 par; non-assessable; issued, \$1,475,000. Annual meeting, second Monday in October.

Bonds: \$100,000 5-year 6% 1st mortgage gold bonds authorized, interest payable annually on Dec. 21. Principal due Dec. 21, 1921. \$85,000 worth of the bonds have been sold.

Property: 8 claims, 3 fractional, unpatented, 123 acres, known as the Climax group, in center of the Johnson camp, between the Peabody, Peacock, Republic and Black Prince mines. Claims show granite and limestone, with replacement deposits carrying malachite, chrysocolla, bornite and chalcocite, averaging 4% copper and 5 oz. silver per ton for the several thousand tons thus far developed. Orebody has a flat dip, averaging 32°, and is about 2' wide on the 250' level.

Development: by 800', 1½-compartment working shaft, said to be bottomed in bornite disseminated in limestone. The 100' level has about 500' of crosscuts and drifting, much of it in ore, but ground is leached and broken. The 250' level has N. and S. drifts, 500' of workings, on a 2' vein. A 500' winze was sunk from the S. drift. Development is said to show large bodies of low-grade carbonates near the surface and some sulphides at 400' depth. On the dump is a car of 8% ore.

Equipment: includes a 40 h. p. gasoline hoist, 4-drill compressor and 5 buildings.

KEYSTONE COPPER MINING CO.**ARIZONA**

Idle.

Office: 603 W. Broadway, Newton, Kans. Mine at Johnson, Cochise Co., Ariz.

Officers: W. W. Miller, pres. and gen. mgr.; A. Bannow, v. p.; T. C. Miller, sec.; W. J. Trousdale, treas.; preceding are the directors. Doane Merrell, territorial agt.; U. R. Miller, supt.

Inc. 1908, in Ariz. **Cap.**, \$900,000; shares \$1 par; \$741,735 issued.

Property: the Bannow group, 16 unpatented claims, surrounding the St. George claim and 1½ miles from the Arizona United property, said to show a large deposit of iron ore and to have cut several veins in a 400' vertical shaft. Claims to have blocked out a considerable tonnage of milling ore between the 300' and 400' levels. Shipped 16 cars of ore during the spring of 1916, assaying 17.5% copper and 3.6 oz. silver. Plans further sinking and developing, with possible erection of a 200-ton concentrator.

MASCOT COPPER CO.**ARIZONA**

Office: Harris Trust Bldg., Chicago. **Mine offices:** Dos Cabezos, Cochise Co., Ariz.

Officers: R. V. Dixon, A. J. Baldwin, J. A. Street, J. W. Phillips and H. H. Evans, directors. T. N. McCauley, mgr.; J. W. Prout, Jr., supt.

Inc. July, 1907, in Arizona. **Cap.**, \$15,000,000; shares \$10 par; non-assessable. Outstanding, 1,000,000 shares.

Property: 48 claims, 20 patented, 1,100 acres, about 300 acres being classed as mineral lands, in the Dos Cabezos district. Company also owns a town site near Dos Cabezos, and miscellaneous lands, including 3 placer claims, total holdings over 1,100 acres.

Property shows limestone near a granitic area, intruded by diorite dikes and quartz porphyry with a covering of rhyolite, on part of the ground. The limestone shows in the lower hills on the south. Granite constitutes the two pillars known as Dos Cabezos.

The ore occurs largely in lenses in contact deposits between altered lime and porphyry and generally within a mineralized zone of from 300' to 400' in width. Ores carry chalcopyrite in a gangue of contact minerals with 3 to 20% copper, the average being 5%, and small gold-silver values.

Development: by the 450' Oregon shaft, and 2 tunnels, longest the 1,800' Consolidated tunnel, connecting with the shaft at the 4th level. Total underground openings aggregate 25,000', and ore in sight is estimated at about 500,000 tons, containing 5% copper. About 20,000' of diamond drilling has been done in various parts of the property. Recent results reported as good, especially at depth of 700'.

Equipment: includes a 250 h. p. distillate engine, a 12-drill air compressor, machine shop, electric lighting plant, smithy, telephone system and boarding house, with about 80 buildings. About 125 men are employed. In June, 1915, the company finished building the Mascot & Western R. R., a 15-mile line connecting the town of Mascot with the S. Pac. R. R. at Wilcox, Arizona. A 10,000' aerial tram is used for carrying ore and supplies from mine to railway. A concentrator is contemplated.

The mine management is good and property is reliably reported as promising, though the company's advertising was lurid and its campaign of stock selling was regarded unfavorably in past years.

Mine was leased to the A. S. & R. Co. in 1917. Output in July was about 2,500 tons, which is sent to El Paso.

PEABODY CONSOLIDATED COPPER CO.**ARIZONA**

Office: 111 Broadway, New York. Mine office: Johnson, Cochise Co., Ariz.

Officers Leo Schlesinger, pres.; Alex T. Wells, v. p.; I. Niner, sec.; J. Born, treas., with Jos. B. Mayer, Morgan J. O'Brien, Jr., Herbert R. Limburg, G. M. Minzesheimer and Jas. Muir, directors. John H. Banks, cons. engr. W. T. Eberhardt, mgr.

Inc. in Ariz. Cap., \$1,500,000; shares \$5 par; fully paid and non-assessable. Empire Trust Co., New York, transfer agent. Listed on New York Curb.

Property: 12 claims, 5 patented, 230 acres, covering 2,000' along the ore belt at the Johnson camp, bought of the Bonanza Belt Copper Co., includes the Peabody mine, located 1879. Mine has a contact deposit between diabase and limestone and replacement veins, all within a 100' belt. Mine is credited with a production of about \$411,970. Ore is a mixture of zinc blende and chalcopyrite in a garnetized lime gangue and is oxidized to a depth of 200'. The ore shipped runs 4%-6% copper, with 5% iron, 15%-20% lime and 55% insoluble; silver averages $\frac{1}{2}$ oz. to each percent copper.

Development: by a 350' shaft, with crosscuts on the 200' and 300' levels, On the 3rd level a crosscut is being driven toward the contact. No ore reserves reported.

Equipment includes 90 h. p. power plant, compressor and hoist.

Shipments: 300 tons per month are made to the Cons. Kansas City S. & R. Co. (El Paso smelter), a subsidiary of the A. S. & R. Co., under a 3-year contract. Forty men employed.

Prospectus issued by company is regarded as rather unduly optimistic. Property is an old one, having been operated intermittently for 20 years.

STERLING COPPER CO.**ARIZONA**

Address: care Judson A. Elliott, Phoenix, Ariz. Mine office: Dos Cabezas, Ariz.

Officers: J. W. Thomas, pres.; L. C. Elliott, sec.; D. E. Nelson, treas.; with E. A. Congdon and J. A. Elliott, directors. C. H. Bean, supt.

Inc. 1906, in Arizona. Cap., \$1,000,000; shares \$1 par; non-assessable; issued, 482,600 shares.

Property: in the vicinity of Dos Cabezas, Cochise Co., Ariz., is developed by short tunnels and a shaft 125' deep, following a limestone porphyry contact, showing copper and lead ore which is said to average 5% copper. There has been about 1,000' of work done and \$3,000 spent in development. Property is a prospect. Letters returned in July, 1917.

TETER-STONE AZURITE MINING CO.**ARIZONA**

Dr. D. W. Teter, pres.

Property: 3 miles south of Dragoon, Cochise Co., Ariz., has a 4 to 10' contact deposit, between limestone and granite, showing outcrops of azurite and malachite, with some sulphide ore in a tunnel. Operations suspended, 1913, owing to a heavy inflow of water.

WILLIE ROSE COPPER MINING CO.**ARIZONA**

Address: J. W. Sterling, mgr., Bowie, Ariz.

Property: the Willie Rose mine, near Triangle Springs, 13 miles S. of San Simon, Cochise Co., Ariz., operated under 10-year lease from 1914. Developed by 188' shaft said to be bottomed in a 12' vein carrying slightly argenteriferous chalcocite, of about 2% copper tenor. Ore occurs in lime-porphry contact, veins running E.-W., showing copper glance at slight depth. Has made several shipments of \$12 per ton ore to the El Paso smelter.

Equipment: includes hoist, oil engine, compressor and air-drills.

KINGMAN, YUCCA, MOHAVE COUNTY

See Chloride district for other mines.

ARIZONA-EASTERN MINING CO.**ARIZONA**

Address: 220 Fifth Ave., New York. **Mine office:** Kingman, Ariz.

Officers: Wm. Schuette, pres.; S. W. Odell, v. p.; A. V. Bradrick, v. p.; Lewis Lusk, sec.-treas.; preceding officers are the directors.

Inc. July 9, 1915, in Ariz. **Cap.**, \$1,500,000; shares \$1 par; issued \$700,000. Bonds authorized, \$100,000, none issued.

Property: 23 claims, 1 patented, 375 acres, 2 miles east of Hancock siding, on main line of Santa Fé R. R. and 10 miles south of Kingman, Ariz., includes the Red Hill and Fay mines, showing gold quartz fissure veins in granite porphyry. The mine was worked years ago by Mexicans. Mill tests said to show average value of \$11.78 gold per ton, with a 98% recovery in cyanide plant.

Development: 200' incline shaft and two 50' shafts, with 400' of underground workings.

Equipment: includes gasoline hoist and a 5-ton stamp mill for testing purposes. Company plans further development work.

ARIZONA-SOUTHWESTERN COPPER CO.**ARIZONA**

Office: 715 Higgins Bldg., Los Angeles, Cal. **Mine office:** Copperville, via Yucca, Mohave Co., Ariz.

Officers: R. H. Weber, pres.; Fred Hessel, v. p.; J. H. Hoffman, sec.; C. Hoffman, treas.; preceding officers, W. G. Laidley, T. A. McNeal, C. L. Davidson, E. B. Schermerhorn and John T. Slitzer, directors; John Lefler, mine supt.

Inc. 1907, in Arizona. **Cap.**, \$4,000,000; shares \$1 par, non-assessable; issued 3,300,000. Authorized bond issue, \$150,000; all outstanding. Annual meeting held in Kingman, Ariz., in April.

Property: 14 claims, 9 patented, 276 acres, including the Pittsburgh mine, in Crow canyon, Cedar Valley district, Hualapai Mountains, 25 miles from Yucca, the nearest rail point. Mine has 2 orebodies under development, estimated by company to average 30' in width and to be traceable 2 miles, opened by tunnels of 500' and 682', and shafts 400' and 300' connected on the 200' level, with about 5,000' of workings. Mine, which is quite wet, shows chalcopryrite, galena and sphalerite, estimated by company to average 0.25% copper, 3% lead, 4% zinc, 10 oz. silver and \$1 gold per ton, which seems too high for a large orebody of this type. Company claims to have 100,000 tons of \$12 ore on the 200' level.

Equipment: includes an 85 h. p. electric hoist, steel headframe, a 12-drill Ingersoll-Rand air compressor, smithy and 300-ton concentrator, with 14 Overstrom tables. Plans to continue shaft sinking and do development work on the 400', 600' and 800' levels.

Property has ore, but it is complex, and mining, milling and freight charges high, so that the problem of dividends is one requiring great skill, courage and time, as well as ample funds.

ARIZONA TELLURIUM MINES CO.**ARIZONA**

Kingman, Ariz.

Officers: Thos. H. Condon, pres.; Geo. A. Shea, sec.-treas.; preceding officers, Carl Bertschinger, W. C. Pedlar, directors.

Property: claims in the Maynard district, 15 miles east of Kingman.

Development: 200' tunnel and a shaft which is being sunk to the 300' level. Presumably idle.

ARIZONA VENTURE CORPORATION**ARIZONA**

Office: 535 Chamber of Commerce Bldg., Pasadena, Calif. **Mine office:** Venture Camp, Kingman, Mohave Co., Ariz.

Officers: Geo. H. Hill, v. p.; Chas. H. Wagener, sec.-treas.; with Jas. Irving, Geo. W. Way, Willis Stanley and W. L. Talbout, directors.

Inc. in California. Cap., \$500,000; increased to \$1,000,000 in 1915; shares \$1 par; 510,000 shares issued.

Property: 5 groups, 12 claims, about 240 acres, is near the Old Diamond Joe mine and is being developed by tunnel, 200' long, reported to have opened up \$15 ore. Company plans erecting a mill.

Equipment: includes hoist, air compressor, drills and electric power plant.

Company also owns the Waldron group at Deluge, Wash., and is sinking a new shaft to 500' level, with crosscut on 400' level, showing 4' 6" of \$23.60 ore. In 1915 management announced production of "lenzite" in commercial quantity, used for wireless telegraphy, in crystals valued at \$5 each. The Lenzite Crystal Corporation was incorporated for this purpose.

Present management disclaims responsibility for exaggerated claims of former president. The commercial value of property and patents remains to be proved.

COPPER GIANT MINE

Hackberry, Mohave Co., Ariz. Wm. Neagle, supt. Property optioned in 1913, by United Verde Copper Co., Jerome, Ariz., which see.

McCRACKEN SILVER-LEAD MINES CO.

ARIZONA

Address: E. C. Davies, 15 Exchange Place, Salt Lake City, Utah. **Mine office:** McCracken, Mohave Co., Ariz.

Officers: W. P. O'Meara, pres.; W. B. Van Horn, v. p.; W. A. Stephen, sec.-treas.

Cap., \$150,000; shares 10c par; 700,000 issued.

Property: an old producer in Mohave Co., Ariz.

Development: by tunnels to open veins at depth. Reports ore reserves of about 215,000 tons. Mill ore contains from 5 to 11.3% lead and 6.6 to 14 oz. silver per ton, for which a 100-ton mill was erected.

NEVADA-ARIZONA MINES CO.

ARIZONA

Office: 510 Odd Fellows Bldg., St. Louis, Mo. **Mine office:** Hackberry, Mohave Co., Ariz.

Officers: John Schmoll, pres.; Chas. E. Hamilton, v. p.; A. E. Louis, sec.; J. Wm. Seller, treas.; with J. Phillips, Aug. Richter, Jr., C. D. Morley, Edw. J. Ryan and Wm. Burmeister, directors. T. D. Walsh, supt.

Cap., \$1,500,000; shares \$1 par. Operating expenses for 1915 were \$51,717.

Property: 17 patented claims, about 340 acres, in the Music Mountains, said to show gold and silver values. Ore occurs in fissure veins, 4-10' wide, in granite formation. Average assays reported at from \$10-\$50 per ton.

Development: includes the 700' Lucknow shaft and 700' Roosevelt tunnel, latter in milling ore for 200'. At depth of 515' the Lucknow vein is 12' wide and carries a little galena.

Equipment: includes compressor and gas hoist. Company has erected a small concentrator, which started work in Oct., 1913. Operations in 1915 resulted in gross earnings of \$22,262 and a 95% recovery.

Mill operating one shift in June, 1917.

ORO-PLATA MINE

ARIZONA

Address: O. B. Stanton, supt., Kingman, Mohave Co., Ariz., and 101 Wall St., N. Y. Property is a gold mine, producing lead-zinc ore, with gold and silver values.

Development: by 280' shaft; equipped with gasoline hoist. Mine has mill with 2 Nissen stamps. Credited with production of \$500,000 in gold and silver.

SOUTHWESTERN COPPER CO.

ARIZONA

See Arizona-Southwestern Copper Co.

TELLURIDE CHIEF MINING CO.**ARIZONA****Office:** 502 Haas Bldg., Los Angeles, Cal. **Mine office:** Kingman, Ariz.**Officers:** W. E. Frost, pres.; S. F. Kelley, v. p.; C. C. Randall, sec.-treas.; R. L. Cornell, res. engr.; G. R. Hannan, gen. mgr.**Inc.** in California. **Cap.**, 1,000,000 shares; \$1 par.**Property:** 6 claims in Maynard district, Mohave Co., Ariz., 20 miles S. E. of Kingman, on E. slope of Wallapai Mountains. Examined by C. E. James, H. E. Bierce, V. Gelensnoff, A. H. Bradford, R. L. Cornell, W. L. Mackay, C. R. Harris and R. C. Jacobsen.**Development:** by over 1,000' of workings to depth of 200'. Shaft to be sunk to 500'. Several veins of molybdenite, gold and copper ore being opened and 2,500 tons are reported on dumps.**Equipment:** 100 h. p. semi-Diesel engine, 60 h. p. hoist, compressor, and 50 or 100-ton mill to be erected.

Company stated in June, 1917, that it expected to be a large producer of molybdenite in a few months.

WALLAPAI CHIEF MINING CO.**ARIZONA****Address:** S. C. Hall, 648 S. Olive St., Los Angeles, Cal., or Kingman, Ariz.**Officers:** C. F. Eyton, pres.; J. W. Squires, v. p.; S. C. Hall, sec.-treas.; with H. T. Rudisill and E. A. Gord, directors.**Inc.** April, 1916, in Arizona. **Cap.**, \$2,000,000; shares \$1 par; non-assessable; 1,000,000 outstanding.**Property:** 5 claims in Maynard district, near Kingman, Mohave Co., Ariz. Sinking underway to open a gold-silver vein in quartzite.**WALNUT CREEK MINING & MILLING CO.****ARIZONA****Kingman, Mohave Co., Ariz.** C. E. Worton, pres.; R. P. Wheelock, mgr.**Property:** 9 miles S. of Kingman, shows a 14" vein of gold and silver-bearing copper ore. No 1917 returns secured.**WASHINGTON-ARIZONA COPPER CO.****ARIZONA****Address:** E. D. Reese, mgr., Kingman, Ariz.**Property:** the George Washington claims in Mineral Park district, Mohave Co., Ariz.**Development:** by 3 tunnels. Some rich copper-silver ore was reported as opened in April, 1917.

In August, 1917, a 900-ton mill, using the Fields flotation process, was reported ready to start operations.

WRIGLEY EXPLORATION CO.**ARIZONA****Address:** N. E. Guyot, Kingman, Ariz.**Officers:** J. H. Patrick, pres.; W. H. Wiley, v. p.; N. E. Guyot, sec.-treas.**Inc.** in Wyoming. **Cap.**, \$1,500,000; shares \$1 par; non-assessable.**Property:** company had an option on claims in the Oatman district, which were forfeited after spending \$40,000 on work. Examined by C. H. James and John Anderson.

Other property is to be acquired by the company to replace the Oatman mine.

YUCCA-ARIZONA COPPER CO.**ARIZONA****Address:** 516 Merritt Bldg., Los Angeles, Cal. **Mine:** 20 miles from Yucca, on the A., T. & S. Fe R. R., in Mohave Co., Ariz.**Officers:** S. J. Haynes, pres.; C. H. Post, v. p.; H. Leon Haynes, sec.; preceding, with W. S. Bullis and W. H. Dann, directors. J. E. White, supt.**Inc.** Jan. 20, 1911, in Arizona. **Cap.**, \$2,000,000; shares \$1 par; 525,000 issued. Annual meeting, third Monday in January.**Property:** 15 claims, 12 owned, 3 bonded, 320 acres, with 2 mill sites and 2 water rights. Lands show granite and porphyry with 6 veins, the main ledge

averaging 3' thick and proven for 3,000' along the outcrop. Ore carries chalcopyrite and copper glance and is reported to average 11.85% copper.

Development: includes 700' shaft, with crosscut showing 4' of ore.

Equipment: includes small gasoline hoist, electric power and mill.

YUCCA TUNGSTEN MINING CO.

ARIZONA

Address: Harvey Klotsch, mgr., Yucca, Mohave Co., Ariz.

Property: 26 claims, 25 miles N. of Edmaier Mining Co. (tungsten mine), in Cedar Valley district, Mohave Co., shows a 5' vein of ore, carrying 5% tungstic acid and 1% to 3% copper.

Development: comprises a 250' shaft and 1,300' of drift tunnels, 200' apart vertically. Company operates a 50-ton mill.

MAMMOTH AND COPPER CREEK, PINAL COUNTY

COPPER STATE MINING CO.

ARIZONA

Described on page 386.

MAMMOTH DEVELOPMENT CO.

ARIZONA

Address: 1022 Investment Bldg., Los Angeles, Calif., and Tucson, Ariz.

Mine office: Schultz, Pinal Co., Ariz.

Officers: C. E. Calm, pres.-mgr.; Epes Randolph, v. p.; C. L. Bundy, sec.-treas., with R. C. Gillis and R. O. Boykin, directors.

Cap., \$300,000; shares \$1 par; 100,000 issued.

Property: has a bond on the Mammoth and Collins groups at Schultz, developed by 833' shaft, said to show gold, lead and wulfenite ore. An 1,800' drift on the 700' level connects both groups.

Equipment: includes 8 Wilfley tables. Flotation is to be installed. Extraction September, 1917, at rate of 150 tons wulfenite ore per day. Shipping 4 tons of concentrates reported to carry \$35 gold and 20% MoO₃.

SOUTHWEST INSPIRATION COPPER CO.

ARIZONA

Office: 8 W. Adams St., Phoenix, Ariz. **Mine office:** Copper Creek, Pinal Co., Ariz.

Officers: H. H. Temple, pres.; J. J. Sweeney, v. p.-treas.; J. W. Crenshaw, sec.; C. J. Price, gen. mgr.; also directors, with Louis Huber.

Inc. 1917, in Arizona. Cap., \$5,000,000; shares \$1 par; non-assessable; 2,500,000 issued.

Property: 69 claims, 1,200 acres, adjoining Calumet & Arizona and Copper State companies' holdings on E., in Bunker Hill district, 12 miles E. of Mammoth, Pinal Co., Ariz. Examined by C. J. Price, N. R. Logue and Louis Huber.

Claims are said to show 5 chimney deposits in diorite, also disseminated porphyry. Ore carries copper, gold and silver values.

Development: commenced in May, 1917; tunnel 1,500' and shaft 400'. Proposed to drive 1,115' crosscut tunnel, sink 2 shafts and churn drill at three points.

SUNSET COPPER MINING CO.

ARIZONA

Address: Hayden, Ariz.

Inc. 1917, by F. W. McQuiston, J. E. Steele and G. H. Parsons. Cap., \$500,000; \$1 par.

Property: 10 unpatented claims, 206 acres, in Bunker Hill district, 14 miles E. of Mammoth and 34 miles from Hayden, Ariz.

Geology: ore-bearing rock is a quartz diorite that cuts the sedimentaries and volcanic breccias. Ore shoots are found as chimneys, or pipes, from 25' to several hundred feet in diameter. Ore usually occurs as a filling between fragments of breccia.

Development: by tunnels, one said to show 5' of 4.4% copper, another,

475' lower, showing 5' of ore, assaying 5.8%. No sulphides have been developed, only bunches of good ore. A 100-ton dump assays 8%.

Mine examined by N. W. Logue in Feb., 1917.

TABLE MOUNTAIN COPPER CO.

ARIZONA

Near Mammoth, Ariz. Was controlled by Arimex Consolidated Copper Co., now defunct; a Thos. W. Lawson promotion. Fully described, Vol. XI, Copper Handbook.

MAYER, YAVAPAI COUNTY

ARIZONA BINGHAMTON COPPER CO.

ARIZONA

Address: Stoddard, Yavapai Co., Ariz. Company absorbed the Stoddard Mines Co. and Stoddard Milling Co., described, Vol. XII.

Officers: W. H. Reynolds; J. H. Whyte, sec.-treas.; above, with David Cole, Francis S. Viete and E. W. Wells, directors. Geo. W. Johnson, gen. mgr.; S. E. Chaney, supt.

Inc. Feb., 1917, in Arizona. Cap., \$1,700,000; shares \$5 par; all outstanding. Stock listed on N. Y. Curb.

Property: 10 claims, 6 patented, about 175 acres, in the Copper Mountain district, 5 miles from Humboldt. Mine was discovered in 1882 and reopened by present company, 1916. The Binghamton mine shows a broad sheared zone in chloritic-sericitic schist. The ore carries chalcopyrite, with but little pyrite, in silicified schist. Main ore-shoot, has been opened from the 100' to 400' levels, and yields 5% ore, though the mill feed averages but 2.2% copper, and in 1916 not much over 1%.

Development: by 1,000' tunnel and 600' shaft, with about 4,000' of workings. New 3-compartment shaft to be sunk 1,500'.

Equipment: includes double-drum electric hoist, a 10-drill compressor, pumps and 250-ton flotation mill. A diamond-drill equipment was installed in 1917.

Production: mill reported to have treated 24,802 tons of ore from August, 1916, to April, 1917, producing 2,389 tons concentrates, that averaged 21.43% copper and netted the company \$243,570.

Treated 300,000 lb. copper in May, 1917, and with double milling capacity, June 1st, should now treat 500,000 lbs. per month.

ARIZONA COPPER QUEEN MINING CO.

ARIZONA

Address: 814 New York Life Bldg., Kansas City, Mo.

Officers: S. C. Douglass, pres.; E. S. Herider, sec.; E. J. White, treas., with W. D. Coldren, W. Burr Douglass and S. C. Douglass, Jr., directors; W. Burr Douglass, supt.

Inc. July 24, 1907, in Arizona. Cap., \$5,000,000; shares \$1 par; 2,641,000 shares outstanding. Annual meeting, first Tuesday in October.

Property: 8 claims, 160 acres, in Yavapai county, about 26 miles S. E. of Mayer, shows a number of narrow quartz veins in granite. The ore is quartz carrying copper sulphides and their oxidation products with fair gold-silver values.

Equipment: includes 75 h. p. boiler, 2 hoists, one good for 1,500', 8-drill Leyner compressor and steam power. Sinking shaft to 400' level.

The company has been practically idle since organization but started active development during 1917, also equipping property with necessary machinery. Sinking shaft to 400' level.

ARIZONA MERGER GOLD & COPPER CO.

ARIZONA

Idle. Mine near Mayer, Yavapai Co., Ariz. H. C. Hillwell, S. L. Herroq, Henry Reefson, Alonzo Hall, Robert M. Bazel and Geo. D. Birch, directors, at last accounts.

Inc. 1909, in Arizona, as a reorganization of the Lyon Copper Co. Cap., \$5,000,000; shares \$1 par.

Property: 64 claims, near Mayer, Yavapai Co., Ariz., show fissure veins developed by a number of tunnels and crosscuts with 250' shaft.

BIG LEDGE COPPER CO.

ARIZONA

Office: 310 Sellwood Bldg., Duluth, Minn. Ehrich & Co., New York City, fiscal agents. Mines at Big Bug (Huron P. O.), near Mayer and Humboldt, Yavapai Co., Ariz.

Officers and directors: Ernest Le Duc, pres.; Charles Batre, v. p. and asst. sec.; D. D. Murray, sec.-treas.; John P. Trebilcock, supt.

Company is the successor of the Big Ledge Development Co.

Inc. in Arizona, Jan. 20, 1915. Cap., 3,000,000 shares; par value \$5.00; fully paid and non-assessable; increased from \$1,500,000, Aug. 3, 1917; 1,900,000 shares issued. The Development company was converted into an operating company, Feb., 1916, the name being changed to Big Ledge Copper Co. and the par value of shares increased to \$5, the number of shares remaining the same and exchange made share for share. The company states that there are 751,000 shares of stock held in escrow, the balance in the hands of the public. Of 1,500,000 shares of new stock, 1,000,000 is to be used for the acquisition of the Great Western Smelters holdings, etc., and the balance is reported to have been underwritten at \$2.00.

Property: consists of 3 groups of claims aggregating approximately 1,900 acres. The Black Hills group consists of 43 unpatented claims about four miles east of Humboldt, Arizona. The Butternut group consists of 2 patented claims and 22 unpatented claims; the Henrietta group consists of 7 patented claims and 7 unpatented claims.

There is a spur of the railway line to the Henrietta orebins, and a 3,800' aerial tramway, costing \$12,000 was built in 1917, to convey Butternut ore to the railroad.

Henrietta Group and Mine: this property shows a fissure vein averaging 5' thick, cutting through hornblende schists near a diorite intrusion. The vein carries several shoots whose ore contains copper-pyrite with pyrite and zinc sulphides in quartz. The claims cover 4,000' along the Henrietta vein and a considerable distance along a split or intersecting vein. The ore shoots so far developed an average width of 2' of ore reported to average \$20 in value.

Development: comprises a main haulage way, 2,300' long called the Henrietta, or lower tunnel. From this level the Le Duc shaft has been sunk 278' below the tunnel floor at a point 2,000' from the portal. Still farther west and over the hill are independent workings, made in former years, and recently reopened. These comprise shaft No. 1 with hoisting equipment to 300' depth and by No. 2 shaft to 450' level and below. An old upper tunnel 327' above the Henrietta is connected with it by a raise. At 150' below the main tunnel, the Henrietta vein is opened by over 550' of drifting. This will eventually be connected with the west workings noted above.

An intersecting vein, the Invincible, meeting the Henrietta where the Le Duc shaft is sunk, shows several inches of high grade ore, making a workable ore shoot at the intersection. This vein is reported to be opened by a 100' drift, south on the 150' level of the Le Duc shaft, with an upraise to the tunnel.

The Butternut Mine: this mine has a zone of silicified, pyritized schist over 20' wide, in which large lenticular masses of pyrite occur, showing low average values in copper and silver. A foot-wall band 2'-3' wide

carries high zinc content. The mine output will, it is believed by us, average less than 2% copper, being largely iron pyrite and quartz. This does not accord with the press reports of 48' of 4% ore on the 300' level, and of 10% ore on the 425' level.

Development: includes two old 1-compartment shafts, only 150' apart, one 300', the other 425' deep, and the new 3-compartment Batre shaft 98' deep in Sept., 1917. Principal development is on the 300' and 420' levels, drifts running along the vein showing 6' to 12' of pyrite ore. Mine has electric power, compressor, hoists, etc., and aerial tram 3,000' long will take ore to the railway.

Production: began March 12, 1917, shipping to the Mayer smelter (Great Western Smelters Corp.), under a 10-year contract calling for a charge of \$9 per ton. Company reported May 21, 1917, a daily average of 125 tons shipped from both mines, but both mine and smelter closed down shortly thereafter. The press reports of 7' of 14% ore in the face of the 420' level are not considered any more truthful than those crediting the mine with 15' to 20' of 8% ore, which when checked by sampling proved to be 9' of 1.8% "ore," high in silica.

The Black Hills or Big Ledge group of claims, 4 miles east of Humboldt, comprises an extensive acreage of land not considered worth paying taxes on.

Opinion: in view of the very remarkable statements as to earnings, ore reserves and smelter operations issued by the company officers, during the past two years, it is well to note that an exhaustive report on the property made by Walter Harvey Weed in the Fall of 1916, gave a total valuation of \$600,000 for the property, equivalent to about 40c a share for the stock. The so-called Big Ledge smelter did not then belong to the company, and any profit it might make would not help Big Ledge shareholders. The smelting rate of \$9 per ton, on a 10-year contract is considered exorbitant, compared with charges for similar ores furnished in large quantity for long periods, at other smelters.

According to press reports, apparently inspired, the Big Ledge smelter, financed by insiders, by a bond issue, has been unloaded on the company, the capitalization being doubled for the purpose. In our opinion this materially depreciates the value of the stock. Company is regarded as a rank example of frenzied finance whose glittering promises are all unfulfilled and which not even war time prices for copper and silver can redeem.

It is reported Sept., 1917, that E. Le Duc and other directors had lost suit against them for unlawfully appropriating 300,000 shares of stock.

BIG REEF COPPER CO.

ARIZONA

Office: Mayer, Ariz.

Officers: John Frank, pres.; A. C. Cole, v. p.; Dell Riggins, sec.-treas.

Inc. in Ariz. Cap., \$1,000,000; \$1 par; non-assessable; 519,997 shares in treasury.

Property: 19 claims, 380 acres, located 2¼ miles from Mayer, in Big Bug mining district, Yavapai Co., Ariz. The mines of the Cons. Ariz. Smelting Co. and Big Ledge Copper Co. are but a few miles distant. Claims cover an area of Yavapai schist traversed by a wide zone of silicification containing disseminated copper ore chiefly oxidized with segregations in quartz veinlets.

Development: about 300' of shallow work has been done to date and chalcopyrite ore reported shown in 60' shaft. Property favorably reported on, 1917, by J. H. Shockey, E. M., of New York.

Treasury issue of 50,000 shares offered the public, April, 1917, at 35c

a share, proceeds to be used in developing property to 200' depth and drifting 1,000' north to get under 100' ledge seen on surface. Is regarded as a promising prospect.

BLACK CANYON MINING CO.**ARIZONA**

Address: Claude Baker, gen. mgr., Turkey, Yavapai Co., Ariz.

Officers: W. A. Moses, pres., Kansas City, Mo.; A. L. Harroun, v. p.; Edna Harroun, sec., Kansas City, Mo.

Property: the Black Canyon, or J. D. Thompson mine, 10 miles south of Mayer and 2 miles from Turkey. Claims show a vein reported as 8-16' wide, opened by 800' drift, with 300' back. Ore carries silver, lead and zinc and is of milling grade.

A flotation mill is planned for 1918.

BLUE BELL MINE**ARIZONA**

See Consolidated Arizona Smelting Co.

BROOKLYN ARIZONA MINING CO.**ARIZONA**

Address: care of J. B. Hill, sec., Andover, Mass. Mine near Mayer, Yavapai Co., Ariz. Benj. B. Tuttle, v. p.; Jas. S. May, treas.

Inc. March, 1907, in Me. Cap., \$2,500,000; shares \$10 par; non-assessable; fully issued. Bonds authorized \$500,000; about \$75,000 outstanding. Was promoted by the American Securities Co. Annual meeting, first Wednesday in April.

Property: 82 claims, about 1,600 acres, including the Brooklyn group of 14 claims, in the Squaw Creek district, about 20 miles S. E. of Mayer, carries auriferous and argentiferous copper sulphides.

Development: by 750' main shaft and 2,500' tunnel.

Equipment: includes compressor, double-drum hoist, 3,000' cable and Partridge smelter. Former mismanagement fully described in Vols. X and XI. Company reported in new hands, 1915, but no later returns received.

CONSOLIDATED ARIZONA SMELTING CO.**ARIZONA**

See description under Humboldt, Yavapai Co., Ariz.

COPPER MOUNTAIN MINES CO.**ARIZONA**

Address: Celora M. Stoddard, Phoenix, Ariz.

Is a reorganization of the old Stoddard Copper Co.

Officers: Celora M. Stoddard, pres.; Senator Reynolds of N. Y., v. p.; M. A. Pickett, sec.-treas., Phoenix, Arizona.

Inc. 1912, in Arizona. Cap., \$5,000,000; shares \$5 par.

Property: the old Stoddard mine on Copper Mountain, a mile from the Arizona Binghamton, and near Mayer, Ariz.

Mine reopened, Nov., 1917, shaft retimbered and gasoline hoist installed.

COPPER QUEEN GOLD MINING CO.**ARIZONA**

Address: Stoddard, Ariz.

Officers: Louis Goldman, pres. and mgr., Paris, Tex.; R. F. Scott, v. p.; W. F. Gill, sec.; A. Goldman, treas.; preceding with J. K. Bywaters, H. P. Mayer, C. R. Caldwell, J. H. Gooch and H. S. Bettes, directors; Claude Ferguson, supt., Stoddard, Ariz.

Cap., \$2,000,000; shares \$1 par; outstanding, 1,238,089.

Property: 25 claims, 23 patented, about 360 acres, and a mill site on the Agua Fria river, 6 miles east of Humboldt, adjoins the Arizona Binghamton. Claims show great beds of silicified schist, cut in places by rhyolite dikes.

Development: by 3 tunnels; No. 1, 593' long with about 2,500' of workings, including shaft and workings on 300' level; No. 2, 600' long, with 2,100' of workings on adit level, a 300' inclined shaft and 800' of workings on the 100' level; No. 3 with about 300' of workings. The vein, 7' to 12'

wide, contains ore carrying chalcopyrite, chalcocite and tetrahedrite, with some gold and silver.

Equipment: consists of two 400 cu. ft. electric driven air compressors and 30 h. p. electric hoist and complete shop outfit at No. 2 tunnel. At No. 1 tunnel there is a 15 h. p. electric hoist. Development work is being done on a substantial scale.

Production: 50 to 100 tons daily, 1916, with increased tonnage looked forward to during 1917. Operations were resumed on March 15, 1917. Ore reserves are said to be 20,000 tons of 8% copper ore.

FAIRVIEW GOLD & COPPER CO.

ARIZONA

Address: John Slak, mgr., Turkey, Ariz.

Office: care of H. M. Coffman, South Bend, Ind.

Officers: F. N. Bonine, pres.; Wm. Miller, v. p., 200 Sheidley Bldg., Kansas City, Mo.; H. M. Kaufman, sec.-treas., with M. T. Knapp, directors.

Inc. Sept., 1916, in Arizona. Cap., \$1,000,000; shares \$1 par; non-assessable; 500,001 outstanding.

Property: 9 claims, 180 acres, in the Peck mining district, Yavapai Co., 1 mile E. of Turkey Creek, and said to lie on Blue Bell contact. Claims reported to show an orebody, 200-300' wide, of oxidized ore, strongly leached, with values varying from \$1 to \$70 in gold, \$1 silver, 3% lead and 1½% copper.

Development: vertical shaft being sunk with drifts and crosscuts at 100' intervals. Management estimates ore reserves at 15,000,000 tons. The mine is equipped with a 35 h. p. gasoline hoist and small compressor.

FERGUSON GROUP (AZTEC GROUP OR LOGOS MINE) ARIZONA

F. E. Andrews, Prescott, Ariz., owner. Property formerly under bond and lease to the Logos Mng. Co. and previously to Aztec King Mng. Co.

Property: 9 contiguous claims, in the Agua Fria mining district, 2½ miles N. E. of Cordes, Yavapai Co., Ariz., and 10 miles from Mayer. Claims cover an area of Yavapai schists between diorite and granite. Copper ore occurs in small quantities at all openings with ore of commercial grade exposed on the main, or Aztec King, ledge.

Development: by many shallow shafts and a 160' tunnel.

Considered well worthy of development.

GREAT WESTERN SMELTERS CORPORATION

ARIZONA

Head office: 120 Broadway, New York. **Works office:** Mayer, Ariz.

Officers: Ernest Le Duc, pres.; Charles Batre, v. p.; W. C. Sherwood, sec.-treas.; foregoing, with John Borg, directors.

Inc. Sept., 1916, in Delaware. Cap., \$1,000,000; shares \$25 par; non-assessable. Bonds authorized, \$250,000. In Aug., 1917, Big Ledge Copper Co. (which see) voted to increase its capital to \$15,000,000 for the purpose of acquiring the smelter at Mayer.

Property: 60 acres at Mayer, Ariz., containing plant, as described hereunder; also lime and silica deposits.

Equipment: 2,000-ton ore-bin, 1,000-ton coke-bin, 250' railroad trestle, one 200-ton blast-furnace complete (blown-in March 12, 1917), Curtis turbo-generator, sample plant and laboratory, machine-shop, pumping plant, houses, etc. Product shipped to U. S. Metals Refining Co.

During July, 1917, a second furnace was blown-in. There has also been installed one 500 h. p. cross-compound Corliss engine, two No. 8 Connersville blowers, two 150 k. w. generator sets, three 250 h. p. marine-type boilers, and a Weber concrete stack. A two-stand converter plant is to be ready soon.

It is stated that the smelter at Mayer, between March 12 and up to April 21, ran 33 days. In that time, it handled 2,700 tons of ore, or only

82 tons per day. It is designed to handle 200 tons, and circulated reports stated that 150 to 200 tons of Big Ledge ore were being handled every 24 hours and that a new 500-ton smelter addition was to be installed to handle increased production. Three shutdowns, for six days in all, were reported to be due to lack of ore supply even at 82 tons daily. Of the 2,700 tons smelted, 800 tons are said to have come from outside ore, and 1,900 tons from Big Ledge ore. Of Big Ledge ore, the Butternut mine contributed 1,300 tons, and the Henrietta mine 600 tons or less than 20 tons daily from the Henrietta, which was touted last February as ready to produce 200 tons daily as soon as the smelter should be ready. As to the smelter production reaching 15 tons of matte per day, the entire matte production from March 12 to April 21 was only about 80 tons, assaying 45% copper and about \$60 a ton in gold-silver, equivalent to 26 lbs. yield copper per ton ore and \$1.80 in gold-silver. These returns are so ridiculously low that the inference is that not all the matte has been drawn from the furnace, but if the returns really represent actual recoveries from average ore, then 26 lbs. copper at 25c a pound and \$1.80 in gold-silver, or \$8.30 per ton in all, would not even pay smelting cost of \$9 per ton on Big Ledge ore, let alone mining, freight, refining and selling.

See Big Ledge C. Co., owned by same interests.

HALF MOON COPPER CO.

ARIZONA

Address: care of O. B. Kemp, pres., Mayer, Ariz.

Officers: O. B. Kemp, pres.; O. A. Hesla, v. p.; J. E. Russell, sec.-treas., with Edw. S. Spring and Jas. A. Brennan, directors.

Inc. June 23, 1916, in Ariz. **Cap.**, \$1,500,000; \$1 par; 750,000 shares in treasury. Registrar & Transfer Co., N. Y., transfer agents.

Property: 14 claims, 280 acres in Agua Fria mining district, about 4 miles N. of Mayer, Ariz., shows copper glance in sericite schist over a zone 50' to 200' wide and traceable a half mile. Property equipped with gasoline hoist and air drills. Development work begun in Aug., 1917, to seriously open up mine.

Property reported by J. H. Shockley and Walter Harvey Weed to be well worthy of exploration.

INTERNATIONAL COPPER & MINING CO.

ARIZONA

Mine office: Mayer, Ariz.

Officers: John Slak, v. p., sec. and mgr.

Inc. Feb. 1, 1916, in Ariz. **Cap.**, \$1,500,000; shares \$1 par. Annual meeting Feb. 15th.

Property: 12 patented claims, 200 acres, in Black Canyon mining district, Yavapai Co., shows fissure veins in lime-porphry-schist formation. The main orebody has N. S. strike and dips 10° from vertical. Average assays reported to run 6% copper, \$5 gold, \$3 silver per ton.

Development: by incline shaft and 3 short tunnels.

Equipment: includes 25 h. p. gasoline hoist and 10x10" Ingersoll compressor. Management plans sinking to 500' depth and crosscutting every 100'.

IRON QUEEN MINING & SMELTING CO.

ARIZONA

Address: Wm. T. Read, 15 William St., New York City. Mines near Mayer, Yavapai Co., Ariz.

Directors: F. W. Wood, Wm. T. Read, A. D. Barnhart, I. D. L. Williams and H. B. Bishop.

Cap., \$3,500,000; shares \$10 par. Company formed to take over, subject to a mortgage for \$130,000, the greater part of the former holdings of the George A. Treadwell Mining Co., sold at tax and foreclosure sales. The

Boggs and Hackberry properties are not included, being bought by the Commercial Mining Co., controlled by Phelps, Dodge & Co. The organizers of the Iron Queen offered stock at 75c a share to stockholders of the Treadwell Co.

Property: consists of Iron Queen group near Mayer, the narrow gauge railway, 31 claims and interests in 3 others in the Verde mining district. The Iron Queen group was favorably reported upon by M. A. Finney, former manager of the Consolidated Arizona Smelting Co. (Humboldt smelter), who states that property is leached down to 300' level, has zinc ore between that and 400' level and has 6' pyritic ore carrying 3% copper, 38% iron and 38% sulphur below that and on the 500' level.

Smelter was bought by the Big Ledge Copper Co. interests and an operating company formed, known as the Great Western Smelters Corp., which in turn was unloaded on the Big Ledge Co.

LOGOS MINES CO.**ARIZONA**

Dead. Claims relocated and known as the Ferguson Group, which see.

LYON COPPER CO.**ARIZONA**

Reorganized as Arizona Merger Gold & Copper Co., which see.

MONTE DE COBRE COPPER CO.**ARIZONA**

W. A. Tucker, John Rose and James Smith, all of Bisbee, are the principal stockholders.

Property: on South Copper Mountain, near Mayer, Ariz., shows chalcopyrite and oxidized copper ore in a vein in schist.

Development: 60' shaft and adit tunnel.

ORIZABA MINING CO.**ARIZONA**

Mine near Mayer, Yavapai Co., Ariz.

Officers: Geo. F. Wilson, pres., Globe; Parker Woodman, v. p., Bisbee; A. F. Muter, sec.-treas., Phoenix, Ariz.; F. M. Huddleston, Los Angeles, and T. J. Lawrence, Pittsburgh, directors.

Inc. Aug., 1917, in Ariz. Cap., \$1,500,000; shares \$1 par.

Company will develop the Orizaba copper mine, 6 miles S. E. of the Kay mine, said to have 15,000 tons of 7% copper ore blocked out. Has several shafts and tunnels.

POCAHONTAS COPPER QUEEN MINING CO.**ARIZONA**

Office: Pocahtontas, Ark. **Mine office:** Mayer, Yavapai Co., Ariz.

Officers: W. H. Skinner, pres. and gen. mgr.; T. J. Burns, v. p.; D. A. Chapin, sec.; Benj. A. Brown, treas.

Inc. 1906, as successor of Big Bug Gold & Copper Mining Co. Cap., \$1,000,000.

Property: 14 claims, 4 miles N. W. of Mayer, in 2 groups, about 1,000' apart. The smaller group of 4 patented claims carries gold-copper ore. The Spar group of 10 claims has a vein up to 14' in width, carrying mainly gold and silver-lead values, and the mine is said to have shipped 23 carloads of high-grade ore, under former ownership, that gave sufficient returns to pay the purchase price and the cost of development. The mine has a 200' two-compartment shaft and a 120' shaft. A level at this depth was being extended to develop 2½' of ore, said to assay \$49 in gold, silver, lead, cut in the bottom of the shaft, at last accounts.

PRINCE ALBERT MINING & MILLING CO.**ARIZONA**

Address: Mark Bradley, mgr., Groom Creek P. O., Yavapai Co., Ariz.

Property: shows gold bearing veins in schist, developed by 200' shaft. Equipped with Fairbanks Morse hoist and Sullivan 240 cu. ft. compressor.

RIO TONTO COPPER MINING CO.**ARIZONA**

Address: 137 No. Central Ave., Phoenix, Ariz.

Inc. Nov., 1917, in Arizona.

Property: the Patton Copper mine, 4 miles east of Mayer, said to have high-grade ore exposed in several openings.

ROSALIE COPPER CO.**ARIZONA**

Address: Haddock & Shackelford, 424 Dwight Bldg., Kansas City, Mo. Mine near Mayer, Yavapai Co., Ariz. G. C. Meese, Los Angeles, Calif., pres. and gen. mgr.

Inc. in Arizona. Cap., \$3,000,000; shares \$1 par.

Property: 9 claims, patented, 180 acres, in the Copper Creek district, 25 miles S. E. of Mayer and 18 miles from Cordes siding, the nearest rail point. The mine has numerous pits and shafts, and a 1,000' tunnel, developing a 2 to 7' vein carrying native copper, in the oxidized zone, followed by bornite, chalcopryite and occasional chalcocite ores, said to assay 4.15 to 7.3% copper, with small gold and silver values.

Equipment: includes a 50 h. p. gasoline engine and air compressor. Letters returned unanswered in July, 1917. Not favorably regarded.

STODDARD MILLING CO.**ARIZONA**

Address: Stoddard, Yavapai Co., Ariz. Company is owned outright by the Arizona Binghamton Copper Co., which see.

Officers: W. H. Reynolds, pres.; Louis Goldman, v. p.; G. W. Johnson, treas. and gen. mgr.; T. H. Tulloch, supt.

Equipment: 250-ton flotation plant, treating ore of the Arizona Binghamton Copper Co., and of Copper Queen Gold Mining Co.

Concentrate contains 25% copper. Extraction is over 90%.

STODDARD MINES CO.**ARIZONA**

Succeeded by Arizona Binghamton Copper Co., which see.

UNITED ARIZONA COPPER MINING & SMELTING CO. ARIZONA

Office: 136 N. Central Ave., Phoenix, Ariz.

Officers: C. H. Dunlap, pres.; R. C. Baker, v. p. and treas.; C. W. Stott, sec.

Inc. March, 1916, in Arizona. Cap., \$2,000,000; shares \$1 par; non-assessable; 650,000 issued.

Property: near Mayer, Yavapai Co., Ariz.

Development: started June 1, 1916. Shaft is 640' deep and will be sunk to 1,000'. Eight feet of high grade copper ore said to have been opened. Shipments commenced in July, 1917.

*MIAMI-GLOBE DISTRICTS, GILA COUNTY***ARIZONA BONANZA MINING & MILLING CO.****ARIZONA**

Address: Miami, Ariz.

Property: 10 claims, 5 miles N. E. of the Inspiration Consolidated, only slightly developed and said to carry ore assaying from 5-30% copper and \$6 gold per ton. Company selling stock at 25c per share to provide development funds, March, 1917.

ARIZONA COMMERCIAL MINING CO.**ARIZONA**

Officers: 50 Congress St., Boston, Mass., and 188 Middle St., Portland, Me. Mine at Globe, Gila Co., Ariz.

Officers: Chas. S. Smith, pres.; Harry M. Stonemetz, v. p.; C. H. Altmiller, treas.; preceding officers, E. S. Goulston, G. T. Rice, Chas. Sumner Cook, clerk, and Wm. E. Chandler, directors; Robert R. Boyd, supt.

Inc. April 4, 1912, in Maine. Cap., \$1,500,000; shares \$5 par, fully paid; non-assessable; issued 175,000. Annual meeting 2nd Wednesday in April.

Superior & Boston mines. The Copper Hill group, 56 acres, carries the Old Dominion and Copper Hill veins for about 1,500'.

Ore: a mixture of pyrite and chalcopyrite, contains 5% copper, 20% sulphur, 30% iron. Concentrating ore containing 4% copper is shipped to the Old Dominion. Smelting ore above 4% is shipped to the Copper Queen at Douglas, Ariz.

Development: in 1916 was confined to the Copper Hill and Eureka mines, with 2,734' of level work and 960' of raises in the first named from the 10th to the 14th level and 540' of work on the 8th level of the Eureka. The latter development proving valueless, work was stopped.

The working shaft at the Copper Hill mine, 1,600' deep, has extensive workings on the 10, 12 and 14th levels, along the Old Dominion vein and ore has been extracted eastward until cut off by the Badger fault, ore being exposed along the bottom of the 14th level for 400'. The most important development of 1916 was the opening up of the orebody for 100' horizontally and 150' vertically on the 10th level, east of the fault; indications point to its extension up to the 8th level and downward to the 16th. Above the 13th level, a new vein of high grade ore was opened in the hanging wall; it does not show on the 13th and continues some distance above the 12th level.

Future ore extraction will come from east of the fault, in the drifts to be driven on the 15th and 16th levels during 1917.

Equipment: at Copper Hill shaft includes a 72' steel headgear; a Wellman-Seaver-Morgan hoist, good for 1,500' driven by 175 h. p. Westinghouse motor; one 500-gal Aldrich electric pump; one 20,000 cu. ft. Sturtevant fan; and 300-ton ore bins.

The Black Hawk group, 97 acres, which carries the Black Hawk and Old Dominion ledges for about 3,000', has a surface capping of low-grade iron ore, above a 25 to 50' vein, leached to considerable depth, followed by silicious ore, estimated to average about 4% copper, with excess of iron. There also is a hematite vein of 3 to 4' width giving assays of 4.5% copper, with small silver values.

The power smelter plant was remodeled in 1916; new equipment includes two 600 k. w. turbo-generators. All power used is generated at this plant, which is connected with the Copper Hill mine by a 6" pipe line for compressed air and an electric transmission line. On the 14th level two 500-gal. p. m. pumps, electrically driven, were installed, pumping all water from the Copper Hill mine to surface.

Production: in 1915 was 44,353 tons of ore, containing 3,592,274 lbs. copper, 16,511 oz. silver and 282 oz. gold and in 1916 amounted to 48,889 tons of ore, containing 4,178,474 lbs. copper, 21,163 oz. silver and 305 oz. gold.

ARIZONA NATIONAL COPPER CO.

ARIZONA

Idle. 327 Pine St., Williamsport, Pa.

Officers: Thos. M. B. Hicks, pres. and treas.; C. S. Messerly, sec.; LeRoy Scholl, gen. supt.

Inc. Feb. 1, 1906, in Arizona. **Cap.**, \$3,000,000; shares \$10 par. Bonds \$300,000, at 5%.

Property: 14 claims, also a 15-acre mill site and 100 acres timber lands, formerly known as the McNelly-Crowley property, on Pinto creek, west of Miami, carrying contact veins between schist and granite, said to average 14' in width and traced 785', showing considerable high-grade oxidized ores, including chrysocolla and native copper, with some chalcopyrite and occasional bornite. The 80' ledge of decomposed schist is slightly impregnated with copper sulphides.

Development: by shafts and tunnels, with a total of 2,000' of workings. Has steam power. No recent returns secured.

BARNEY COPPER CO.**ARIZONA**

Office and mine: Globe, Gila Co., Ariz.

Officers: Hon. J. D. Coplen, pres. and gen. mgr.; J. B. Coplen, v. p.; W. J. Miller, sec. and mgr.; foregoing, with J. N. Porter, directors; 1st Nat'l Bank, Globe, treas.

Inc. Oct. 27, 1910, in Arizona. **Cap.**, \$5,000,000; shares \$5 par; non-assessable; fully paid and fully issued, 999,995 shares being given for property. Annual meeting, first Tuesday in October.

Lands: 34 claims, partly fractional, patented, about 560 acres, adjoining the land of the Inspiration Cons. Copper Co. on the west, show Pinal schist and quartzite, partially covered by conglomerate. Property has a number of old pits and shafts, deepest 500', in Gila conglomerate.

Equipment: includes 15 h. p. gasoline hoist, and there are 7 camp buildings.

In April, 1911, Barney stock was offered for sale in Kansas City at 50c per share. In Jan., 1912, an option on property was given to the General Development Co. for \$600,000. This company put down 2 holes, one at the bottom of the 400' shaft passed out of schist and into dacite and at 1,030' into granite porphyry. This drill hole encountered an artesian flow at 960', which is a valuable asset of the company. The General Dev. Co. soon after relinquished its option. Drill hole No. 2 was discontinued at 600' without disclosing ore. The Barney Co. claims to have put down two holes, one of which passed through 20' of ore, about 1.2% copper, before being lost. Second hole was also lost. The surface conditions on property are unpromising, as the rocks are gray and unaltered.

In 1916 company sold 113½ acres to the Porphyry Copper Co., a new organization with same directorate as the Barney Copper Co., the latter holding control through ownership of 754,442 shares. The Porphyry company is reported to have sunk a 495' shaft, passing through 65' of carbonate ore and 21' of chalcocite. The strike interrupted operations in August, 1917.

BLACK WARRIOR MINE**ARIZONA**

At Black Warrior, Gila Co., Ariz. See Warrior Development Co.

CASTLE DOME DEVELOPMENT CO.**ARIZONA**

Address: 100 Broadway, New York City.

Officers: Mulford Martin, pres.; Garrett Mott, v. p.; E. C. Curnen, sec.-treas., with H. A. Tingley and John Kasser, directors.

Inc. in Maine. Owns 94% of outstanding capital of Inspiration Extension C. Co.

Company has bond and lease on the Inspiration Extension Copper Co. (which see) property at Miami, Ariz. Began work, April 15, 1916, on a tunnel, now 400' long, running N. E. into the property, in anticipation of opening a low-grade "porphyry" copper deposit.

COLE DEVELOPMENT CO.**ARIZONA**

Office and mine: Globe, Gila Co., Ariz. P. J. Cole, pres.; M. L. Cole, Jr., sec.-treas.

Inc. Sept., 1909, in Arizona. **Cap.**, \$300,000; shares \$1 par; issued, 151,000 shares.

Property: 17 claims, known as the Cole & Goodwin group, 4 claims wide and 4 claims long, extending along Mineral creek, 3 miles south of the Gibson mine and about 10 miles S. W. of Miami, the nearest available rail point, and 10 miles N. E. of Ray, but is separated from Ray by some

extremely rugged country. Country rock is Pinal schist with diabase intrusions, carrying the Cole & Goodwin fault, traceable about 2 miles, that cuts the schist diagonally. This property carries fissure veins in schist, and also disseminated ores in schist.

Development: by the 450' Cole incline shaft, with 5 drifts, cutting several bodies of low-grade disseminated ore, and some high-grade from which regular shipments of 6% to 17% copper and \$2 to \$4 gold and silver are reported in 1917. There also are several short tunnels, showing schist carrying impregnations of disseminated chalcopryrite, there being a 135' crosscut tunnel about one-half mile from the shaft, and a 480' crosscut tunnel, 1,700' west of the shaft, with portal 500' vertically below the collar of the shaft.

Equipment: includes a 22 h. p. gasoline hoist. Idle since 1910, but development work resumed 1915 and small milling plant contemplated.

COPPER & SILVER ZONE MINES

ARIZONA

Claims sold to Globe Dominion Mining Co., which see.

COPPER SPRINGS MINING CO.

ARIZONA

Office: Globe, Ariz.

Officers: Capt. E. Storer Tice, pres.; R. L. Springer, v. p.; E. F. Hiatt, sec.-treas.; preceding with Dr. W. H. Meler, B. G. Stewart and W. H. Hiatt, directors. Exchange Trust Co., Boston, transfer agents. Fidelity Trust Co., Boston, registrar.

Inc. in Aug., 1916, in Arizona. **Cap.** amount not given. Stock is full paid and non-assessable.

Property: 25 unpatented claims, about 500 acres on Mt. Madera, in the Schultz ranch section of the Pinal mountains, about 6½ miles from Miami, Ariz., in a rough section of the country. Property is reached by wagon road.

Development: by 8 tunnels, aggregating about 1,400'. Work reported to show considerable leaching and some silicates of copper in the upper tunnels. Nos. 5 and 6 tunnels are reported to have cut carbonates and sulphides of copper running from 1½% to 4%. A new tunnel is being driven to obtain a depth of 400' with the expectation of getting sulphide ore.

Copper values are reported in nearly all of the tunnels but not in a very appreciable amount.

Property is a prospect being promoted by Temple H. Fay & Co., of Boston.

CORDOVA COPPER CO.

ARIZONA

Property taken over by the creditors and new company formed called Lecora Copper Co., which see.

DUQUESNE MINING CO.

ARIZONA

Address: care of T. A. Luckhart, sec., DuBois, Pa. Mine near Globe, Gila Co., Ariz. Geo. M. Luckhart, pres. and mgr.

Inc. 1909 in Arizona. **Cap.**, \$1,000,000; shares \$1 par.

Property: 10 claims, in Gold gulch, about 3 miles south of the Arizona National and 15 miles west of Globe, in the Pinal mountains. Mine has a 10' vein, carrying mainly silver-lead ore with copper expected at depth. Opened by 3 tunnels, 2 of 200' and 300', showing ore assaying well in gold. A 50' shaft on the East End claim shows ore giving assays of 5% copper, 3 oz. silver and \$4 gold per ton.

Equipment: includes a 25 h. p. gasoline hoist. Only assessment work done in 1914-15.

Probably closed down, 1917. No returns secured.

GERMAN COPPER CO.

Idle. Office: Chas. H. Trotter, sec., 10 No. New Jersey St., Indianapolis, Ind. Mine at Globe, Ariz.

Officers: John H. Murdoch, pres.; Chas. H. Zollner, v. p.; John A. Hook, treas.; preceding officers, Wm. Elwarner, Jos. Lauler, David Fair, Wm. Burnett, John I. Carson and J. B. McMurray, directors; John H. Faight, supt.; P. H. Pernot, cons. engr.

Inc. March 25, 1911, in Arizona. Cap., \$3,000,000; shares \$5 par, fully paid; 142,378 issued; outstanding debt, \$75,000. Annual meeting, second Tuesday in October. Company is successor, 1911, of the Arizona-Colorado Belt & Gold Mining & Milling Co.

Property: 14 claims, 270 acres, held by location in the Globe district of Arizona. Ore occurs in a large fissure vein cutting through diabase, quartzite, and limestone, and as contact ores between diabase and sedimentary rocks. Vein strikes N. E.-S. W., dips 55°, is reported as 9' wide, proven to depth of 900', and said to carry 2% copper, 2 oz. silver and slight gold values per ton, principally as chalcopryrite, on 800' and 900' levels. Ore developed above 800' estimated at \$125,000.

Development: by 863' shaft, and a total of 3,000' of underground work. The 800' level is, said to block out 2,000 tons of ore with 18,000 tons of 2½% ore reasonably certain.

Equipment: includes 100 h. p. steam hoist, Cameron pump and 7-drill air compressor. Arizona-Eastern railroad is 1 mile from property, which is well located and has merit. Assessment work only being done at last accounts.

GIBSON CONSOLIDATED COPPER CO.**ARIZONA**

Address: R. P. Greer, sec., Globe, Ariz.

Officers: Chas. E. Kaltenbach, pres.; Gen. Amasa P. Peake, v. p.; H. E. Bierce, managing director, with F. F. Towle, W. A. Lamson and E. J. Kaltenbach, directors.

Inc. May, 1917 in Delaware. Cap., \$1,000,000; shares \$1 par; 750,000 issued. Columbia Trust Co., New York, registrar. Empire Trust Co., New York, transfer agents.

Property: 16 claims, 8 patented, 300 acres, about 8 miles W. of Globe, with a good wagon road connection, includes the Gibson mine which was opened by Messrs. Gibson and Henderson with capitalization of \$90 cash and a team of horses and not only paid its way but earned good profits.

Worked in a very small way, by different owners, 1900 to 1906, when taken over by the Gibson Copper Co., and thereafter worked continuously until June, 1910. Mine was under lease and option to the Summit Copper Co., for 17 months, at \$42,375, but reverted to owners, Jan., 1912, and was again operated under lease by Sultan & Wayne until August, 1913.

Geology: country rock is Pinal schist and granite carrying 3 approximately parallel fissure veins, having a N. E. strike. The Summit and Pasquale are the principal veins, the former vein, of 4 to 7' width, traceable for the entire length of the property, a distance of 1¼ miles. The Summit and Pasquale veins are about 250' apart, the Intermediate vein about 75' E. of the Pasquale. Ore occurs in the Summit and Pasquale veins in well-defined shoots, pitching 40 to 65° S. the lenticular form of these shoots being in some cases due to strike faulting and movements. Ore is mainly massive chalcopryrite, with a little bornite. Gangue is quartz with some calcite and small quantities of specular hematite and gypsum. Two veins show high-grade ore and some low-grade ore has been developed in 5 veins. The McKinley vein, undeveloped, shows a strong outcrop.

Development: to 500' depth by shafts and tunnels with 23,000' of work.

The Pasquale tunnel, driven on the Pasquale vein, is about 200' below the collar of the incline shaft. The Reynolds tunnel is to intersect the vertical shaft at 1,800' from the portal, at depth of 500'; the Toombs tunnel, 100' vertically above and the Upper Toombs tunnel, 210' above the Reynolds, are drifts on the Summit vein. Working shaft is an incline, 600' deep, sunk on the Summit vein, with 6 levels which show that the Summit vein runs N. 21° E., dips 56° N. W., and carries a seam of high-grade ore, the main pay streak carrying 8 to 15" of chalcopryite ore assaying 20 to 30% copper, throughout the various levels. The shaft has 5,915' of workings on the Summit vein, besides drifts on the Pasquale and Intermediate vein, reached by crosscuts on the 3rd and 4th levels.

Development by the Summit Copper Co. was by a vertical 3-compartment shaft, sunk to a depth of 244' by the Gibson Copper Co., and deepened by this company to 573', this depth corresponding with the 7th level of the old incline shaft. About 4,000' of new drifting and crosscutting, costing nearly \$142,000, was done. The vertical shaft cuts the Pasquale vein at 165', the Intermediate vein at 300' and the Summit vein at 500' depth.

The Pasquale vein differs from the Summit in that it cuts across the bedding of the schist, instead of following the bedding planes as does the Summit, having a strike of N. 20° E., with dip of 35 to 50°. Apparently the Pasquale vein is better defined, more continuous and stronger than the Summit, the fissure being of 5 to 10' width, carrying a pay streak, from a few inches to 3' in width, of ore assaying up to 33% copper. Ore occurs in the Pasquale vein in shoots pitching to the south, similar to the ore occurrence of the Summit.

The Intermediate vein, with drifts of 225' length on the 3rd and 4th levels, has a strike of 12° E., with dip of 52° N. W., and is only about 8" wide, with firm walls and, as developed, is not of great importance, but has possibilities. The ground is heavy and treacherous, requiring timbering for practically every foot of drifting and concrete posts were used.

Ore reserves: estimated by new owners at 500,000 tons, of a net value of \$3.50 per ton, if copper sells at 15c. This figure is in our opinion much too high as Messrs Pritchett & Hamilton estimated the developed ore reserves, at the end of 1910, excluding all high-grade ore, and omitting probable ore between the 3rd and 4th levels on the Pasquale vein, as 33,011 tons of ore, averaging 4.36% copper, on the Summit vein; 17,062 tons of 3% copper ore in the Summit filling; 39,860 tons of 2% ore on the Summit dump and 8,578 tons of 6.51% copper ore developed in the Pasquale vein. The development by the Summit Copper Co. proved disappointing; irregular occurrence and insufficient tonnage failing to offset the high-grade ore extracted. C. W. Pritchett, Denver, Colo., consulting engineer, advised the surrender of option after sampling and examining all workings.

Equipment: at the incline shaft includes two 250 h. p. boilers, a 14x16" hoist and a 6-drill Sullivan air compressor. The plant at the vertical shaft includes two 200 h. p. Stirling water-tube boilers, a 16x20" Hendrie & Bolt-hoff double-drum hoist, good for 1,000' depth and a 10-drill Sullivan cross-compound air compressor, with a 132' steel smokestack of 42" diameter. The vertical shaft has pumps with capacity of 500,000 gals. daily. A 300-ton mill is to be erected with funds derived from sale of treasury stock, 1917. The gross value of ore produced by the Gibson Copper Co., 1906-09, has been estimated at \$1,250,000. It was shipped to the Old Dominion smelter, a distance of about 18 miles, by 10-horse teams, and required careful selection, owing to the extremely high cost of transportation, returning better than 20% copper.

Production: 1,106,100 lbs. fine copper in 1906; 3,340,777 lbs. in 1907;

1,270,211 lbs. copper and 2,000 oz. silver in 1908; 667,405 lbs. copper in 1909, and 600,000 lbs. in 1912. Output in 1916, 3,460 tons ore yielding 1,043,144 lbs. copper. Smelter settlements, \$214,348. Costs, 26c per lb. Total shipments to July, 1917, reported as netting \$2,100,000.

GIBSON COPPER CO.**ARIZONA**

Property sold May, 1917, to Gibson Consolidated Copper Co., which see. Fully described in Vol. XII of this book.

Office: Globe, Gila Co., Ariz. Mine at Bellevue, Gila Co., Ariz. P. P. Greer, pres.; F. F. Towle, sec-treas.; P. P. Greer, F. F. Towle, S. L. Gibson, J. N. Robinson and J. L. Alexander, directors.

Inc. 1906, in Arizona. **Cap.**, \$2,500,000; shares \$25 par; non-assessable; issued \$2,000,000. Has authorized a \$500,000 issue of 6% bonds; issued, \$6,000. Total dividends to date, \$80,000. Annual meeting, first Wednesday in March.

GLOBE BULLION MINING CO.**ARIZONA**

Address: Globe, Ariz.

Inc. by P. J. Minck of New York, W. Buckland and G. B. Pert of Globe. H. Heidemann, supt.

Property: south of Miami shows gold-bearing ore. Press reports stated that the company's slogan was, "Pick your own samples and the company will pay for the assay." Caveat emptor.

GLOBE COMMERCIAL COPPER CO.**ARIZONA**

Address: A. R. Jameson, Jr., Globe, Ariz., leaser.

Property: near Copper Hill, Gila Co., shows copper and manganese ore. A. H. Buckingham, leaser, is shipping manganese ore. A. R. Jameson shipping copper ore, 1917. Mill is proposed for 1918.

GLOBE DOMINION COPPER CO.**ARIZONA**

Office: Globe, Ariz.

Officers: J. H. Barr, pres., Pittsburgh, Pa.; T. H. Jenks, v. p., Wickenburg, Ariz.; B. O. Thralls, sec.; T. A. Pascoe, treas.; preceding, with Dr. R. W. Craig and C. R. Clapp, directors.

Inc. in Arizona. **Cap.**, 1,500,000 shares; par \$1; 975,000 outstanding.

Property: 25 claims, about 500 acres, in diabase area, 1 mile east of Globe, adjoining the Old Dominion and Globe Consolidated mines and near the Superior & Boston, was originally worked for its silver ore, found near the surface. Development has proven the existence of copper at depth and owners expect to encounter the extension of the Gladiator vein of the Old Dominion mine. Property was formerly known as the Copper and Silver Zone Mines, owned by W. R. Martin, El Paso, Texas.

Development: by the 103' Clark and 108' Faugh shafts on the Old Ironsides claim, from which ore shipped has returned 1.25 to 3.5% copper, \$19 to \$236 silver, or an average of \$21.60 per ton. Present company has sunk the shaft to 375'. When the 600' level is reached drifts will be started following the veins that outcrop on the surface. Company employ 22 men. Property was reported on by Sydney H. Ball for Luke, Banks & Weeks, of 14 Wall St., who are reported to be financing it. Stock is traded in on the N. Y. curb.

GLOBE & LOST GULCH SILVER-COPPER MINES CO. **ARIZONA**

Office: 1549 Logan St., Denver, Colo. Mine in Lost Gulch, Gila Co., Ariz. Mary E. Brooke, pres. and gen. mgr.; H. A. Wimbush, sec.

Inc. April 1, 1907, in Arizona. **Cap.**, \$1,000,000; shares \$1 par, non-assessable.

Property: 10 claims, patented, 180 acres, and other locations; also a mill site at the head of Lost Gulch, 1½ miles N. of Inspiration and

Miami, Ariz., showing quartzite, granite and limestone, cut by porphyritic dikes.

Development: shows silver-lead ore in diabase, with indications that copper ore will come in at depth; also shows silver-chloride ore in granite and limestone, and copper carbonate ore in dacite.

GLOBE-MIAMI COPPER CO.

ARIZONA

Address: Victor Gilsey, treas., 14 W. 40th St., New York.

Officers: D. F. Beggs, pres.; Albert Hicks, W. A. Jones, F. W. Barker, all of N. Y., directors.

Inc. 1917 in Delaware. **Cap.**, 200,000 shares; \$1 par.

Property: 21 claims in Globe-Miami district, Ariz., upon which \$200,000 is said to have been spent in development and purchase. There has been some gold ore extracted.

All the literature available on the property is from a brokerage house in New York; it is so profuse and tells so much about other properties and so few facts about this, that it is suspicious. The property may have a future, but it must be heavily burdened with too many metals, since the literature states there are copper, gold, silver, lead, tungsten and molybdenum deposits on the claims.

GLOBE MINING CO.

ARIZONA

Globe, Gila Co., Ariz.

Officers: Hon. J. F. Hechtman, pres. and gen. mgr.; M. A. Patterson, v. p.; Walter M. DeKalb, sec.; Geo. L. Beach, treas.; preceding officers, F. B. Walker, L. E. West and R. A. Jamison, directors.

Inc. Feb. 19, 1903, in Arizona. **Cap.**, \$2,500,000; shares \$1 par. Property leased to Mineral Farms Co., 1912. Both companies idle.

Property: 21 claims, patented, 335 acres, 2½ miles north of Globe, shows granite-porphry, syenite, quartzite and diorite, carrying fissure veins in diorite of 2 to 100' width, with gossans giving assays of 2 to 6% copper, 4 to 30 oz. silver and \$2 to \$28 gold per ton. The Mineral Farm group of 21 claims, 3 fractional, includes the Vacey-Constance mine, worked 1886 for silver, and said to have produced upwards of \$100,000 worth of ore under former ownership, this group having upwards of 20 old pits and shafts, of 10 to 165' depth. The Mineral Farm group shows altered sedimentary and igneous rocks, with iron dikes and a complex fissure system. The Mineral Farm vein, of about 4' width, gives assays of 4.8% copper and up to 132 oz. silver and \$7.44 gold per ton, and the group also shows a 20' vein, said to sample 22% copper, 9% zinc, 2 oz. silver and \$4.96 gold per ton, which seems excessive. The Eagle Pass group has a 215' two-compartment shaft, between 2 iron outcrops.

Equipment: includes a 60 h. p. boiler, 8x10" hoist and air compressor. There are 6 mine buildings.

INSPIRATION CONSOLIDATED COPPER CO.

ARIZONA

Office: 42 Broadway, New York. Mine at Miami, Ariz.

Officers: W. B. Thompson, pres.; W. D. Thornton and L. D. Ricketts, v. p.'s; Joseph W. Allen, sec.-treas.; Evan J. Dudley, asst. sec.; W. S. Harper, asst. treas.; Charles E. Mills, gen. mgr.; Wm. B. Thompson, Wm. D. Thornton, Jos. W. Allen, C. E. Mills, Edmund C. Converse, William E. Corey, Charles A. Corliss, L. D. Ricketts, William G. Rockefeller, John D. Ryan, Charles H. Sabin and Albert H. Wiggin, directors. D. A. Welch, purch. agt. Guaranty Trust Co., New York, and Old Colony Trust Co., Boston, transfer agents; Bankers' Trust Co., New York, and National Shawmut Bank, Boston, registrars.

Inc. Dec. 18, 1911, in Maine. **Cap.**, \$30,000,000; shares \$20 par; issued and outstanding Dec. 31, 1916, 1,181,967 shares. All bonds have been retired.

Comparative General Balance Sheet: year ending Dec. 31:

Assets—

	Prop. & Equip.	Supplies	Copper on Hand	Other Current	Total
1916.....	\$24,858,004	\$1,133,633		\$16,926,219	\$41,784,314
1915.....	25,293,529	622,276	\$1,115,960	411,281	27,443,046
1914.....	22,166,764	439,880		2,641,219	25,247,863

Liabilities—

	Capital Stock	Bonds	Current	Surplus	Reserves	Total
1916...	\$23,639,340	.....*	\$4,182,003	\$12,681,501	\$1,281,469	\$41,784,314
1915...	18,419,500	6,544,500	1,878,983	600,062		27,443,046
1914...	14,459,160	10,500,000	288,703			25,247,863

* All retired, 1917.

Profit and loss: for 1916 shows: sales of copper, \$33,496,343; total expenses, \$11,965,820; balance from 1915, \$600,062; total profit, \$21,229,552; surplus for 1917 after paying dividends, \$12,681,501.

Dividends: in 1916, four were paid, totaling \$8,548,051, equal to \$7.25 per share. In 1917, to Oct. 29, \$8 per share was paid.

Company took over properties owned by the Inspiration Copper Co. and the Live Oak Development Co., paying for same in stock. In May, 1912, the mill and camp site of the Black Warrior copper mine was purchased from the Warrior Copper Co. for \$175,000. Early in 1914 the property of the New Keystone Copper Co., lying between the Inspiration and Live Oak groups, 219 acres, was purchased for \$795,940, payable in 39,797 shares of stock at \$20 per share, 9 shares of New Keystone for 1 share Inspiration.

The consolidated property holdings of the company are as follows: mining lands, 1,870 acres; mill-site, tailing disposal, water supply, etc., total 4,216 acres, 8 to 10 miles W. of Globe, Ariz.

Company said to be developing properties in the Wickenburg district.

Geology: property carries about 1½ miles of the strike of a mineralized belt by Pinal schist, much crushed, altered and silicified by contact action, due to the intrusion of the great mass of granite forming the hills to the S. W., the shattering having allowed the free circulation of secondarily enriching solutions. The oxidized zone shows carbonates, occasionally of commercial tenor, as in the Clipper tunnel, but ore occurs mainly in secondary form as disseminated chalcocite, forming an enriched zone of commercial ore of 50 to 575' in thickness, estimated by the management to average 180', with an average of 90 to 100' of overburden, underlaid by a primary zone of cupriferous pyrite below commercial tenor. About 40% of the values occur in small fissures and veinlets and along the jointing planes and planes of schistosity, copper being mainly in the form of flakes and grains of chalcocite, the balance of about 60% of ore values being disseminated through the gangue of friable Pinal schist, with some quartz. The mineralization also extends into the granite-porphry contact, about 10 to 15% of the ore developed in the Colorado orebody being in granite. The cupriferous schist is faulted, just east of the Woodson orebody, by the Bulldog fault zone, of about 300' width.

Ore reserves: Jan. 1, 1916, consisted of 97,143,000 tons of 1.63% copper ore made up of the following: (a) sulphide ore, 46,252,000 tons, 2.01% copper; (b) low sulphide material, 28,698,000 tons, 1.26% copper; (c) oxidized material, 17,460,300 tons, 1.31% copper; (d) mixed carbonate and sulphide material, 4,732,700 tons, 1.31% copper.

No attempt was made during 1916 to develop additional ore, therefore as 5,353,880 tons was mined, reserves now stand at 91,789,120 tons.

About 20,000,000 tons of this is oxide ore, upon which experiments were made by leaching, giving good results.

The new mill, designed by H. K. Burch, consists of 20 sections, each one with rated capacity of 900 tons per day, making a total of 18,000 tons per day.

The scheme of treatment, stated in general terms, is as follows: at the mine—crushing ore to 4", maximum size in gyratory crushers, crushing this ore to 1½" maximum size by Symons disc crushers. At the mill—crushing product from the Symons disc crushers in Marcy ball mills to pass 48-mesh screen, treatment of this product in flotation machines with separation of flotation tailing into sand and slime. Sand is treated on concentration tables and the slime retreated in flotation machines. Concentrates are dewatered in the filter plant. Trials were made recently with Hardinge ball-mills.

While plans were for a 7,500-ton mill to cover 8 acres, adoption of the flotation process has permitted doubling originally planned capacity within space of 3 acres. As a result of this compactness, elimination of elaborate classification, and some stage crushing, the costs of the combined oil flotation and water concentration in 1916 were 50.385c per ton. Mill is equipped with Mineral Separation and Callow flotation machines, also one designed by Rudolf Gahl, in charge of the mill. Coal tar is the chief component in the frothing mixture. The first unit of the mill went into operation June 29, 1915, the 18th in Feb., 1916, and the 20th a year later. The first ore was caved underground and actual mining started July 25, 1915.

The Live Oak group of 14 claims, 200 acres, is about 1½ miles W of Miami, at the western end of the Miami ore belt and separated from the Inspiration group by the New Keystone group. The geological conditions are similar to those of the Miami belt generally, save that much of the surface is covered by leached white granite, showing brilliant, green-stained outcrops of far more attractive appearance than any other part of the belt. This granite is underlain by schists carrying the ore, but part of the orebody is in granite.

The mine was originally opened on a flat dipping vein, 5 to 12' thick, carrying high-grade chrysocolla ore, from which shipments running 17 and 18% were made for several years. Much of this material is quartzose and valuable as a gemstone. The vein ended at water level in a mass of low-grade chalcocite ore similar to that of the Miami mine. Orebody was developed by tunnel work and drilling by the Live Oak Development Co. by over 50 drill holes with 20,000' of drilling and 5,000' of underground work. This work blocked out a body of disseminated ore 1,400' long, 75 to 200' deep beneath a capping of oxidized material averaging 435' thick. The orebody as developed averaged 114' thick and contained 15,000,000 tons of 2.11% copper ore.

The New Keystone Group has about 60 acres underlain by Pinal schist, covered in part by a sheet of granite porphyry, 25' to 200' thick. A strong fissure vein crossing the property was mined by the old Keystone Copper Co., the vein being 12' thick with a paystreak averaging 15", from which shipments of 19 to 22% copper and 2 to 5 oz. silver per ton were made for some years. Mine yielded, according to report, about \$1,000,000. The New Keystone Copper Co. explored and opened up a deposit of disseminated glance ore similar to that of the Miami mine.

Development: by the new company consisted in blocking out this orebody by underground workings and churn drilling. The Keystone shaft is 330' deep and at the time the company was absorbed by the Inspiration Cons. Copper Co., had a total of 14,886' of workings. Churn drilling along

200' squares was discontinued June, 1912, after company had put down a number of holes with an aggregate of 21,947' of work. Development blocked out 2,516,000 tons of ore, which sampling showed to have an average of 2.25% copper.

Development under the present company has been of a dual nature, including both extensive underground openings, and churn-drill borings along the same general system as followed in the development of the Ray and Chino mines. Underground work in 1916 amounted to 147,840'; total workings, Dec. 31, 1916, approximately 92 miles, in addition to 29½ miles churn drilling. Stopping operations destroyed 31 miles of workings to the end of 1916, so the present openings are 61 miles.

The Inspiration orebody is being worked by 2 main tramping levels at 326' and 450' in depth respectively. The Live Oak orebody is accessible through the Live Oak shafts, but all ore is hauled through the main haulage-tunnel, 6,600' long, connecting with the bottom level of the Inspiration shafts.

Ore is mined by the so-called Ohio system, locally termed the "Finger Raise" system, undercutting and caving in blocks of about 70' vertical dimension; the broken and caved ore is drawn off through a system of inclined raises delivering to the haulage-ways below; these raises have a sufficient number of branches immediately below the caved area to reduce the interval between the heads of the raises that tap the caved ore to a minimum of about 8'. The ore is carried in trains of 5-ton cars by air locomotives to the working shafts, where it is delivered to one set of double concrete bins underground holding 3,700 tons and hoisted to surface through 2 shafts, delivering to a bin of 2,000 tons capacity located between the shafts. Skip loading and hoisting is automatically controlled. Ore extraction will be entirely confined to these 2 cement and steel-lined shafts, 585' deep and 107' apart, in Webster gulch, on the north side of the mountain, while men and supplies will be lowered and water pumped at the Incline, or Supply shaft on the opposite, or Miami side of the mountain. The 2 shafts will be operated from the same hoist house, but will be entirely independent units, capable of handling 1,000 tons per hour. The total lift is 630'. The ore will be hoisted in skips, passed through crushers and put in 25,000-ton storage bins. From these bins it is carried over the company's 1.6-mile railroad, with 3% grade, to the mill at the old Black Warrior townsite.

Ore extraction: 1916 was a complete operating year, mining confined almost entirely to the Inspiration ground. The output was 5,353,880 tons, averaging 1.548% copper. The greatest day's output was 21,289 tons. The average output of ore per shifts work was 17.46 tons. The area undercut was 18.4 acres. The cost of mining was 60.7c per ton.

From the time the ore is dumped from the chutes into the mine cars no manual labor is required, all operations being entirely mechanical.

The company owns its own railroad of 4½ miles standard-gauge track, connecting the mine with the mill and the mill with the smelter of the International Smelting Co.'s Miami plant, where concentrates are smelted.

The mine and mill are connected with both the U. S. Reclamation hydro-electric plant at Roosevelt and with the company's own steam plant, consisting of three 6,000 k. w. turbo generator units.

Production details in 1916:

Ore treated, tons.....	5,316,350
Average per day, tons (16,000 has since been exceeded).....	14,850
Average copper-content, per cent. (0.835% oxide).....	1.548
Average in tailing, per cent.....	0.397

Extraction, per cent.....	74.860
Copper in concentrate, per cent. (flotation 37.50%).....	30.688
Water used per ton of ore, gallons.....	1,108
Steel ball consumption per ton of ore, pounds.....	1.760
Flotation oil, used per ton of ore, pounds (coal tar 1.2 lb.).....	1.287
Cost per ton for milling, cents.....	50.385
Refined copper for year, pounds.....	120,772,637
Cost per pound of copper, cents.....	8.673
Cost per ton of ore.....	\$1.948

The low recovery, 74.86%, is due to the unavoidable inclusion of oxide ore. The percentage of copper in sulphide form was 1.213%, and in oxide combinations 0.335%. The extraction on the former was 90.95%, but on the latter 16.60%. Gravity or flotation concentration give low recoveries on the oxide ore.

The average yield of refined copper was 22.625 lb. per ton of ore. The mine is now capable of producing 20,000 tons of ore daily.

Production for 8 months to Nov., 1917 (mine was closed July and August on account of strikes), was 72,050,000 lbs. copper.

A profit of \$20,629,489 for the first complete year's work gives a good idea of future possibilities, although sales of copper realized over 25c per lb., against an average of about 15c over a period of normal years. Even at the latter figure, and costs at 9c per lb., large profits should be made on the normal output, which is at the rate of 11,000,000 lb. monthly. Dividends are kept at \$8 per share per annum, although profits are more than double this amount; but in these war times, it is best that some caution be observed by holding large cash reserves. The property is financially and technically managed by the best talent. The 1917 output will show a big decline on account of labor troubles in the Miami district at mid-year; there was no production in July and Aug. and the Sept. output was 2,250,000 lb., or about 20% of normal.

Earnings in 1916 were \$17.54 per share. In October, 1917, company had a surplus of about \$13,000,000, and earnings for the year will approximate \$15,000,000 or \$13 per share, a very large part of which will be absorbed by the war tax.

INSPIRATION EXTENSION COPPER CO.

ARIZONA

Address: F. O. Augustin, 433 Broome St., New York City. Wm. H. Correa, pres.; A. L. Rosengarten, v. p.

Inc. Feb. 11, 1913, in Delaware. Cap., \$1,000,000, increased to \$1,500,000 in 1915; shares \$5 par; all issued. Annual meeting February 11th. Company's holdings are under bond and lease to the Castle Dome Development Co., 100 Broadway, New York, which acquired 94% of this company's stock, 1917.

Property: 95 acres, patented, in the Miami district, partially surrounded by claims of the Inspiration Consolidated Copper Co., and underlain by schist, locally altered, said to show a deposit of low-grade copper ore. Also 29 claims, unpatented, about 500 acres, on Porphyry Mountain, about 5 miles W. of the first group and adjoining the Continental mine of the Old Dominion Copper Co. This group shows disseminated ore in granite. Development to date consists of 3 tunnels total 2,200', all above water level.

Development: of the Miami tract includes a 500' shaft disclosing primary sulphides.

Equipment: includes a 35 h. p. gasoline hoist good for 500', with various buildings. Extensive drilling of ground planned for 1918.

INSPIRATION NEEDLES COPPER CO.**ARIZONA****Offices:** 116 Nassau St., New York, and Globe, Ariz.**Officers:** D. R. Williamson, pres.; Frank Beston, v. p.; F. W. Hamm, sec.; A. D. Williamson, treas., with Geo. J. Stoneman, directors.**Inc.** Jan. 4, 1912, in Ariz. **Cap.**, \$2,000,000; issued, \$1,300,000; shares \$1 par. Security Transfer & Registrar Co., New York, transfer agent and registrar. Listed on New York curb. Annual meeting first Monday in February.**Property:** 35 claims. 500 acres, 3 miles from Miami, Ariz., adjoins Southwestern Miami on the W., lies 1 to 2 miles S. W. of Inspiration Cons. property. Surface shows Gila conglomerate, Pinal schist and Schultze granite formation.**Development:** the result of assessment work, consists of a number of shafts, none over 100' in depth, and tunnels, none over 200' in length.

August, 1916, two churn-drills operating at holes No. 1, 395' deep, and No. 2, 300' deep, had cut oxidized ore carrying 1% to 2.6% copper, proving that the ground is on the ore zone of the district.

Churn drilling began June 18, 1916. Expect to have 7 drills in operation. Examined by J. H. Dockweiler (Crocker Bldg., San Francisco, Calif.) in June, 1916.

No recent news available.

IRON CAP COPPER CO.**ARIZONA****Office:** 50 Congress St., Boston, Mass. Mine at Copper Hill, Gila Co., Ariz.**Officers:** Frank P. Knight, pres.; J. Judson Dean, v. p.; R. H. Knight, sec-treas.; F. A. Woodward, supt.; preceding and Alvin T. Baldwin, directors.**Inc.** Feb. 7, 1911, in Maine. **Cap.**, \$2,000,000; shares \$10 par, fully paid and non-assessable; 50,000 preferred, convertible into common, and 150,000 common; issued, 32,528 preferred, 112,513 common.**Dividends:** pfd. No. 4, July 2, 1917, 3½%; com. No. 1, Jan. 1, 1917, 2%; No. 2, July 2, 1917, 3½%, plus extra of 65c; on com. 50c extra, Dec. 1, 1917.**Bonds:** \$125,000, 7% 5-year, dated April 1, 1916. Federal Trust Co., registrar; Exchange Trust Co., transfer agent. Stock listed on Boston curb. Annual meeting, first Tuesday in January.

Company reports for year ended Dec. 31, 1916, a gross income of \$432,414, of which ore sales realized \$414,292. Expenses totaled \$385,332, including 5% depletion charge. No debts save outstanding bonds. Cash, accounts receivable, stocks and bonds total \$280,212.

Property: the Iron Cap and Bird groups at Globe, 20 patented claims, dividing two Arizona Commercial groups and adjoining the Old Dominion property.**Geology:** claims show shale and quartzite cut by diorite at depth and traversed by a fissure vein running N. E. and S. W., and dipping at 70°.**Development:** by 981' Williams shaft, with levels at 660, 765, 868 and 968'. Vein is opened for about 1,000' in length. The Iron Cap shaft is 920' deep, with levels at 450, 600, 800 and 920'. On the 800 and 900' levels the vein has been exposed for 400'.**Equipment:** 2 Wellman-Seaver-Morgan double-drum hoists of 1,500' capacity, 2,200 cu. ft. Sullivan air-compressor.

During 1916 the ore shipped to El Paso, Texas, averaged 8.6% copper and 6.54 oz. silver. Employs 140 men.

The future of this property appears to be good. The daily output in July, 1917, is 100 tons to the smelter and some 5% ore to the Old Dominion concentrator. Profit was \$118,706 in May, 1917.

LECORA COPPER CO.**ARIZONA**

Idle. Office: 500 Lonsdale Bldg., Duluth, Minn. Mine office: Globe, Gila Co., Ariz. David L. Fairchild, treas. The Cordova Copper Co., the old company, was taken over by its creditors and renamed.

Property: 21 claims, aggregating 270 acres, north of the Old Dominion mine and west of the Arizona Commercial.

Development: by the 1,225' three-compartment Gem shaft with extensive crosscuts on the 1,100' and 1,200' levels, cutting the Gem and Future veins, which have shown a little ore occasionally, but nothing of commercial size.

Shipments made from a vein 5 to 8' wide on the 1,200' level, averaged 3.35% copper, 33% iron, 35% sulphur, with \$1.30 in gold and silver.

Equipment: includes hoist and 12-drill air compressor. Management has struggled faithfully to make a mine, both east and west of Globe, but has rather poor prospects.

LOUIS d'OR GOLD MINING CO.**ARIZONA**

Reorganized 1916 as Louis d' Or Mng. & Mlg. Co., which see.

LOUIS d'OR MINING & MILLING CO.**ARIZONA**

Is a reorganization of the Louis d' Or Gold Mining Co., which company was practically a reconstruction of the Lost Gulch United Mines Co. Is controlled by Baldwin Syndicate.

Address: P. O. Box 995, Miami, Ariz. **Office:** 339 Monadnock Block, Chicago, Ill.

Officers: L. W. Whitmer, pres.; Geo. P. Baldwin, v. p.; J. A. Glenn, treas.; G. O. Swarts, sec., with J. B. Huling, Willis H. Smith and Theo. A. Steller, directors.

Inc. Nov. 29, 1916, in Ariz. Cap., \$3,000,000; shares \$1 par; 1,400,000 issued. Assets, May, 1917, \$35,000.

Property: 17 claims, partly fractional, 292 acres, in 2 contiguous groups, about 2 miles north of the mouth of Lost Gulch, and 3 miles from a railway. Claims show monzonite-porphry, diorite and granite, carrying 4 fissure veins, of which 3, of 4' estimated average width, are more or less developed, the mines as a whole having about 8,500' of workings.

The **Badger** mine has a vein of 3 to 6' width, developed by a 145' shaft, somewhat wet, carrying ore said to average about \$7 per ton in values, with occasional shoots of \$17 to \$30 per ton, and a 400' tunnel showing a vein of 3 to 6' width, averaging about \$7 per ton. Equipment includes a 15 h. p. gasoline hoist, good for 400' depth.

The **Bonanza** mine has a 1,050' tunnel. The **Cedar Tree** mine carries mainly argentiferous and auriferous galena, with a little copper and zinc. The **Tiger** or main vein is entirely auriferous, is developed by a 350' tunnel to 110', and is said to carry values of from \$3 to \$90 per ton. All ores are sulphide.

Shipments: of surface ore averaged 6 oz. silver and 1 oz. gold, with lead and silver. Development by winze sunk from the tunnel on the vein.

Equipment: the mill, of wood, completed Feb., 1910, has 10 stamps, a 6x10" Gates crusher, 2 Wilfley tables, 2 Frue vanners and a Pierce amalgamator; power equipment includes two 80 h. p. water-tube boilers and a 150 h. p. Corliss engine, 40 h. p. steam plant and compressor, installed 1915.

Company is churn drilling 300 acres of adjoining ground and has contracted to settle for each 20 acres as they are drilled and according to conditions underground; monthly payments, however, being made on property.

Examination of the Louis d' Or in 1916 by Chas. E. Hart, E. M., led to above purchase, his report stating that the west side of the property

was in "copper porphyry" with good surface indications of copper sulphides occurring at 500' to 600' in depth. Only churn drilling being done, 1917.

The property has been a failure as a gold mine but possibly has a chance of making good as a "porphyry copper."

MANITOU HILL COPPER CO.

ARIZONA

Idle and probably dead.

Office: care W. H. Brown, sec., 110 S. Third St., St. Joseph, Mo. **Mine office:** Globe, Gila Co., Ariz. A. T. Hammons, pres. and mgr.

Inc. 1911. **Cap.**, \$1,250,000; shares \$1 par. Company is a reorganization of the Pinto Creek Mining & Smelting Co., and by consolidation later acquired the property of the Five Points Copper Mining Co.

Property: 70 claims, at the head of Pinto Creek, about 10 miles S. W. of Miami, shows pre-Cambrian schists cut by granite and granite porphyry. Ore is low-grade.

The Pinto Creek group is developed by the 570' Yo Tambien shaft, showing a fair body of sulphide ore, the 70' Manitou shaft, and 8 tunnels, longest 2,200', with upwards of a mile of workings.

The Five Points group, some distance down the valley, is developed by the 150' Solace incline shaft, and the 350' Crackerjim shaft, sunk 1,500' apart. Property shows malachite near surface with some chalcocite at shallow depth.

Equipment: includes small steam plant and hoist at the Five Points mine, 6 h. p. gasoline hoist, 6-drill air-compressor, and 250-ton concentrator at the Pinto Creek mine. Assessment work done, 1914. Company endeavoring to raise \$25,000 for sinking shaft to prove ore in commercial quantities.

McMILLEN-STONEWALL MINING CO.

ARIZONA

Globe, Gila Co., Ariz. V. Y. Smith, pres. and gen. mgr.; C. N. Lightle, sec.-treas.

Inc. March 27, 1907, in Arizona. **Cap.**, \$1,000,000; shares \$1 par.

Lands: 34 claims, in the Richmond basin, 16 miles N. E. of Globe, carry 3 miles of the strike of the Stonewall Jackson vein, of 25 to 35' average width.

Property: includes the Stonewall Jackson mine, worked 1876-83, with an estimated production of about \$500,000 of silver ore, of high average grade.

Development: by the 300' three-compartment McMillen shaft and the old 600 Stonewall Jackson shaft, latter showing no stoping done below 230'. The mine is said to have considerable ore carrying 5 to 50 oz. silver per ton, with about 40,000 tons of discarded silver ore on the old dumps.

Equipment: includes an old stamp mill and a small cyanide plant. A full and favorable report on the property was made, May, 1912, by R. B. Wagner.

In 1914 property was bonded to G. H. Hayes and explored by diamond drilling, which proved unsatisfactory owing to the broken nature of the ground.

MIAMI CONSOLIDATED MINES CO.

ARIZONA

Office: Miami, Ariz., 110 Nassau St., New York, and 1050 Old South Bldg., Boston, Mass.

Officers: J. S. Cook, pres.; J. A. Pinyan, J. H. Thomson, Theo. Phillips, G. J. Davis, Irva Linley, J. B. Kendall, A. E. Gilmore and E. G. Schulze, directors; J. H. Dockweiler, cons. engr.

Inc. 1916 in Arizona. **Cap.**, \$2,500,000; shares \$1 par; 1,336,000 issued. Security Transfer & Registrar Co., New York, registrar.

Property: about 1,200 acres S. of and adjoining Inspiration Consolidated, Southwestern Miami, and Inspiration Needles properties at Miami,

Ariz. Originally held by 19 different owners. In 1915, prospectors shipped 272 tons of 2.6 to 5% copper ore, in 1916, 100 tons of rich ore, and previously 500 tons of 3 to 6% ore, all coming from two well-defined areas; north-central and southern. Prospectus was modest enough to inspire confidence.

Development: churn-drilling under way in 1917. No. 1 hole in May, 1917, was down about 1,000' and is said to have passed through sulphide ore at 420'; No. 2 found sulphides at 585', this ore understood to be an extension of the Live Oak orebody of the Inspiration Co.

Property warrants further drilling to determine extent of orebody.

MIAMI COPPER CO.

ARIZONA

Office: 61 Broadway, New York. **Mine office:** Miami, Gila Co., Ariz.

Officers: Adolph Lewisohn, pres.; J. Parke Channing, v. p.; Sam A. Lewisohn, treas.; preceding, with Hermann Sielcken, J. H. Susmann, Wm. H. Nichols, Walter T. Rosen, F. W. Estabrook, B. Hochschild and Theo. L. Herrmann, directors; Herman Cook, sec.; B. Britton Gottsberger, gen. mgr.; F. W. MacLennan, asst. mgr.; F. W. Solomon, mill supt.; R. B. Yerxa, asst. mill supt.; W. F. Williams, chief clerk; Arthur Stonham, auditor.

Inc. Nov. 30, 1907, in Delaware. **Cap.**, \$3,000,000; shares \$5 par; increased Nov., 1909, to \$3,500,000, and again increased Aug., 1910, to \$4,000,000; issued, \$3,735,570. Of this last increase in capitalization, 60,000 shares were offered to stockholders at \$18 per share. Of the issued stock, 300,000 shares were given, Nov., 1907, in payment for lands; 200,000 shares were issued April, 1908, at \$5 per share; 100,000 shares were issued Aug., 1908, at \$10 per share; 60,000 shares were issued Aug., 1910, at \$18 per share, and of the balance, 88,236 shares were set aside for conversion of bonds, and 52,886 shares remain unissued. Debentures, \$1,500,000 first-mortgage 10-year 6% gold bonds have been retired.

The company is controlled, through stock ownership, by the General Development Co. Mechanics & Metals National Bank, New York, and Old Colony Trust Co., Boston registrars; Bankers Trust Co., New York, and American Trust Co., Boston, transfer agts. Shares are listed on the New York and Boston Stock Exchanges. Annual meeting, third Wednesday in April.

Comparative General Balance Sheet:

Assets:	Property & Equip.	Devel.	Metal on Hand	Other Current	Stock Invest.	Total
1916....	\$4,582,483	\$1,207,071	\$5,419,056	\$1,893,412	\$100,000	\$13,202,022
1915....	4,593,765	1,416,994	3,017,566	299,163	100,000	9,427,488
1914....	4,465,743	1,535,208	966,489	471,712	100,000	7,539,152
Liabilities	Capital	Res. for	Capital	Acc'ts	P. & L.	Total
	Stock	Mine Depl.	Surplus(a)	Pay	Acct.	
1916....	\$3,735,570	\$423,588	\$1,995,412	\$831,816	\$6,215,636	\$13,202,022
1915....	3,735,570	.....	1,995,412	521,161	3,175,345	9,427,488

(a) Premium on shares, less expense of issue.

Dividends: started in 1912, were paid regularly until Oct., 1914; resumed in May, 1915, at rate of 50c, and increased 25c each quarter since: \$1.50 per share in 1912; \$2.00 in 1913; \$1.50 in 1914; \$2.25 in 1915; \$5.75 in 1916; \$8.50 in 1917.

Property: 222 acres, mining claims, patented, 555 acres held for the mill and power plant and 345 acres for water rights, in the Miami district, 6 miles west of Globe. Claims show an area of silicified schist at and near a contact with a great intrusive body of granite, known as Schultze granite. The altered schist belt averages about 1,200' in width and has a generally

E.-W. direction. The granite merges into granite porphyry at its borders, and this and offshoots, or dikes of the granite in the schist, are mineralized along the ore belt. This is seen in a dike with E.-W. strike, of 40 to 60' width, mineralized in the same manner as the schist.

The schistose area is netted with contraction fractures and later fissuring due to metasomatic changes of volume, accompanying mineralization and alteration. The ore belt is marked by silicification and intense alteration of the schist, a change that fades out into natural gray schist a few hundred yards north of the Miami and Inspiration mines. The ore zone is oxidized and leached to an average depth of 210', this part containing small seams and veinlets of oxidized ore. Below this leached belt a few feet of mixed ore is succeeded by the zone of disseminated glance, a rather soft, much altered rock, specked with tiny glance grains and films.

Mining methods: the mine contains two separate orebodies known as the Main and Captain. In the former, topslicing produces 3,000 tons per day; in the latter, which consists of lower-grade ore, a system of shrinkage stoping with undercutting and caving of the pillars is used. The production by this method is also approximately 3,000 tons per day.

In the topslicing method, haulage levels are laid out 150' apart vertically, with drifts spaced 50' apart horizontally, and along these drifts, raises to the slicing levels are spaced 50' apart. One sub-level 50' above the haulage level is installed for the purpose of distributing air from the fans through the raises to the various slices. The slices are mined in blocks 250' square and 10' high. Each block is a unit in itself, being served by its own supply-raise and manway. The extreme horizontal dimensions of this orebody are 1,000' x 750'.

The Captain orebody is about 350' thick with extreme horizontal dimensions of approximately 500' square. This is developed by a haulage level below the orebody, and hand trampling levels at suitable vertical intervals above the haulage level in the orebody. The hand trampling level consists of drifts 25' apart, with drawing off chutes spaced along them at intervals of 6½' apart on the alternate sides of the drifts, thus tapping the orebody at intervals of 12½' apart in all directions. The ore is soft, and caving is induced by putting up narrow shrinkage stopes at right angles to the drawing off drifts, and subsequently caving the pillars between them by undercutting. The ore is drawn off from the chutes uniformly and trammed in 20 cu. ft. cars and dumped through raises to the haulage level, where it is transported to the shaft in trains made up of 30 cars of 3.3 tons capacity, by 6-ton electric trolley locomotives.

Development: has been by extensive underground operations, supplemented by churn drilling. Up to the end of 1916 drill holes of 624' average depth had been drilled to the number of 92. Drill holes were put down at the corners of 200' squares. Drill borings in the vicinity of the mine have shown commercial ore to at least 115' additional depth below the 720' level of the mine.

The mine is worked by a very large main shaft with 3 others sunk during prospecting operations and development. The latter are known as No. 1, No. 2 and No. 3 shafts. No. 2, with 3 compartments, is 720' deep, and is sunk in about the center of the mineral deposit. All of the ground around this shaft has been mined practically to the 420' level and use of shaft has been discontinued. No. 3 shaft, 2,150' N. W. of No. 2., has 3 compartments and is 422' in depth, sunk through surface capping into ore. No. 1, the first shaft put down on the property, was stopped at 210' but in 1913 was deepened to 515', and a trampling level prepared for stoping and ore extraction.

The No. 4, or main working, 4-compartment shaft, equipped for ultimate production of 8,000 tons of ore daily, is sunk outside the proven mineral zone in order to be immune from caving and is bottomed in conglomerate at depth of 710'. It is 12x16' inside of timbers with 14x18' outside dimensions, and framed with Louisiana long-leaf yellow pine, preserved by the use of 12 lbs. of creosote per cubic foot.

Development: work in 1916 amounted to 42,118', as compared with 21,746' in 1915. Total amount of underground workings at close of 1916 amounted to 290,678'.

Ore reserves: Jan. 1, 1917: figured at 16,400,000 tons of 2.4% sulphide ore and 28,000,000 tons of 1.06% sulphide ore. In addition there are 6,000,000 tons partially developed mixed sulphide and oxide ore of an approximate grade of 2% copper. These figures are reliable, because of the unusually thorough manner in which the ore has been developed and blocked out and the well-known conservatism of the management. A very large part of this ore is actually blocked out underground, and the estimated average percentage is based upon thousands of careful assays, made of samples taken at 5' intervals, throughout the workings. It is probable that further development of the mine will develop more or less additional ore, possibly above what is considered the present payable limits.

Power Generation: In the power house are three 4-cylinder, triple expansion engines direct connected to three 1,000 k. w., 3-phase, 25-cycle generators; two 4-cylinder, triple expansion air compressors, with a capacity of 4,000 cu. ft. of air per minute at 90-lb. initial pressure. Steam is supplied from the boiler house by five 600 h. p. water-tube boilers producing steam at 190-lb. pressure and 100° superheat. At the present time additions are being made to the power plant, consisting of two turbo-generators of 4,000 k. w. capacity, and two 600 h. p. boilers will be added to the boiler plant.

The main shaft has 2 Nordberg hoists, the larger for raising ore having 2 drums of 10' diameter with 55" face, capable of handling 1,000' of 1 $\frac{3}{8}$ " rope. An auxiliary hoist has 16x16" cylinders with a drum of 8' diameter and 6' face for hoisting the man cage. The ore hoist raises two 7 $\frac{1}{2}$ -ton skips which are dumped directly into the pockets of the crusher building.

The crusher building, at No. 4 shaft, of 6,000 tons daily capacity, has Chalmers-Williams crushers, breaking ore to 1 $\frac{1}{4}$ " size, the product being fed through two 4x10' trommels to four 62x18" rolls that crush oversize to half-inch cubes. Ore then goes by belt conveyor, Miami type, heavy duty Traylor, to the mill bins.

The concentrator, originally designed by H. Kenyon Burch, with initial capacity of 2,000 tons daily, since increased by remodeling to 6,000 tons daily, is on a hillside south of the ore deposit, permitting gravity handling, and with a large acreage nearby, available for tailings. The mill building is of steel and stands on concrete foundations and in interior construction steel and concrete are used almost exclusively.

Ore treatment: in the crusher building ore is reduced by gyratory crushers and rolls to pass a $\frac{3}{4}$ " hole, and is then delivered by belt conveyors, equipped with automatic weighing device, to bins behind the mill, with a total capacity of about 10,000 tons.

The mill proper is divided into six sections described as follows: from the bins, ore is carried by belt conveyor to an 8'x36" Hardinge mill loaded with 4" balls. The product of this mill passes to a Dorr classifier, where the finished product made up to this point is separated. The oversize from this classifier is divided between two 8'x30" Hardinge mills loaded

with 2" balls, each operating in closed circuit with a Dorr classifier, and in these, the reduction of the entire feed to finished size (minus 48-mesh) is completed. The ore-pulp is then subjected to treatment by flotation in pneumatic flotation cells, which are a modification of the original Callow design. These cells are fitted with air bottoms covered with a porous medium through which is admitted air for aeration of the pulp. The total area of air bottoms in one section is 539 sq. ft. Air is supplied by a Root's blower with a capacity of 5,000 cu. ft. of air per minute at 6-lb. pressure, driven by a 150 h. p. motor. After flotation, the sand contained in the flotation tailing is subjected to treatment on Deister sand and slime tables. Concentrates pass through tunnels to the concentrate handling plant. The original plant consisted of round tanks with filter bottoms subjected to vacuum, but this is no longer used, and concentrates are now prepared for shipment by filtering. This plant consists of four Dorr thickeners 60' diam. by 12' depth, from which the thickened product passes to three 12' Oliver filters. From these the concentrates are delivered by belt conveyor direct to railroad cars.

The above description represents the latest flow-sheet adopted for the plant, and will be in full operation early in 1918.

For the past year, a 100-ton experimental plant has been in operation; in this the remodeled flow-sheet was worked out. Experiments on the treatment of mixed oxidized and sulphide ore are also being carried out in this plant, and the first steps for the handling of such ores will probably soon be decided upon. Concentrates produced in the mill average about 42% copper and are being shipped to the International smelter at Miami.

Water supply for the mill comes from the Old Dominion mine at Globe, and from two 16" wells equipped with centrifugal pumps, at the lower end of the Miami wash. Here is the main pumping plant, equipped with two Nordberg pumps of a capacity of 1,250 gal. per minute each. Water is delivered to the mill through a 14" pipe to two steel storage tanks with a capacity of 500,000 gal. each.

Buildings include machine shop, warehouses, steel change house, store, boarding house, bunkhouse and upwards of 150 frame dwellings for employees, all lighted by electricity. There is a substantial office building, erected at a cost of \$15,000, a club house and recreation hall, and a hospital owned jointly with the Inspiration Consolidated Copper Co.

Early in 1917 a Y. M. C. A. building was erected in the town of Miami at a cost of \$85,000. This is operated by the Industrial Branch of the Y. M. C. A., and membership is open to all residents of the district.

Mine is served by an extension of the Arizona Eastern railroad from Globe to Miami.

In the Miami district the basis of wages for all workers is by sliding scale based on the price of copper, the minimum for miners being \$3.50 when copper sells at 13c per lb., and 25c is added for each 2c increase in the price of the metal.

Production: begun March, 1911—

	Tons		Oper. Cost p. Ton			% Cu.		% Rec.		% Cu. Lbs. Cu. in Rec. per T. Ore		Net Prod.		Cost	Sellin
	Treated	Mine	Mill	Total	Cu.	Rec.	Cncta.	T. Ore	Lbs. Cu. (a)	per Lb.	Cents	Price	Cents		
1916.....	1,842,017	\$1,119	\$0.589	\$1.937	2.07	73.88	42.492	30.58	53,518,331	9.523	24.465				
1915.....	1,248,123	1,016	.579	1.878	2.17	75.17	41.91	32.66	41,832,059	8.765	17.331				
1914.....	1,096,533	1,188	.499	1.959	2.28	69.93	39.31	31.96	33,296,010	9.204	13.349				
1913.....	1,058,784	1,608	.572	2.465	2.30	71.06	38.09	32.68	32,867,666	10.609	15.240				
1912.....	1,040,744	1,303	.659	2.042	2.39	69.39	37.02	33.21	32,832,609	9.588	16.582				
1911.....	445,036	1,213	.627	2.011	2.48	73.37	40.36	36.39	15,385,783	9.103	13.03				

(a) Smelter returns.

Production: for 11 months to Dec., 1917, was 38,096,812 lbs. Output in 1917 will be about 12,000,000 lbs. short on account of labor troubles started early in July. Resumption on a small scale started early in Sept. I. W. W. and Union recognition were the basic troubles.

In 1914 the Mineral Separation Co. brought suit against the company for infringement of patent, and in the final decision given in 1917 by the U. S. Circuit Court on appeal, Miami was declared to have infringed the M. S. patents. In 6 months of 1917 Miami produced concentrates worth \$1,958,122 by flotation. The Miami is a property of demonstrated worth and the management is thoroughly experienced and capable. The stock is a first-class investment, with an assured long life for the mine. Company is particularly free in giving information concerning all operations.

MIAMI MOTHER LODE MINING CO.

ARIZONA

Address: Miami, Ariz.

Officers: W. Schafer, pres.; F. W. Solomon, v. p.; G. D. Barclay, sec-treas., with A. Reid, E. Schafer, H. W. Faust and H. E. Gragge, directors.

Inc. in Arizona. Cap., \$5,000,000; shares 50c par.

Property: consolidated claims of Manitou and other companies, totaling 1,100 acres, in Miami district, Ariz.

Development: by 325' shaft said to have cut 18" vein on the 200' level and disclosed several lenses of ore in other workings.

MIAMI NEEDLES COPPER CO.

ARIZONA

Idle, and probably dead. **Last address:** Globe, Ariz.

Officers: D. R. Williamson, pres.; F. Beston, v. p.; F. W. Ham, sec-treas.; the above and Geo. J. Stoneman, directors.

Inc. 1912. Cap., \$500,000; shares \$5 par.

Property: 11 claims on Needle mountain, about 5 miles west of Miami, slightly developed, shows altered schist and Schultze granite, the former with evidences of mineralization along narrow belts. Much of the group is covered by barren Gila conglomerate.

Is apparently succeeded by Inspiration Needles Copper Co., which see.

MOUNTAIN CONSOLIDATED MINING & MILLING CO.

ARIZONA

Address: Box 1899, Globe, Ariz., and G. B. Reed, Payson, Ariz.

Officers: G. B. Reed, pres.; J. W. Reed, v. p.; W. B. Haynie, sec.; A. T. Hammons, treas., with W. H. Shenk, A. C. McKillop and J. Nugent, directors.

Inc. March 22, 1917, in Arizona. Cap., \$3,000,000; shares \$1 par; 1,285,000 issued.

Property: 66 claims, 1,260 acres, in Payson and Brown's districts, Gila Co., Ariz. Claims said to show gold-silver-copper-lead-vanadium quartz veins in schist, slate and diorite. Ore occurs as streaks. Copper minerals are sulphides.

Development: by 214' shaft and 270' tunnel. Estimated reserves are 36,200 tons, but as only 98 feet of lateral work had been done to June, 1917, this amount must include probable ore based largely on outcrops. The Black Rattler claims in the Brown district are reported to have a silver-copper vein 10,500' long and from 40 to 100' wide, in a slate-schist contact, which outcrops from 50 to 75' above the surrounding country. Proposed to install a hoist and 10-ton mill.

NEW DOMINION COPPER CO.

ARIZONA

Office: 321-25 Owl Drug Bldg., San Diego, Cal. **Mine office:** Globe, Ariz.

Officers: R. E. Vandruff, pres.; B. F. Baker, v. p.; D. F. Mayfield, sec.,

with W. S. Vandruff and O. H. Reinholt, directors; R. W. Stephens, treas.; O. H. Reinholt, cons. engr.; Henry H. Holden, supt.

Inc. Sept. 29, 1916, in Ariz. **Cap.**, \$2,000,000; shares \$1 par; 1,030,000 shares issued.

Property: 27 claims, 500 acres the Mallory mine, Mills College group, and Baker group, immediately adjoining the Old Dominion and Iron Cap mines on the N. and W. of the latter, 2 miles from the center of Globe. All but 6 of the claims are patented.

Geology: similar to that of the Old Dominion, where the principal oxidized ore is cuprite. The ore occurs in lodes or veins, masses in limestone, and irregular mineralization of shattered rocks. Some sulphide ore has been found along a fault-vein on the 450' level. The limestone area, according to the surficial map of the U. S. Geol. Survey, is much greater than that of the Superior and Boston, but slightly less than that of the Old Dominion.

No large orebody has been blocked out yet, but surface ores show high silver values and copper up to 21%. The former operator shipped several carloads in 1916, averaging 8.31% copper.

Development: the original locator of the main group sank several shallow shafts and extracted considerable silver ore in the '70's and early '80's. The Globe Consolidated sank 800' 10 years ago on the site marked I. X. L. or Mallory shaft on the Geol. Survey maps. Altogether over 4,000' of development work had been done before present owners took charge. Since Sept., 1916, they have retimbered the 2-compartment shaft to 700' and cleaned out all the levels so that new crosscutting and drifting could be resumed. Plans call for a 3-compartment shaft $\frac{1}{2}$ mile N. W. of the old shaft, and a 1,400' tunnel through the ridge between these shafts to explore the limestone and facilitate communication after the railway-spur reaches the new shaft. Diamond-drilling will probably be carried on from the lower workings.

Pumping: no expense has been incurred in recent years for unwatering, due doubtlessly to the proximity of Old Dominion workings, which are now 1,000' deeper.

Equipment: includes a modern machine shop, a 400 h. p. steam plant, duplex Prescott pump, 6-drill compressor, etc. Altogether almost \$50,000 worth of improvements have been made during the 5 months; Sept., 1916, to Feb., 1917.

Production: much silver ore in early days. Complete statistics of copper production are not available. About 150 tons of good ore has been mined since Sept., 1916, only incidentally to the clearing out of the old workings, about 10,000 tons of ore expected to be mined and smelted at Old Dominion between Aug. and Dec., 1917. Distance to Old Dominion smelter about $1\frac{1}{2}$ miles by good wagon road.

NEW DOMINION MINES CO.

ARIZONA

Idle and no record of recent operations available.

Address: care Sydnor & Williams, Bellevue, via Miami, Gila Co., Ariz.

Inc. 1905. **Cap.**, \$1,000,000; shares \$1 par.

Property: about 400 yards west of the Gibson mine, is said to show a 4' vein in schist, opened by a 240' incline shaft. After 2 years of work this vein, carrying chalcopryrite ore averaging 23% copper, was struck in a crosscut 200' from the tunnel face.

NORTH DOMINION C. MNG. & DEV. CO.

ARIZONA

Office: Hamil Bldg., Globe, Ariz. Mine at Radium Station, $3\frac{1}{2}$ miles from Globe, Gila Co., Ariz.

Officers: L. L. Lichtfield, pres.-act. treas.; A. Billard, v. p.-act. sec.; with Wm. Richards, W. H. Mercer and C. S. James, directors.

Inc. July 31, 1916, in Arizona. **Cap.**, \$5,000,000; fully paid and non-assessable; 2,750,000 issued.

Property: 42 claims, about 800 acres, mostly on the east side of Pinal Creek, 3 miles north of Globe. The area is outside of the Globe district proper and is several miles from the producing mines of the Globe and Miami districts. Company states that it has spent \$20,000 on development to Dec., 1917.

Geology: claims are said to show diabase and diorite cut by a mother lode and offshoots from it. This lode is reported to be 20 to 80' wide and to carry oxidized ores of copper with some vanadium, as well as silver and gold values.

Development: consists of 12 prospect shafts from 20 to 115' deep and 6 crosscut tunnels, the total results of 12 years' work, according to company's prospectus.

A 3-compartment shaft was down 115' in Nov., 1917.

A report by J. E. Hurd, E.M., states "there is not in the whole district a property capable of producing a greater quantity of ore rich in the metals, as the N. D. C. M. & S. Corp., which with careful management can be made to furnish work for several thousand people and to pay yearly very large dividends for a great number of years on the large and rich bodies of ore known to exist."

Such statements are not only humorous but in our opinion are gross exaggerations and not warranted by the limited development work done to date.

Two carloads of ore averaged 8½% copper in 1917.

NORTHWEST INSPIRATION COPPER CO.

ARIZONA

Address: A. H. Hammond, mgr., Miami, Ariz.

Officers: L. J. Overlock, pres.; C. E. Lucas, v. p.; A. H. Hammond, sec.-treas., with J. P. Glass, J. D. Houston and A. C. McKillop, directors.

Inc. Jan. 31, 1916, in Arizona. **Cap.**, \$1,500,000; shares \$1 par; non-assessable; 750,000 in escrow until 300,000 are sold.

Property: 23 claims, 483 acres, at Miami, Ariz., adjoining Inspiration Consolidated Copper Co. for about 4,500' on the north, and less than half a claim from the Black Warrior mine on the west. Examined by Carl Triehka and A. H. Hammond.

Claims reported to show a deposit of disseminated copper ore in schist. A shaft is being sunk 500', after which a N. drift will be run to cut the Black Warrior and Black Copper veins.

OLD DOMINION CO.

ARIZONA

Office: 50 Congress St., Boston, Mass.

Officers: Jas. Douglas, pres.; Chas. Sumner Smith, v. p., with Cleveland H. Dodge, Jas. McLean, Arthur C. James, Chas. S. Smith and J. Waldo Smith, directors; W. M. Bradley, clerk; C. H. Altmiller, asst. clerk and treas.

Inc. Jan. 15, 1904, in Maine. **Cap.**, \$8,750,000; shares \$25 par; \$7,333,825 issued and fully paid. Annual meeting last Wednesday in January. Stock listed on Boston and New York Stock Exchanges.

Dividends: 50c in 1905 and 1906; \$1 in 1907; 50c in 1908; \$1.50 in 1909, 1910 and 1911; \$4 in 1912; \$5 in 1913; \$4 in 1914; \$5 in 1915; \$12 in 1916; a total of \$10,840,714. To Oct., 1917, \$7 in dividends have been paid. Dividend rate reduced to \$1 quarterly, Sept., 1917.

The company is a securities-holding corporation only, organized to promote the operation of the Old Dominion Copper Mining & Smelting

Co. and United Globe Mines properties. These two companies are operated individually, but with a free exchange, upon an equitable basis, of ores for smelting and fluxing. On Jan. 1, 1917, the Old Dominion Co. owned 155,353 shares or \$3,883,825 out of \$5,000,000 stock issued by the Old Dominion Copper M. & S. Co. and the entire stock, \$2,300,000, of the United Globe Mines.

Income account for 1916 shows net income of \$3,532,126. Dividends paid in 1916, were \$3,520,236, compared with \$1,466,765 in 1915. The surplus was \$11,890, which, with \$355,696 surplus, Dec. 31, 1915, leaves \$367,586 surplus, Dec. 31, 1916.

The stock represents ownership in subsidiaries producing over 40,000,000 lbs. of copper annually, at a cost of about 11.7c a pound.

OLD DOMINION COPPER MINING & SMELTING CO. ARIZONA
(Controlled by stock ownership) Office: 50 Congress St., Boston, Mass. Mine and works office: Globe, Gila Co., Ariz.

Officers: Chas. Smith, pres.; Chas. G. Lund, v. p.; Chas. H. Altmiller, sec.-treas.; preceding with J. T. Herrick, E. P. Ricker, J. Waldo Smith and F. T. Bulmer, directors; W. C. McBride, gen. mgr.; I. H. Barkdall, mine supt.; H. H. Colley, smelter supt.

Inc. July, 1895, in New Jersey. **Cap.**, \$5,000,000; shares \$25 par; issued \$4,050,000. Stock listed on New York Exchange. Annual meeting, first Wednesday in April. Is controlled through ownership of 155,353 shares of the 162,000 shares of issued stock, by the Old Dominion Co.

Dividends: resumed July, 1907, after an intermission of 12 years, have been \$1.25 per share in 1907, \$1 in 1908, \$3 in 1909, \$3 in 1910, \$3 in 1911, \$4.50 in 1912, \$5 in 1913, \$2.75 regular and a special dividend of \$10 per share in 1914; \$5 and a special dividend of \$1.50 in 1915; \$12 in 1916; total to Dec. 31, 1916, (33 dividends), \$8,424,000. Gross earnings for 1916 were \$5,064,500; net earnings \$2,670,595. Surplus Dec. 31, 1916, was \$954,327.

Assets: Dec. 31, 1916, \$9,561,899, including mines, \$3,421,807; plant, and gen. construction, \$3,571,802; cash accts. receivable securities, and copper on hand, sold but not paid for, \$2,568,290.

Liabilities: capital stock, \$4,050,000; accts. payable and unpaid dividends, \$748,334; surplus acct., \$4,763,565.

The surplus account consists of: reserve against special fund voted for dividend, \$163,428; reserve for plant renewals (neither asset nor liability), \$2,207,593; mine renewals, \$1,438,216; profit and loss \$954,327; total surplus, \$4,763,565.

The company was engaged for years in litigation with A. S. Bigelow and the estate of Leonard Lewisohn suing for recovery of secret promotion profits. This has been settled for \$900,000 by the Leonard Lewisohn estate and by a judgment for \$2,223,722 against A. S. Bigelow rendered by the Supreme Court. The securities turned over by Bigelow have yielded 2 "special dividends," the first for \$10, the second for \$2. There will be another and final one of not more than \$1.

Property: 38 mining claims and fractions, 5 mill site claims and 4 placer mining claims, all patented; included in these is the Old Dominion mine at Globe; the Old Dominion and Keystone claims, 3½ miles north of Globe and the Continental mine at the head of Webster gulch, about 18 miles west of Globe; also the Chicago & New York group of 60 acres and the Geneva mine.

Geology: at the Old Dominion mine, the principal ore zone occurs along a big fault vein having a N.-E. strike with sharp easterly dip. The hanging wall is limestone and quartzite, with footwall of diabase of more recent age, faulting evidently occurring both before and after the intrusion

of the diabase. The ore favors the hanging wall, but also occurs in lenses along the bedding planes of the limestone and in shattered quartzite, the largest lens yet developed being 60x100x200' in size. The oxidized ores are mainly cuprite, associated with a little malachite and chrysocolla, in a gangue of iron oxides and quartz.

Sulphide ores first appear at a depth of about 350', as chalcocite, with gangue of pyrite and quartz, the lower workings also showing chalcopyrite. All ores are more or less argentiferous, and, as a rule are highly silicious, requiring heavy lime and iron fluxes in smelting. The mine shows large sulphide ore shoots on the 14th level and below, and has improved wonderfully in the deeper workings opened up in the past few years.

The orebody under Pinal creek shows oxidized ores up to 20% in copper tenor, on the 8th, 9th and 10th levels, with chalcocite of even better tenor on the 11th level.

Development: principal mining developments of the past few years have been at the western end of the mine, which furnishes $\frac{3}{4}$ of the smelting ore mined. On the 15th and 16th levels the vein is broken and bunched. On the 17th and 18th it is 35' to 40' wide, but of concentrating tenor.

The east side workings on the 14th, 15th and 16th levels develop the Gladiator orebody, and production, nil in 1913, was 30,000 tons in 1916. Development in 1916 totaled, 23,314'. In addition 1,305' of churn-drilling was done.

In blocks 8, 9, 11 and 12-W, 17th level, considerable work is to be done in exploring this favorable looking zone. On No. 18 level the foot-wall drift was extended W. into block 12-W, and a crosscut in 10-W cut 80' of 3% concentrating ore.

Mine is now developed down to the 1,800' level, where the workings show a wider orebody both east and west than was found on the 1,400', with no sign of diminishing values of size below the bottom workings of the mine.

No important changes have been made in mining methods and the heavy wet ground on the west side is still worked by square sets and filling, while the more solid ground on the east side of the mine is stoped by cut and fill without timber.

The "A" shaft, or main working shaft, on the eastern side of Pinal creek, in the west section of the mine, is connected with the principal workings by underground trolley lines, including a line to handle the ore of the Gladiator mine, which has yielded a notable quantity of smelting ore, and large quantities of concentrating ore. Ore extraction on the east side is mainly from the 1,200', 1,400', 1,500' and 1,600' levels; on west side from the 900' to 1,600' levels. Large ore pockets were cut in 1915 at these levels. "A" shaft has 5 compartments, 2 equipped for skip hoisting, 2 with cages for lowering men and supplies, and 1 for air and steamlines, water columns and electric cables. Ore and waste, hoisted to surface, is handled in skips.

Pump shaft was lined with concrete from 10th level to surface in 1916.

Equipment at "A" shaft includes a steel engine house, built 1910, having a 17"x31"x48" Nordberg compound hoist, good for 2,000' depth.

"B" shaft, on the eastern side of Pinal creek, bottomed on the 14th level, has 4 compartments. "C" shaft has a 100,000 cu. ft. fan for ventilation, and is bottomed on the 14th level. "D" shaft, 300' deep, is located on the western side of Pinal creek, about 2,000' west of the most westerly previous workings. The "K" shaft, 1,400' deep, also has a ventilating fan. The Transit shaft is about $\frac{1}{8}$ mile east of "A." The Kingdon (1,200') and Grey shafts, main working shafts of the United Globe Company, are con-

nected with the 1,200' level of the O. D. mine. The Grey shaft has a 75 h. p. Wellman-Seaver-Morgan electric hoist. Property has a number of smaller shafts and several tunnels, not in present use.

Pumping: the mine is very wet, the daily average amount of water pumped being nearly 7,000,000 gals. in 1916. During Feb., 1916, as high as 11,501,907 gals. were pumped in 24 hours. The company sells part of the water pumped to the Miami C. Co., but receipts from this source reimburse it only to a slight extent for the pumping expense.

During 1916, 2,523,870,000 gals. of water was pumped to surface. The Miami Copper Co. bought 720 million gals. for use in its concentrator.

The mine is equipped with pumps of about 20,000,000 gals. capacity daily, these including a 1,500-gal. Prescott pump on the 10th level, having a 12" water column, discharging 30' above the collar of the shaft, into a launder on a trestle leading to a storage tank, whence water is drawn for use of the mill and smelter. There are 4 Nordberg steam pumps on the 12th level, having a rated capacity of 8,000,000 gals. per day, with 4 Gould electric pumps, 2 on the 10th and 2 on the 14th levels. On the 18th level there are two 1,200 gals. per minute quintuplex Aldrich electric pumps. New centrifugal pumps were added, 1916, driven by power generated by a Diesel engine.

Early in 1916 drilling in Pinal creek proved the existence of a badly broken and porous area under the creek near the mine workings. Management has been grouting this ground with slime from the mill, thus reducing flood-water entering the mine from this point.

Mill and Smelter: the mine, mill and smelter are connected by a private railway, equipped with a Porter locomotive, and 50-ton ore cars.

A new crusher plant and sampling mill were erected in 1913. Capacity, 150 tons per hour. In 1914, a 600-ton concentrator, using a 300-ton flotation plant to extract copper from the slime, was completed. The old 300-ton concentration mill, erected 1909, will be maintained as a reserve for test purposes.

The smelter does custom work, and was formerly an extensive purchaser of sulphide ores for fluxing the oxidized ores of the Old Dominion and United Globe mines, but these mines developed large quantities of sulphides in the lower workings. In 1916 a much larger tonnage of custom ore was treated than formerly.

The smelter has 8 double storage bins, holding 1,000 tons of coke, limestone and ore. Mixing, weighing and charging are done automatically, requiring a force of only 4 men. There are 5 blast furnaces, 3 being 44"x198" at the tuyeres, and the other 2 being 44"x231", set tandem, with settlers between, charged automatically from side-dumping cars. The furnaces have a nominal capacity of about 2,400 tons daily, but one furnace is held in reserve. Fuel is New Mexican coke, from the Dawson Coke Co. The smelter is served by an electric locomotive and three 3,000-lb. tilting cars for charging, with a steam locomotive and dump-cars for slags.

In the converter department acid converting was abandoned in Jan., 1913, and one stand of the basic converter type has handled all of the production since that time. The basic converter has been particularly successful at the Old Dominion plant. A shell removed in 1915 from the stand had been there for 30 months without patching and had during that time produced over 70,000,000 lbs. of copper. Shells are handled by a 40-ton electric traveling crane. The converters take 50% matte, and turn out blister copper of 99.5% copper with small silver values.

The power plant at the smelter includes a 2,300 k. w. generator and two 750 k. w. generators, direct-connected to General Electric horizontal

low-pressure steam turbines, utilizing exhaust steam. All machinery, except hoists and compressors, is actuated electrically. There is a 30-drill Nordberg compound air compressor, with intercooler and water-jacketed air cylinders, and a complete electric light plant. Within the last three years a 5,000 cu. ft. air compressor has been installed. Furnace blast is supplied by Connersville blowers of 45,000 cu. ft. per minute aggregate capacity and an 18,000 cu. ft. Nordberg air compressor furnishes converter blast. Fuel oil is used for the boilers. Power in 1916 cost \$74.14 per h. p. year, an increase of \$3.33.

Production: smelter production is larger than mine production because the smelter treats ores of the United Globe and a considerable amount of custom ore.

	Tons Extr.	%	Tons Conc.	%	Tons Charge Smelt.	Costs per Ton			Cost Rec'd		
						Mng.	Conc.	Sm.	Lbs. Cu. Prod.	p. Lb. p. Cts.	p. Lb. p. Cts.
1917									*20,941,000		
1916	152,059	5.88	254,213	3.89	271,367	\$6.48	\$1.14	\$2.79	40,776,611	11.69	26.81
1915	115,459	6.56	173,046	4.34	206,549	\$5.51	1.21	2.75	27,736,158	8.90	18.61
1914	129,813	7.44	151,893	4.67	207,595	5.20	0.93	2.67	30,210,361	8.22	13.71
1913	169,961	5.88	150,203	3.70	300,926	4.78	0.88	2.63	30,572,863	9.70	15.21
1912	201,181	4.67	166,870	3.77	306,086	4.55	0.75	2.30	27,353,243	10.34	16.42
1911	174,246	5.84	140,230	3.99	231,603	4.18	1.01	2.57	26,482,019	9.15	12.39

* First half of year.

Production in 1916, included 1,240 oz. gold and 60,688 oz. silver. Cost of converting per ton of fine copper produced in bullion, 1916, was \$7.59 compared with \$5.36 in 1915.

Monthly production compares as follows (in lbs.):

	1917	1916	1915	1914	1913
January.....	3,000,000	3,121,000	1,745,000	2,797,000	2,727,000
February.....	2,695,000	2,823,000	2,074,000	3,066,000	2,381,000
March.....	3,335,000	3,277,000	603,000	2,997,000	2,953,000
April.....	3,516,000	3,290,000	1,338,000	2,779,000	3,040,000
May.....	4,430,000	3,405,000	2,868,000	3,303,000	2,749,000
June.....	3,965,000	3,843,000	2,744,000	2,937,000	2,511,000
July.....		3,852,000	3,199,000	2,962,000	2,526,000
August.....		3,600,000	2,843,000	2,236,000	2,524,000
September.....		3,011,000	2,538,000	2,121,000	2,679,000
October.....		3,200,000	2,970,000	1,616,000	2,037,000
November.....		3,650,000	2,443,000	1,924,000	2,170,000
December.....		3,270,000	2,495,000	1,700,000	2,613,000

Mine was closed down from July to September, 1917, owing to labor strikes.

Ore reserves in the Old Dominion property are sufficient for at least 2 years production at the normal rate. It is not advisable to have reserves for a longer period than this as it is too expensive to keep the ground open. Ore has been found continuously and consecutively on all levels down to the 18th, 1,400' level, and company has found no difficulty in opening ore as required. Indications are that production will increase in the future rather than decrease. Management is exceptionally capable and efficient.

United Globe Mines

Office: 99 John St., New York. **Mine office:** Globe, Gila Co., Ariz.
Officers: Jas. Douglas, pres.; A. C. James, v. p.; Geo. Notman, sec.-

treas., with C. H. Dodge, Jas. McLean, Wm. Church Osborn and E. Haywood Ferry, directors.

Cap., \$2,300,000, shares \$100 par. Is controlled through ownership of entire stock issue, by the Old Dominion Co.

Income account for 1916 was \$3,291,862 from sales of ore and lime rock, with expenses of \$1,238,785, giving net income of \$2,053,077, and a total surplus of \$479,933, Dec. 31, 1916.

Dividends: \$6.50 in 1905; \$6 in 1906; \$4 in 1907; \$20 in 1912; \$30 in 1913; \$18.50 in 1914; \$27 in 1915; \$73 in 1916; a grand total to 1917 of \$4,255,000.

Property: 60 claims and 4 mill sites, lying W. of the Old Dominion group, including the Grey, Buckeye and Buffalo mines.

Development: is by several shafts and through the workings of the Old Dominion, of which this mine is practically a part, carrying the main vein of the Old Dominion in which the greater part of the development work is centered. The Kingdon and Grey are the operating shafts. In 1916 operations were confined to ore extraction, exploration and development work on the Old Dominion, Grey and Big Johnnie veins.

Good productive ground is opened on the 800', 1,000', 1,200', 1,400' and 1,600' levels in the Old Dominion vein. The orebodies are extensive, but erratic, and the ores are decidedly silicious, but are in good demand at the smelting works of the southwest for converter charging. Practically all of the ore is treated in the Old Dominion smelter. An enormous tonnage of concentrating ore, of 3 to 4% copper, has been developed, as well as large quantities of high-grade smelting ore up to 10% in copper tenor. An underground haulage line has been installed on the 14th level E. drift from "A" shaft of the Old Dominion mine.

The Kingdon shaft is being sunk from the 18th to 20th level. This will permit the shaft to be used for hoisting and ventilating purposes down to the present lowest operating level of the mine, and will greatly facilitate mining operations on the east side. It is planned during the coming year to add at the Kingdon shaft an adequate hoisting plant, together with necessary surface and underground equipment to allow of the entire Old Dominion and United Globe tonnage being hoisted at this point in case of a shutdown at the "A" shaft.

Total development work, 1916, 18,704'.

Production:

Year	Copper Lbs.	Silver Oz.	Gold Oz.	Year	Copper Lbs.	Silver Oz.	Gold Oz.
1906.....	4,607,537	5,277		1912.....	12,252,073	124,361	789
1907.....	3,399,084	12,382		1913.....	11,348,100	119,587	1,536
1908.....	2,599,155	29,308	17	1914.....	11,086,674	91,582	1,580
1909.....	3,674,728	43,486	33	1915.....	11,536,021	105,109	1,508
	(See Old Dominion Co.)			1916.....	14,852,399	123,066	1,543

206,163 tons of ore produced was shipped to the Old Dominion Copper M. and S. Co. The costs at Globe for mining, pumping, development and other expenses at the mine were \$1,211,140, or about \$5.08 per ton of ore.

In 1916, 15,379 tons of oxide ore and 187,280 tons concentrating ore were smelted.

OLD DOMINION EXTENSION COPPER CO.

ARIZONA

Office: Globe, Ariz. Walter Harris, Maud Meeth and E. S. Davis, incorporators.

Inc. Apr., 1917, in Ariz. Cap., \$10,000,000; shares \$5 par. Company formed to acquire mines, ore and do a general mining business.

OLD DOMINION EXTENSION MNG. DEV. CO.**ARIZONA****Office:** Globe, Ariz.**Officers:** J. F. Chisholm, pres.; R. G. Thomas, v. p.; L. M. Greenstein, sec.-treas.; all of Miami, Ariz.; above with W. P. Geary, F. Gill and A. R. Malone, directors.**Inc.** 1916 in Ariz. **Cap.**, \$5,000,000; shares \$5 par; 474,000 in treasury. 226,000 shares given for property are in escrow for an unstated length of time.**Property:** 600 acres, adjoining and dovetailed into Old Dominion C. Co. ground, at Globe, Gila Co., Ariz. Diamond drilling started, July, 1917, to cut the Sea-Bird vein at about 800' in depth.**Development:** by tunnels and several shafts, one 125' deep, sunk in quartzite and entering limestone. A 200' drift along the quartzite limestone displacement is reported to show several pockets of ore and an average sample of the black oxide of manganese found shows 13 oz. silver.

Is a prospect.

PORPHYRY COPPER CO.**ARIZONA**

Controlled by Barney Copper Co. through ownership of 754,422 shares out of 1,500,000.

Address: P. O. Box 1419, Globe, Ariz.**Officers:** J. D. Coplen, pres.; J. B. Coplen, v. p.; W. J. Miller, sec.-treas.; above with W. H. Woodson and W. A. Neiswanger, directors.**Inc.** 1916 in Ariz. **Cap.**, \$1,500,000; shares \$1 par; 1,078,624 issued. Security Transfer & Registrar Co., transfer office.**Property:** 5 claims and 5 fractions, patented, 114 acres, in the Miami district, bought from the Barney Copper Co. and paid for in stock.

Developed by 496' shaft said to pass through 60' of carbonate ore and into chalcocite ore. Work stopped, Sept., 1917, by miners' strike.

Equipment: includes 50 h. p. hoist, and compressor.**POWERS GULCH DEVELOPMENT CO.****ARIZONA**

John Matson, supt.

Property: 23 claims in Powers gulch near Globe, Gila Co., is said to show a vein carrying bornite and chalcopyrite ore associated with pyrite. Mine idle for a long time, was reopened in 1915 and a strike of tungsten ore reported in April, 1916.**Development:** by 2 shallow shafts and 2 short tunnels.**SOMBRERO DEVELOPMENT CO.****ARIZONA****Office:** Houghton National Bank Bldg., Houghton, Mich. **Mine office:** Globe, Gila Co., Ariz. Dr. Lucius L. Hubbard, gen. mgr. Company is a syndicate, not incorporated.**Property:** on Cherry creek, west of Sombrero Butte, and about 50 miles north of Globe, is slightly prospected by adits. The mine has a small water-driven plant. Inactive.**SOUTHWESTERN LEASING & DEVELOPMENT CO.****ARIZONA**

Has a lease on a part of the property of the Warrior Copper Co., which see.

SOUTHWESTERN MIAMI DEVELOPMENT CO.**ARIZONA****Office:** 85 Devonshire St., Boston, Mass. **Mine office:** Globe, Ariz.**Officers:** Geo. F. Ruez, pres.; L. A. Thulin, sec.; W. S. Rooney, treas., with R. H. Gross, T. S. Dee, D. T. Kennedy, J. H. Blodgett and A. H. Moir, directors; F. W. Hoar, gen. mgr.**Inc.** June 24, 1911, in Arizona. **Cap.**, \$500,000, increased Feb., 1912, from \$250,000; shares \$5 par; issued 15,000 fully paid shares and 85,000 assessable shares; \$2.25 paid in. Last assessment was 25c, payable Jan. 12, 1914. The first annual report as of date Dec. 31, 1912, gave receipts since organi-

zation as \$276,084 and disbursements as \$197,162 of which \$65,944 was payments on options, leaving a balance of \$78,922. Shares are listed on the Boston curb. Boston Safe Deposit & Trust Co., registrar.

Property: 17 claims, 4 patented, adjoining the Inspiration Consolidated holdings, in the Miami district, 8 miles west of Globe, shows silicified schist, mineralized at and near the contact with granite-porphry, the orebody being an extension of the porphyry deposit opened in the Inspiration and Miami properties. Ore occurs as chalcocite disseminated in schist.

Development: by churn drilling, along the same lines followed by its big neighbors, Miami and Inspiration. Eighteen holes have been drilled, averaging about 1,200' deep and the total footage amounting to about 20,000. Ore developed in this manner was estimated by Mr. Hoar, July, 1914, at about 981,000 tons of 1.5% copper, on which a recovery of about 65% is expected and probable total ore reserves of 4,294,000 tons of 1.2% ore. Development work to prove the extension of the orebody consisted of 7,940' in holes 10 and 18 in 1913. Mr. Hoar also estimates mining costs at \$1.15, milling costs at 65c per ton, and cost of smelting, etc., at about 3c per lb.

Idle. No recent information available.

SUPERIOR & BOSTON COPPER CO.

ARIZONA

Office: Houghton, Mich. **Mine office:** Globe, Gila Co., Ariz.

Officers: Wm. G. Rice, pres.; John H. Rice, v. p.; John R. Pimlott, sec.-treas.; preceding, with Jas. W. Harrington and Geo. Kingdon, directors; A. L. Graham, supt.

Inc. Nov. 23, 1906, in Arizona. **Cap.**, \$6,500,000; was originally \$1,500,000, increased Sept. 5, 1908, to \$2,000,000; April 22, 1909, to \$2,500,000; July 25, 1911, to \$3,000,000; Sept. 30, 1911, to present amount; shares \$10 par; \$7 paid in; issued, 283,827. Company has levied 7 assessments, last one of \$1 Feb. 7, 1916. Listed on Boston Stock Exchange. State Street Trust Co., Boston, registrar; Boston Safe Deposit & Trust Co., transfer agent. Annual meeting first Monday in December.

Comparative Financial Statement: fiscal year ending Sept. 30—

	Ore Sales	Calls & Sundries	Balance Oct. 1 Prev.	Total	Total Expnd.	Balance Oct. 1
1917. . . .	\$340,198	\$42,344	\$176,107	\$559,649	\$418,071	\$141,577
1916. . . .	40,501(a)	243,030	29,529	313,060	136,953	176,107
1915. . . .	54,530(b)	19,108	59,285	132,923	103,394	29,527
1914. . . .	291,515	1,720	75,268	363,503	309,218	59,285
1913. . . .	153,436	268,503	81,382	503,321	423,052	75,269

(a) Lessees produced \$167,121 additional. (b) Lessees produced \$42,164 additional.

Property: 51 claims, 785 acres, 28 claims, 388 acres, patented. The Globe & Arizona tract of 22 claims was bought for \$320,000, an adjoining group of 21 claims was bought for \$46,000, and the Collins-Doyle group of 5 claims was bought for \$150,416.35, giving a total cost of \$516,416.35 for lands. The Collins-Doyle group, added 1909, adjoins the former holdings on the north, carrying the extension of the Old Dominion fault, and being well located with respect to the Great Eastern vein. The property is a compact tract next east of the Arizona Commercial, and east of the Old Dominion. Lands are about 4,200' above sea level, and about 800' above Pinal creek, at Globe. The property carries both limestone and iron ore for fluxes. It is reached by the Arizona Commercial and Arizona Eastern railways, both connecting with the main line at Globe.

In 1917 the Telfair group of 12 claims, 200 acres, adjoining the Superior & Boston, was acquired for \$7,000 cash and 14,000 shares. The ground is valuable, as it is considered to have the extension of the Old Dominion vein. W. X. Osborn, cons. engr., advised this purchase.

Geology: the property shows diabase cutting through about 600' of quartzite with interbedded shale and Globe limestone. Copper ore occurs in veins filling fault fissures. There are 2 dominant fault-belts, one series including from north to south, the Old Dominion, Great Eastern or Black Hawk, Limestone, Quo Vadis, Black Oxide and Iron King fault veins, intersected at nearly right angles, by other faults of later age, apparently but slightly mineralized. Three of the veins named show ore in commercial quantities. Later development may show the Quo Vadis to be the faulted continuation of the Great Eastern; there is a possibility that both are merely the eastern extension of the Old Dominion vein. The average strike of the faults is N. 70° E., with average dip of 60° N. The oxidized zone is deep, ore opened on the 8th level including cuprite, native copper, as well as chalcocite. Malachite is found in the workings above.

Development: by 4 shafts, the McGaw, Great Eastern, Limestone and Gardner, and 1 tunnel. Underground workings total about 33,000'. New work during year ending Sept. 30, 1917, amounted to 2,782'. The Great Eastern 444' vertical shaft being poorly located, was replaced by the McGaw shaft, to the north.

The McGaw shaft is 1,400' deep, with 3 compartments. The 10th level opened at 970' corresponds with the 10th level of the Arizona Commercial mine, next west. This shaft lies 900' north of the old shaft and is sunk between the Old Dominion fault on the north and the Great Eastern vein on the south, and is planned to intersect the Great Eastern vein at depth. This is the main working shaft of the mine and does the ore hoisting for the entire property.

One of the main hindrances to mining in the past has been water, also the largest item of expense.

The Great Eastern vein on the 6th level in the McGaw shaft, showed an ore shoot 25' to 30' wide, proven for a distance of over 800'. The 8th level exposed this vein for over 400' and also showed the zone of oxidation to continue to this depth. The 10th level discloses the first sulphide ore encountered in the McGaw workings of the mine, but the 12th level shows little or no copper in this vein, as far as developed. The vein matter is heavily stained with iron, highly silicious and, when commercial, carries about 7% copper.

The Old Dominion vein is tapped by crosscuts from the McGaw shaft, on the 4th, 6th and 10th levels, where it shows only oxidized material, quite thoroughly leached, carrying slight silver values, but with promise of copper ore at greater depth.

The 318' Limestone shaft showed a 4' footwall paystreak of commercial ore on the 300' level; has not been operated for several years.

The Gardner 3-compartment vertical shaft at the southern end of the property, on the Black Oxide vein, is 435' deep; mine is now idle. The Black Oxide vein apparently is a continuation of the Buckeye fault, on which the Old Dominion has opened mines on the Buckeye, Carrie and True Blue claims.

The 1,054' Black Oxide tunnel has its portal about 1,000' S. W. of the Limestone shaft, and cut the Black Oxide vein at 670', giving a 400' back, drifts on this level showing a vein carrying micaceous hematite, with small quantities of copper, and a little shoot of smelting ore. Indications are favorable to the existence of good bodies of high-grade sulphide ore at

greater depth. The Black Oxide is 280' east of the True Blue mine of the Old Dominion, from which lessees shipped small quantities of high-grade ore for several years.

The Iron King vein, parallel with the other 4 faults of the property, shows a good gossan, and has an old 70' shaft, in leached vein material similar to that in the other faults, at similar depth.

In 1916 nearly all the work was done on the 800' level, and most of the ore came from 70' above this level.

By April, 1917, the McGaw shaft was down 1,400', and crosscutting N. for the Great Eastern vein was started; the vein was cut and found to be wide and promising. Further work is in progress. The mine was in shape to produce 2,500 to 3,000 tons of 5% ore per month. There is considerable ground yet to be explored. Some copper glance was cut on the 1,000' level in June, 1917.

Equipment: includes hoists at each shaft, aggregating 1,260 h. p. The main plant, at the McGaw shaft, has four 250 h. p. Stirling water tube boilers, a 5-ton hoist good for 1,600', and a 1,200 cu. ft. Nordberg cross-compound air compressor, with an auxiliary compressor at another shaft. The mine has three 1,000-gal. Prescott pumps.

The company owns 38 buildings, including machine shop, smithy, carpenter shop, office and warehouse, with a number of dwellings for employees. The shops are well equipped and the smithy has a Wood drill sharpener. The changing house at the McGaw shaft has steam-heated lockers, shower baths and drying racks. Buildings are lighted by electricity. Fuel is mainly petroleum, with 5,000-gal. and 12,000-gal. storage tanks.

Production: was begun Feb., 1908, and to end of 1910 amounted to 27,126 tons ore, yielding 3,846,402 lbs. copper and 94,698 oz. silver, all from the Great Eastern vein above the 6th level with the exception of about 681 tons extracted by lessees from the Black Oxide workings. Known ore reserves being exhausted, production was suspended Aug., 1910, to March, 1913, when shipments were again resumed, curtailed in 1914 and resumed March 15, 1915.

Output in the year ended Sept. 30, 1917, was 17,146 tons of ore valued at \$340,198.

The management hopes to open up reserves of sulphide ore, which, if done, should make the company a steady and profitable producer.

SUPERIOR & GLOBE COPPER CO.

ARIZONA

Idle for several years. **Office:** 3 Calumet State Bank, Calumet, Mich.

Officers: John Daniell, pres.; Fred Smith, v. p.; Chas. Chynoweth, sec.; Joseph W. Selden, treas., and Hon. Norman W. Haire, directors.

Inc. Dec., 1908, in Arizona. Cap., \$3,000,000; shares \$10 par; issued, \$2,450,000, in 15,000 shares of full paid stock and 230,000 shares of stock \$1 paid. Property is fully paid for; lands were bought for \$75,000 cash and 15,000 shares of full paid stock. First National Bank, Calumet, registrar. Annual meeting, third Monday in November.

Property: 13 claims, 250 acres, include the Magnet group of 12 claims, adjoining the Mineral Farm group of the Globe Mining Co., and 1 fractional claim, of several acres. The property, 2 miles N. E. of Globe, is in the eastern portion of the Globe district, lying N. of the Arizona & Michigan and N. E. of and adjoining the Globe Mining Co. and the Yuma mine of the Old Dominion, latter carrying the Yuma-Big Johnnie-O'Dougherty fault. The outcrop of the Yuma fault, on the Superior & Globe lands, shows an iron gossan carrying copper stains for about 3,000'.

Development: by several old shafts of 50 to 60' depth, said to have been sunk for gold ore. Present owner has sunk a 680' vertical shaft in the

hanging of the Yuma fault, on Copper Trust No. 2 claim, about $\frac{3}{4}$ mile from the Superior and Boston mine. The shaft cuts a 5' vein carrying iron with copper stains and has about 1,100' of workings on the 650' level, the N. crosscut 522' long showing 2 veins. The Yuma vein, cut at 235' from the shaft, has 320' of drifting, with an 85' winze and a 17' crosscut to the vein from the bottom of the winze. The vein shows merely iron and manganese, with copper stains and small silver contents. In the N. crosscut, 487' from the shaft, a second vein was cut showing a width of 20' and a 38' drift thereon showed material similar to that in the other vein, neither carrying commercial values. The S. crosscut on the 650' level was driven 233' in hard diabase, developing nothing of value.

Diamond drilling was begun in June, 1910, a 350' horizontal and a 957' vertical hole being bored from the bottom of the shaft. This work was continued until early 1912, but developed nothing of importance.

Equipment: includes a 100 h. p. gasoline plant having a 60 h. p. Fairbanks-Morse hoist good for 1,000' and a 3-drill gasoline air compressor. There are 5 buildings, including carpenter shop, engine house, office and dwelling.

UNITED GLOBE MINES

ARIZONA

Controlled by Old Dominion Co., and described thereunder.

VAN DYKE COPPER CO.

ARIZONA

Address: Hoval A. Smith, mgr., Miami, Ariz.

Officers: C. W. Van Dyke, pres., with H. A. Smith, W. E. Loomis, L. D. Van Dyke and C. B. Loomis, all of Miami, directors.

Inc. Aug., 1916, in Arizona. Cap., \$5,000,000; shares 50c par.

Development: drilling was started early in 1917, and 11% ore was reported between 1,100' and 1,200' in April. In September, 47' of 7% ore was reported in No. 1 hole, No. 2 hole, $\frac{1}{2}$ mile from No. 1, was down 700' late in September.

WARRIOR COPPER CO.

ARIZONA

Office: Brown Bldg., Philadelphia, Pa. **Mine office:** Black Warrior, Gila Co., Ariz.

Officers: Spencer D. Wright, pres.; Geo. H. Buchanan, v. p.; D. H. Paris, sec.; H. S. Hopper, treas., with Ernest L. Tushin, Philip Godley, W. W. Doughten, T. A. Blythe, C. Gallagher, G. B. Walker and Thos. D. Martindale, directors.

Inc. March 10, 1905, in Delaware, as successor of Black Warrior Copper Co., Amalgamated, which came to grief. Cap., \$1,600,000; shares \$10 par; in \$750,000 cumulative 7% preferred stock and \$850,000 common stock.

Bonds: \$100,000, issued \$41,000, at 6%, with interest paid.

Property: 50 claims, 46 patented, about 800 acres, including the Black Warrior group and the Lost Gulch group, near the Inspiration mine. The principal property is the Black Warrior mine, a producer since 1904, located about 7 miles N. W. of Globe.

Geology: the Black Warrior property shows slightly altered schist, dacite tuff, diabase, and conglomerate, the greater part of the area being covered by schist, which is the oldest formation. The diabase occurs as intrusive dikes, and the dacite is a surface flow over both schist and diabase. The Black Warrior vein is a fault zone 30 to 60' wide, filled with crushed mineralized dacite for about 300', with a breccia of schist and some diabase below. The vein has a generally E.-W. trend, and W. pitch. The ore averages about 50 to 60' in width, though a width of 100' is shown at a number of points. This property includes the Montgomery group, with the Montgomery and Dadeville claims, developed by tunnels of about 1,000' and 1,200' length, developing extensive bodies of copper silicates and hydrated copper oxides of excellent average value.

The Lost Gulch claims show a highly altered monzonite-porphry covering the larger part of the area, with extensive outcrops of dacite and limestone and smaller ones of diabase, general geological conditions being much the same as at the Black Warrior.

Development: the Black Warrior mine is developed by the Winnie shaft, 500' from the western boundary, and tunnels of about 1,000' and 1,200' length, opening the mine to a depth of 300', with 5 levels spaced at 50' intervals. The mine has yielded a large tonnage of high-grade ore, giving assays of 6 to 25% copper, between the 200' and 300' levels. Considerable churn drilling was done, 1910-11, 1 hole in the vicinity of the Winnie shaft being sunk 506' in schist, showing mineralization, and a 580' drill hole proved the existence of chalcopyrite, disseminated in schist, though not of commercial value. The western portion of the property was tested without favorable results by churn drill, May, 1911.

Equipment: includes a steam plant, burning petroleum. Buildings include an assay office, engineering office, smithy, carpenter shop, several dwellings, and a 300-ton shipping bin.

A portion of the property has been leased to Messrs. Fisk and Snell, who are operating the plant under the name of the Southwestern Leasing & Development Co., and shipping about 100 tons of 6% ore daily. Production is mainly from the 200' and 300' levels.

The old mill and mill site at Warrior P. O., about 1½ miles E. of the mine, was sold, 1912, to the Inspiration Consolidated Copper Co.

MORENCI, CLIFTON, GREENLEE COUNTY

AMERICAN CELTIC COPPER CO. ARIZONA
Inc. 1912. Cap., \$3,000,000; shares \$5 par; issued \$2,000,000. Is a successor of the Arizona-Morenci Copper Co. and owns all its property.

Property: 98 claims, 2,000 acres, in 9 groups in Clifton-Morenci district, Greenlee Co., Ariz. Mines are adjacent to and surrounded by the Phelps-Dodge, Arizona Copper and Shannon properties. Mill and town sites are on the San Francisco river and the Morenci Southern railway crosses the ground.

ARIZONA-CELTIC COPPER CO. ARIZONA
Office: 504 I. W. Hellman Bldg., Los Angeles, Cal. **Mine office:** Clifton, Greenlee Co., Ariz.

Officers: B. F. Taylor, pres.; D. M. Lynch, v. p.; A. G. Shaw, sec-treas.; preceding officers, R. T. O'Donnell, Archibald Morrison and G. M. Chartier, directors.

Inc. Feb. 20, 1912, in Ariz. Cap., \$3,000,000; shares \$5 par; issued 400,000.

Property: 37 claims, 768 acres, and a 1,040-acre mill and smelter site, in the Greenlee Gold Mountain district, showing 3 orebodies, 1 vein of 80' width, said to average 3% copper. Property which was formerly owned by the Arizona Morenci Copper Co., is only slightly developed. Presumably idle.

ARIZONA CONSOLIDATED COPPER MINES, LTD. ARIZONA
Letters unclaimed by H. S. Blake, Throgmorton House, Copthall Ave., London, E. C., Eng. **Mine office:** Clifton, Graham Co., Ariz. Hon. H. A. Stanhope and Jas. H. Hosking, directors.

Inc. June 17, 1899, in Great Britain. Cap., £150,000; shares £1 par; issued £135,007 paid for property and £10,000 cash working capital. Last balance sheet Dec. 31, 1915, showed cash £121; loans at call, £5,930; expenditures, £4,919; liabilities, £963.

Property: in the Copper Mountain district, bought, 1909, from Con-

tinental Finance Syndicate, Ltd., for £135,000 in full-paid stock, is said by company to be the Scioto, Lowland and Chillicothe mines. The claims are said to show a vein that is 2½ to 8' and in places 30' wide, proven for 3,500'.

Development: by 3 adits; No. 1 in ore for 55'; No. 2, 110'; No. 3, 100'. Property includes a mill site, on the San Francisco river. Claims to own six copper mines, 120 acres adjacent to properties of the Arizona Copper Co. and of the Detroit Copper Co., near Morenci, Ariz. Operations reported to have been resumed, April, 1917.

ARIZONA COPPER CO., LTD. (THE)

ARIZONA

Head office: 29 St. Andrew Square, Edinburgh, Scotland. **Board of Directors:** Hon. Lord Salvesson (chairman), G. Readman, W. H. Carter, Young J. Pentland, Alex. McNab, J. L. MacLeod and Sir David Paulin; Sec., William Exley Miller. Mine and works office: Clifton, Greenlee, Ariz. Norman Carmichael, gen. mgr.; P. B. Scotland, supt. of mines; J. G. Cooper, cashier and purch. agent.

Inc. August 5, 1884, in Great Britain. (For early financial details see Copper Handbook, Vol. XI, 1914, p. 72.)

Cap., authorized, £755,000; issued £703,984 10s as follows: 160,000 "A" preference shares of 5s each, all uncalled but £7,480 10s paid in advance of calls; £316,530 preference stock; £379,974 ordinary shares (1,519,896 shares of 5s each fully paid). Profits are divided thus: 10% cumulative dividends on "A" preference less 5% interest on amount uncalled and unpaid; 7% cumulative dividends on preference stock; balance to ordinary shares.

Funded Debt: 5% terminable debentures. Amount authorized and fully subscribed £500,000, repayable at 103 May 15, 1922, or at any time after May 15, 1915. On September 30, 1914, £400,000 of these debentures had been issued. Five per cent terminal debentures outstanding, Sept. 30, 1916, £287,825. Fiscal year ends on September 30. Dividends on ordinary shares for recent years have been as follows: 2s 6d in 1908, 1909, 1910 and 1911; 3s 3d in 1912; 2s 9d in 1913; 1s 9d in 1914; 2s 3d in 1915; 4s in 1916. Balance carried forward September 30, 1916, £443,490.

Property: company owns about 4,000 acres in the mineral belt of Clifton-Morenci district. Principal producing mines: Humboldt, Clay, Longfellow, Coronado, King, Metcalf and Boulder, others in reserve or process of development. Produces about 4,500 tons of concentrating ore and about 175 tons of direct smelting ore daily. Concentrating ore is chalcocite, disseminated in porphyry, carrying about 2.45% copper. Top-slicing is principal mining method used. Metcalf mining division supplies concentrator at Clifton. Morenci and Coronado divisions supply concentrator at Morenci. All mines connected by electric haulage to main hoisting shaft at concentrator, except Metcalf, which is connected by 36" gauge steam road (Coronado R.R.) to Clifton.

Electric haulage operated by 21 6-ton Jeffery locomotives, used singly, and two-unit and three-unit. Coronado-Morenci ore train consists of 36 10-ton cars hauled by three-unit locomotive over track of 20" gauge of 50 lb. rails.

Longfellow Mining Division: principal mines, Humboldt, Clay and Longfellow. Orebodies disseminated chalcocite in porphyry dikes and faulted or brecciated areas. Mining conducted principally through adits at present. There are 8 working levels and 2 shafts. Commercial ore proven to depth of 900' below surface. Concentrates transported by gravity incline 2,515' long to Coronado R.R., thence 6.1 miles to smelter, 2.2 miles below Clifton.

Metcalf Mining Division: principal mines, King and Metcalf. Other smaller producers. King mine produces disseminated chalcocite ore from faulted areas in porphyry and granite. Metcalf mine yields oxide ore from deposits in limestone and shale and small porphyry dikes. Ores transported by gravity inclines to bins on Coronado R.R. Outlying mines served by cable tramways. Ores mined by open-pit and shrinkage underground methods.

Coronado Mining Division: principal mines, Coronado and Horseshoe. Pyramid mine in development stage. Orebodies disseminated chalcocite and surface oxide ore in porphyry dike filling fault fissure in granite. Developed by 5 shafts (deepest 1,100') and nine levels, adit level 9,400' long, 1,100' below surface, and is part of electric haulage system to concentrator at Morenci. The Coronado shaft was gutted by fire, Aug., 1917, but has been retimbered.

The reduction works now consist of two concentrating plants, No. 4 mill at Clifton, with 500 tons daily capacity; and No. 6 mill at Morenci, with 4,000 tons daily capacity. A 400-ton experimental mill for the treatment of low-grade ores is also in course of erection at Morenci. Both concentrating plants have been equipped with the Callow system of pneumatic flotation, with the necessary thickener and Oliver filter equipment for handling the flotation concentrate. An addition of 8 Dorr pulp thickeners has been made to the water-reclaiming equipment at the No. 6 plant.

The mills are equipped with steel liners, and use steel balls as a grinding medium.

Improvements under way include the installation of Allen cones for de-watering and re-grinding mill feed, and an installation of 12 Dorr classifiers.

The new smelting plant, started up early in 1914, is situated 2 miles below Clifton, on the east bank of the San Francisco River. This plant is entirely of steel, brick and concrete, and consists of a receiving bin system with a capacity of 1,000 tons of ore and 1,500 tons of concentrates, a crushing, grinding and sampling plant, and a bedding plant with a storage capacity of 20,000 tons for mixing and storing the ores and concentrates, supplementary bunker bins being provided for the fettling ores, converter ores and fluxes.

The mixed charge is fed to the roasting plant, consisting of eight 7-hearth Herreshoff air-cooled roasters, equipped for firing with coal if needed. The roaster gases pass through a large dust chamber to a central stack, and the roaster charge and dust to the reverberatory plant, consisting of 3 oil-fired furnaces 22x100' (2 operating). The waste gases from this plant pass through a set of six 712 h. p. Sterling boilers, which, with 5 oil-fired boilers, supply the steam necessary to operate the power plant. The matte is tapped into ladles handled by 40-ton cranes for treatment in the converter plant, which consists of 4 stands with 5 shells of the Great Falls type converter, 12' in diameter. The bullion produced is cast in pigs for shipment on two straight-line casting machines. Both the reverberatories and the converters are provided with suitable dust chambers, the gases ultimately discharging into a common stack. The plant is served by both standard and narrow gauge railroad, in addition to electrified industrial tracks, and is equipped throughout with belt conveyors for the transportation of material.

The power plant is housed in a brick-steel concrete structure, and consists of 3 General Electric turbines of 2,000 k. w., three 10,000 cu. ft. Nordberg blowing engines for converter air, and an Ingersoll-Rand compressor for high-pressure air; the auxiliary pumps, motors, generators, transformers, condensers, cooling towers, spray ponds, etc., necessary for operations. The plant supplies all power needed at the smelter and also, through a 13,200-volt transmission line 10 miles long, the power needed for the town of Clifton, the concentrators and mines.

Well-equipped machine, blacksmith, boiler, tin, carpenter and electrical shops are maintained, as well as a large warehouse and brick shed.

Development work in 1916, amounting to 16,255', included proving marginal or disseminated ore, 20' wide, 200' below previous lowest workings.

At the Clay mine further development work opened up a large but very low-grade orebody, not yet being mined. The Pyramid mine has had 2,000' of new work on the 6th level, and the 1,100' or Coronado adit level. In the

Coronado vein, the oreshoot is bottomed between the 7th and 11th levels, but ore reserves have been maintained by additional ore developed east of the Matilda shaft.

The Horseshoe orebody is now an important producer, and will be connected with the main haulage, or 1,100' level, in 1917. In the King mine, a shoot of 8-10% ore, 10' thick and 200' long, was found in the pyritic vein on the 3rd level.

Miscellaneous enterprises operated by the company include foundry, machine shop, saw-mill, a 30-ton ice plant and town lighting plant. The company also has general merchandise stores at Clifton, Morenci and Metcalf.

Production: for fiscal years ending September 30: 1907, 27,404,349 lbs.; 1908, 33,980,291 lbs.; 1909, 32,017,487 lbs.; 1910, 32,161,205 lbs.; 1911, 34,569,019 lbs.; 1912, 38,150,000 lbs.; 1913, 34,230,000 lbs.; 1914, 38,942,455 lbs.; 1915, 37,416,010 lbs.; 1916, 34,100,000 lbs. (operations suspended by strike five months).

ARIZONA-MAYFLOWER COPPER CO.

ARIZONA

Office: Duncan, Ariz.

Officers: Jas. E. Hay, pres.; John W. Norgrove, sec.; W. B. Duval, treas.-mgr. Steve D. Corle, supt.

Inc. 1916, in Mass. **Cap.**, \$1,000,000; shares \$1 par.

Property: 17 claims, 340 acres; 13 claims are located in the Mayflower district, Greenlee County, Arizona, and 4 claims in Steeple Rock district, Grant County, New Mexico. Ore occurs as sulphides and oxides in fissure veins, with dacite foot and limestone hanging wall, reported to average 4 oz. silver, 4.3% copper and 7 oz. silver, 14% copper. Developed to depth of 100', and equipped with compressor, drills, gasoline engine and hoist.

ASH PEAK EXTENSION MINING CO.

ARIZONA

Address: Geo. Powell, mgr.

Inc. 1917, in Arizona.

Property: 14 claims, unpatented, in the Clifton district, said to show good gold-silver values at surface. Plans development and installation of necessary machinery, 1917-18.

CHASE CREEK COPPER CO.

ARIZONA

No returns secured, 1917.

Mine office: Clifton, Greenlee Co., Ariz.

Officers: Clarence K. McCornick, pres.; H. G. Smith, treas.; S. S. Campbell, mgr.; Isaac N. Stevens, supt.

Cap., \$5,000,000.

Property: 52 claims, 1,040 acres, 8 miles west of Clifton, having a 2,300' tunnel, 6x8', on lands adjoining the Longfellow mine, cutting the Longfellow orebody, of concentrating grade, at a distance of 493', having a back of about 900', showing low-grade sulphide copper ore. Tunnel practically reaches the Coronado Railroad, permitting advantageous shipments. Was making small shipments to the Shannon smelter in 1914.

CORONADO MINING CO.

ARIZONA

Idle. Clifton, Graham Co., Ariz.

Inc. July 12, 1902, in Maine. **Cap.**, \$1,000,000; shares \$1 par. Is controlled through ownership of a stock interest of about 53%, by the Shannon Copper Co., the remainder of the stock is held principally by Phelps Dodge Corp. Officers and management are the same as those of the Shannon Copper Co.

Property: 30 claims, 400 acres, patented, near Metcalf, adjoins the mines of the Detroit Copper Mining Co. and the Coronado mine of the Arizona Copper Co., Ltd. Mine has a 2-compartment shaft, on the Garnet claim, showing some ore on the 200' level; also several shallow shafts and short tunnels.

CUPRITE COPPER CO.**ARIZONA**

Inactive. Mine near Clifton, Graham Co., Ariz.

Officers: N. W. Lord, pres.; Isaac N. Stevens, v. p. and mgr.; L. B. Kauffman, sec.; Geo. B. Kauffman, treas.; Frank A. Ray, engr.; preceding officers, and Frank B. Laine, directors.

Inc. March, 1904, in Arizona. **Cap.**, \$1,000,000; shares \$1 par.

Lands: 26 claims, 490 acres, in the Copper Mountain district, opened by shafts of 30' and 320' and tunnels of 150' and 260'. The leached zone carries isolated pockets of rich ore. Company also owns about 2,000 linear feet of strong hematitic outcrops, ranging 5 to 100' in width. Property considered promising, but company inactive, awaiting developments on adjacent properties.

DETROIT COPPER MINING CO. OF ARIZONA **ARIZONA**

Fully described under title of Phelps-Dodge Corporation.

EAGLE GOLD & COPPER MINING CO. **ARIZONA**

Address: care W. J. Riley, First National Bank, Clifton, Ariz. Mine near Morenci, Greenlee Co., Ariz.

Officers: Wm. M. McCoy, pres.-mgr.; E. V. Horton, J. R. Hampton, J. R. McRea, M. H. Kane and E. C. Bunker, all of Clifton, directors. H. A. Collins, gen. mgr.

Property: formerly known as the Gold Belt, 20 claims, 4 miles N. W. of Morenci, carries veins with copper, lead and gold ores, developed by a 40' shaft on 1½' vein of rich silver lead ore.

Equipment: includes 5-stamp gold mill.

After 5 years of idleness, property is reported active, June, 1917, and shipping two carloads of ore weekly to the Shannon smelter at Clifton.

HOME COPPER CO. **ARIZONA**

Morenci, Graham Co., Ariz.

Officers: H. J. Degener, pres.; W. A. Leonard, v. p.; W. P. Gee, sec.-treas.

Inc. April, 1901.

Property: 35 claims, 700 acres, in 2 groups, also a mill site on Eagle River. Promoters were unable to inspire confidence and could not raise enough money to prospect the property sufficiently to prove if it has merit. Not a "wild cat" but a mistake. See Vol. XI, Copper Handbook.

LESZYNSKY COPPER MINE **ARIZONA**

J. Leszynsky, owner, 32 Broadway, New York City. Mine address: Clifton, Ariz.

Property: 38 claims, 24 patented, in Morenci-Metcalf district, Greenlee Co., Ariz., showing a deposit of low-grade disseminated copper ore, said to average 2½%, with between 2 and 3 million tons developed by shafts and mine workings.

Production: during year June, 1916, to June, 1917, was 30,000 tons of 3½% copper ore. Plans 500-ton concentrator for 1918.

MORENCI BRANCH OF THE PHELPS DODGE CORPORATION

M. H. McLean, gen. mgr., Morenci, Ariz.

(For description of corporation and the Morenci holdings, see P. D. Corp'n under United States.)

The original company, organized by Captain E. B. Ward, of Detroit, a wealthy steamboat owner, who was later joined by William Church, of Denver, Colo., was called the Detroit Copper Mining Company of Arizona. After they had developed important bodies of copper ore and demonstrated that the properties were highly productive, the properties were purchased by the Phelps-Dodge interests in 1897, and consolidated with other Phelps-Dodge interests, the name was changed on April 1, 1917, to Phelps Dodge Corporation, Morenci Branch.

The history of these properties is of great interest. Originally the district was prospected by a party of 46 gold hunters from Silver City, N. M., along in 1870. Isaac N. Stevens, of Clifton, is one of the survivors of the party. They were after gold, but saw the big copper outcrops. No copper claims, however, were located until 1872, when some of these prospectors located the Arizona Central, Yankee and Montezuma mines, now the property of the Phelps-Dodge Corporation, Morenci Branch. Other locations were made in 1873 by the original prospectors. During those times the country was infested by marauding bands, several miners being killed on Gold Creek, in 1882, and an attack made on the outskirts of Morenci. In 1875 Captain Ward purchased the four claims named. In 1882 he and Church started a small smelter on the San Francisco River, six miles from Morenci, the nearest available water supply. Two years afterward the plant was moved up to the mines, to which water was pumped. The smelter was enlarged, and by 1885 its output of copper gained to 3,345,000 pounds, growing from that time to over five million pounds in 1894. In 1893, however, discovery had been made of low-grade ore of Copper Mountains, and it was largely this that made the property appear most favorable as an investment to the Phelps-Dodge interests, who purchased it in 1897. Since then the property under their administration has been one of the important copper producers of the Southwest. A railroad was built from Guthrie to Morenci, and a concentrating plant erected, and large sums expended by the company in modern office buildings, general merchandise store, and large hotel. Taking into consideration its production for 1882, the property of the Morenci Branch had a production to last year of 360,000,000 pounds copper, to which should be added several million more pounds since.

The annual output of the Morenci property is nineteen million pounds of copper. In its mines and reduction plants 1,500 men are employed.

The Company's Reduction Plant, Mill and Smelter

Run of mine ore is reduced by 3 Symons disc crushers to $\frac{1}{2}$ " size. The mill feed is reduced by rolls to pass a 4-mesh screen, and is then treated to a succession of wet concentrations as follows: The total mill feed passes through 4-mesh screen and is treated on Wilfley tables with Butchart national riffles, the tailings of which are deslimed with shovel wheels and Dorr drag classifiers. The fine product of this treatment is primary slime. The coarse product is reduced to one millimeter by means of Monadnock and Marathon mills. The product is then separated by Dorr classifiers into coarse sands, fine sands and slimes. The coarse sands are treated on Wilfley tables with the Butchart national riffle; the fine sands on Overstrom universal tables, and the slimes overflow, united with primary slimes mentioned above, is treated by flotation machine of the Rork type.

Flotation reject is cleaned up by a system of Frue sand vanners. The total mill concentrates are dried by vacuum tanks and shipped to the smelter. The tailings are dewatered in Dorr tanks and the clear water returned for further use.

The concentrates are delivered to the smelter, which consists of one 500-ton blast furnace. The matte is then delivered to three barrel-type converters. The product is sold as casting copper.

A marked feature of Phelps-Dodge policy is their constant search for new fields of mineral to be held in reserve. This is notable in the Morenci district. The company has spent large sums in such acquirements and the development of the same. At the same time, they employ the very latest methods of ore treatment and installing up-to-date machinery. By these methods the Morenci properties are now a very valuable part of the Phelps-Dodge mining family.

NEW ENGLAND & CLIFTON COPPER CO.**ARIZONA**

Sold to Phelps-Dodge interests. Described in Copper Handbook, Vol. XI.

NEW YORK-ARIZONA GOLD & COPPER CO.**ARIZONA**

Idle. Address: Morenci, Graham Co., Ariz.

Officers: A. L. York, pres.; J. F. Cleaveland, v. p.; C. E. Tyler, sec.-treas.; John C. Molder, gen. mgr.; J. R. Wester, supt., at last accounts.**Inc.** April 15, 1907, in Arizona. **Cap.**, \$900,000; shares \$1 par.**Property:** 30 claims, unpatented, 600 acres, and a 150-acre mill site, 4 miles west of Morenci, in the Copper Mountain district. Includes the Buzzard Shadow and adjacent groups. Claims show quartzite, shale and limestone cut by porphyry, with contact deposits, having orebodies, more or less developed, said to range from 10" to 4' in width.**Development:** by tunnels, 100', 450' and 600' long and the Lillian tunnel, 1,800', claimed to show a vein carrying several ore shoots. There are 5 shafts, including the 260' Argentine shaft, said to show copper sulphides; the 80' Louise shaft, reported to cut an 8" vein showing ore assaying up to 15% copper, 180 oz. silver and \$20 gold per ton, and the 72' Jensen shaft near the Louise. The Buzzard Shadow group, at the eastern end of the property, shows a 2 to 4' vein carrying auriferous and argentiferous copper ore.**Equipment:** includes a 15 h. p. Fairbanks-Morse gasoline hoist, 4 Nissen stamps and a tube mille.**P. D. EXTENSION COPPER CO.****ARIZONA****Address:** W. P. Weller, sec.-treas.-mgr., Morenci, Ariz.**Directors:** Wallace Keith, Isaac N. Stevens, Chas. T. Howland, J. C. Callaghan, Lester M. Dull and W. P. Weller.**Cap.**, \$2,000,000; shares \$1 par; 200,000 shares offered the public at 75c per share, Dec., 1916.**Property:** 35 claims, 710 acres, in the Clifton-Morenci district, developed by a 400' tunnel. A strike of 20% copper ore was reported in March, 1917.**SHANNON COPPER CO.****ARIZONA****Office:** 67 Milk St., Boston, Mass. **Mine office:** Metcalf, Greenlee Co., Ariz. **Works office:** Clifton, Ariz.**Officers:** Nathan L. Amster, pres.; H. N. Stonemetz, v. p.; Chas. R. Jeffers, sec.-treas.; preceding, with Kenneth McNeil, Wm. A. Paine, M. W. Cole, C. J. McGilvray, J. B. Beaty and David A. Ellis, directors. J. W. Bennie, gen. mgr.; H. H. Dyer, mine supt.; Wm. H. Bond, mill supt.**Inc.** Nov. 13, 1899, in Delaware. **Cap.**, \$3,000,000; shares \$10 par, increased July, 1909, to \$3,300,000; issued, \$3,000,000, with \$300,000 held in the treasury. **Bonds:** \$600,000 at 7% were retired 1911, but the company has guaranteed an issue of \$600,000 of 6% bonds, authorized May, 1909, by the Shannon-Arizona Railway Co., reduced by purchase to about \$103,000. The company has paid 8 dividends, aggregating \$1,200,000, to June 30, 1917. Shares are listed on the Boston Stock Exchange. National Shawmut Bank, Boston, registrar; Boston Safe Deposit & Trust Co., transfer agent. Annual meeting, third Wednesday in March.

Controls the Coronado Mining Co., through ownership of 53% of the stock issue, and operates, under lease, the property of the Leonard Copper Co. owning the Copper Belle mine at Gleeson, Cochise County, Ariz.

Comparative General Balance Sheet:**Assets:**

	Mines & Equip.	Current	S. A. Ry. Bonds	S. A. Ry. Cur. Acct.	Suspense	Total
1916	\$3,447,724	\$1,169,555	\$465,000	\$55,624	\$5,527	\$5,143,430
1915	3,408,115	595,830	381,000	64,945	5,204	4,455,094
1914	3,412,862	388,047	383,000	53,601	3,590	4,241,100

Liabilities:

	Capital Stock	Current	Oper. Reserves	Defer. Credits	Surplus	Total
1916....	\$3,000,000	\$127,255	\$713,207	\$6,772	\$1,206,196	\$5,143,430
1915....	3,000,000	33,139	610,056	5,771	806,128	4,455,094
1914....	3,000,000	31,784	75,168	4,977	1,129,171	4,241,100

Balance sheet of Shannon-Ariz. Ry. Co. for 1916 shows assets: \$1,308,623, which includes: road and equipment, \$716,643; bond issue guarantee account, \$590,000; cash, etc., \$1,733. Liabilities include: capital stock, \$600,000; bonds outstanding, \$569,000; Shannon Copper Co., \$55,623; accrued interest, \$6,290; reserves, \$40,633; profit in 1916, \$9,673.

Income Account:

	Metal Sales	Expenses	Profit
1916.....	(d) \$2,620,950	\$1,799,896	\$821,054
1915.....	(c) 1,102,275	853,625	248,650
1914.....	(b) 1,291,539	1,190,345	101,194
1913.....	(a) 3,153,412	2,713,837	439,575
1912.....	2,594,867	2,034,252	581,015
1911.....	2,014,219	1,895,365	118,854

(a) 16 months to Jan. 1, 1914. (b) operated first 9 months only. (c) add interest, \$16,228, and deduct expenses 5 months during which property was idle, \$43,044, leaves \$221,833 net profit for 1915. (d) Operating 11 months.

Dividends: 50c per share in 1905, \$1 in 1907, 50c in 1913, 50c in 1916, and \$1.75 in 1917 to Nov.

Property: 34 claims, 562 acres, at Metcalf, in the Greenlee district, also about 600 acres mill and smelter sites at Clifton, Ariz., and some limestone claims on the San Francisco River. The Shannon has a side-line agreement with the Arizona Copper Co., Ltd., by which extra-lateral rights are waived mutually, obviating all possibility of future litigation over apex rights.

Geology: ore occurs between limestone and porphyry, under hematite gossans, the oxidized ores favoring the limestone, while the ores in the porphyry side are mainly silicious sulphides. The ore occurs in irregular deposits, some of which are up to 300' in the greatest dimension. Many of the orebodies are large, and though low-grade and bunched, the quantity is very great. The upper levels in the mine show oxide and carbonate ores of 3 to 8% copper tenor; sulphide ores of 2 to 6% copper tenor are mined in the lower workings, the ores holding chalcopyrite with a little chalcocite. The mine as a whole is deficient in sulphide ores, and about one-third of the production is silicious ore, too low in grade to smelt, not readily amenable to concentration, but giving good results with the Bennie system of leaching when mixed with other ores. The concentrating ores average 2.5% and smelting ores about 4%.

Development: by shafts, tunnels and open pits, workings reaching a depth of 1,300' below the crest of the mountain, and totaling about 29 miles, 1917, with considerable ore reserves. The mine is timbered with 12x12" square sets. Extraction is by 3 double-track tunnels, connecting with a 1,400' double-track incline tram leading to the Shannon-Arizona Railway, with 6 ore bins at either end, the tramway, inclined at 36°, having 10-ton cars, operating in counterbalance, the steel cable passing around a 13' double drum, which runs a small air compressor serving as a brake.

Developments at company's outside properties in 1916 was reported as encouraging, and extension of better grades of ore is anticipated.

Shannon-Arizona Ry. Co. The Shannon C. Co. owns the entire stock of the Shannon-Arizona Railway Co. Cap., \$600,000; shares \$100 par, and \$466,000 of the railway's \$575,000 6% 10-year bonds, guaranteed by the Shan-

non, and convertible into Shannon Copper Co. stock. The officers are: Nathan L. Amster, pres.; Chas. R. Jeffers, v. p. and sec.-treas.; John W. Bennie, W. A. Paine, B. F. Spriggs and C. G. Cole, directors.

This standard-gauge line, of about 10 miles length, was built and equipped at a cost of about \$700,000, the territory traversed being very rugged and including a 900' tunnel. The line was completed 1910, and not only is saving considerable money to the Shannon on ore haulage, but also gives immunity from serious interferences formerly caused by frequent floods.

Mill: the 500-ton concentrator at Clifton, on the San Francisco River, 8 miles from the mine, has ore bins 100' long, in 2 sections, for first and second-grade ores. The mill is of steel, in 2 connected sections, terraced, the upper section having two Blake crushers, four 6' Huntington mills, a 220' Robins belt conveyor, Hartz jigs and Wilfley tables. The lower section has 38 sand and slime tables. The steel power house at the concentrator has two 250 h. p. Stirling water-tube boilers and a 300 h. p. Nordberg tandem-compound engine. Water is pumped from the wells near the San Francisco River by a 600-gal. electric triplex pump.

Smelter: the smelter at Clifton, 7 miles from the mines, has 3 blast furnaces with a combined daily capacity of 1,800 tons of ore and treats concentrates and oxidized ores from the mines at Metcalf and pyritic ore from the Copper Belle mine of the Leonard Copper Co. The mixture is almost self-fluxing. Above the charging floor are 23 ore bins, with chutes. Fumes from the blast furnace pass through a 10' dust flue to a 20x20x100' dust chamber with hopper bottom, discharging periodically into cars on a railway track in a tunnel beneath, fumes passing from the dust chamber through a 170' flue to a 150' steel smokestack. Slags are hauled by an electric locomotive. The converter plant has 2 stands and is capable of turning out 120,000 lbs. of copper daily. The briquetting plant for fine ore, concentrates and flue dust, has a daily capacity of 60 tons, and there is a small sampling mill in connection. Slag haulage, converters, slag elevators, dust conveyor, briquetting plant and custom sampler are all operated electrically. The smelter power house has a 300 h. p. tandem-compound condensing engine, direct-connected to blowers, and converter blast is supplied by a 250 h. p. Nordberg air compressor. Fuel is petroleum.

In 1916 a 150-ton leaching plant was built, thorough experimental work having proven that mill tails and probably a very large tonnage of semi-oxidized ore can be treated at a profit. This plant was in full operation by May, 1917.

The company owns general stores, at Metcalf and Clifton. There are about 60 dwellings for employees. The Shannon owns and operates a water plant. Forces are about 1,200 men at the mines, mill and smelter.

Production:

	Copper Lbs.	Silver Oz.	Gold Oz.	Cost Per Lb.	Sell. Price Per Lb.
1916.....(a)	9,364,968	62,935	1,328	18.46 cts.	27.24 cts.
1915.....(b)	6,017,642	35,450	690	13.40 cts.	17.80 cts.
1914.....(b)	9,003,169	69,603	1,295	12.26 cts.	13.63 cts.
1913.....(c)	18,793,724	169,197	3,412	13.50 cts.	15.87 cts.
1912.....	16,511,525	202,975	3,129	11.42 cts.	14.87 cts.
1911.....	14,775,829	97,339	1,563	11.58 cts.	12.38 cts.
1910.....	15,873,481	47,726	984	12.10 cts.	12.84 cts.
1909.....	15,379,588	43,751	1,233	12.20 cts.	13.23 cts.
1908.....	16,281,983	50,189	925	12.60 cts.	13.15 cts.
1907.....	10,874,619	34,037	950	14.50 cts.	

(a) 11 months. (b) 9 months. (c) 16 months.

The property was closed down in Sept., 1914, on account of the low price of copper. Operations were resumed March 1, 1915, but in September the company was compelled to close down again, due to the miners' strike in the Clifton-Morenci district. This is most unfortunate for Shannon, for it is a high-cost producer (13.4 cts. per lb. in 1915 and 18.46 cts. in 1916), and it is only on high-priced copper that the company can earn money for dividends. Operations were started in Feb., 1916. In June, 1917, the yield was 956,000 lbs. Mine was again closed for several months in 1917, due to labor strike.

STEVENS COPPER MINING CO.**ARIZONA**

Office: No. 1 Broadway, New York. **Mine office:** Clifton, Greenlee Co., Ariz.

Officers: Fred Enos, pres.; W. Rowland Cox, v. p.; Geo. H. Kent, sec.-treas.; D. D. Irwin, resident mgr.

Property: 39 claims, patented, 780 acres, about 2 miles from Metcalf, Ariz., shows granite overlaid by Cambrian quartzite and Silurian limestone, with much faulting and intrusive porphyritic dikes, with orebodies near the fault lines. Some of the claims have produced copper ore, which was shipped to the Shannon smelter. Property being worked by lessees at present.

*NOGALES, SANTA CRUZ COUNTY***ARIZONA EUROPEAN MINING CO.****ARIZONA**

Office: Nogales, Ariz.

Officers: Manuel Escalada, pres.; Wm. Schuckman, sec., with Geo. Januel, directors. Jas. Ritchie, supt.

Property: the Buena Vista group, 2 miles from Patagonia, at an elevation of 5,500', said to show a 6' ledge of high-grade lead-silver ore.

Mine reported under development, August, 1917.

AUSTERLITZ GROUP OF MINES**ARIZONA**

Owned by A. H. Noon, Nogales, Ariz. Under lease to Camphius & Rives, Oro Blanco, Ariz.

Property: 5 claims, about 100 acres, in Oro Blanco mining district, Santa Cruz Co., Ariz., developed by 150' shaft and 2 tunnels, 600' and 300' long, said to show quartz fissure vein in porphyry assaying from \$4 to \$40 in copper, gold and silver. Developing in 1917. The property has been an intermittent small producer.

ORO MINE**ARIZONA**

G. B. Williams, owner, 316 Meigs St., Rochester, N. Y. A. J. Fraser, supt.

Property: the Oro mine, 10 claims, unpatented, at Old Glory, in the Oro Blanco district, 30 miles west of Nogales, Santa Cruz Co., Ariz. Mine shows 3 parallel fissure veins, from 6 to 30' wide. Vein on which most of the work has been done is 16' wide, with a 5' paystreak of silicious sulphide ore carrying copper, lead and gold.

Development: carried on since 1911, consists of a 350' shaft with 2 levels and ground opened for stoping. In 1916, a drift on vein at 350' said to have followed a paystreak assaying 3% copper, 5% lead and \$20 gold.

Equipment: includes pumps, tramway, mill and dam. Mine has produced about \$50,000 worth of ore to 1916.

Plans sinking winze and continuing drift on vein at 350' level.

*OATMAN, MOHAVE COUNTY***ADAMS MINING CO.****ARIZONA**

Address: 620 I. W. Hellman Bldg., Los Angeles, Calif. **Mine office:** Oatman, Ariz.

Officers: E. H. Newland, pres.; N. A. D'Arcy, sec.-treas.-gen. mgr., with C. H. Palmer, Jr., and M. Lines, directors. Thos. Kilker, supt.

Inc. Dec., 1915, in Arizona. Cap., \$100,000; shares 10c par. Annual meeting, first Monday in February.

Property: 9 claims in the Black Range section, adjoining the Nellie.

Development: by 400' shaft, crosscuts and drifts, said to show 3' of ore assaying \$20 per ton.

Equipment: includes 80 h. p. engine and pumps. Developing in 1917.

AOTMAN PIONEER MINES, INC.

ARIZONA

Oatman, Ariz. **Officers:** R. G. Tryon, pres.; Geo. F. Moser, sec.-mgr.

Inc. in 1915. Cap., \$1,500,000; shares \$1 par; all outstanding.

Property: 6 patented claims, including the Pioneer, formerly owned by the Pioneer Cons. Mines Co., 2 miles from Oatman. The Pioneer vein, one of the largest of the district, is covered for 4,000' by company's claims.

Development: by 420' main Pioneer shaft and several hundred feet of crosscuts and drifts on the 100', 200' and 400' levels, exposing above the 200' level 17,000 tons of \$9.20 ore north of the shaft and \$100,000 south, or a total of \$256,400 gross. No estimate is made of the lower-grade ore below the 400' level, and the high-grade shoot is bottomed.

In the Treadwell mine a 340' shaft with levels at 100', 200' and 300' exposes 12,800 tons of an average value of \$5.62, which is about the cost of handling such ore in the district.

The 35 Parallel mine has a 220' shaft connecting on the 150' level with a tunnel. The work is all in ore, exposing 8,500 tons of \$13.30 ore.

Equipment: includes 10-stamp mill, 80 h. p. engine, compressor and 2 hoists.

Property has merit, but the high cost of mining and milling the ores of the Oatman district must be overcome before the low-grade material in this and other mines can be successfully handled. The property is probably second only to the United Eastern in magnitude, and though of lower grade, is a property of much merit. A detailed report by Geo. F. Moser made March, 1917.

ARGO MINES CO.

ARIZONA

Address: Oatman, Mohave Co., Ariz.

Officers: S. S. Jones, pres. and gen. mgr.; J. M. Francis, v. p.; J. E. Shank, treas.; J. S. Withers, sec.

Inc. in Ariz. Cap., \$1,000,000; shares \$1 par; 600,000 shares held in treasury.

Property: 7 claims, 110 acres, in the Oatman district, show a vein 40' to 130' wide on surface, supposed to be a continuation of the Tom Reed vein.

Development: a two-compartment shaft is being sunk to the 500' level.

Equipment: 25 h. p. gasoline hoist, and a 360 cu. ft. air compressor.

Is one of many boom-day mines of this district.

ARIZONA CENTRAL MINES CO.

ARIZONA

Office: 15 Broad St., New York City. **Mine office:** Oatman, Ariz.

Officers: Chas. E. Knox, pres.; Sidney Green, v. p., with F. G. Corning, Donald C. Catlin and C. Van R. Cogswell, directors. W. W. Storer, sec.-treas.

Inc. December, 1915, in Arizona. Cap., \$1,000,000; shares \$1 par; \$600,000 shares outstanding. Stock listed on N. Y. Curb.

Property: 1 claim, 18 acres, at Oatman, bounded on the N. and E. by the United Eastern and on the S. by the Tom Reed. The mine is developed to depth of 360', and is said to show a quartz-calcite vein, 30' wide, carrying small gold values at surface and to depth of 300'.

Equipment: includes gasoline hoist and 4-drill compressor.

Is a prospect. Reported on by C. C. Burger.

ARIZONA EAGLE MINING CO.**ARIZONA****Address:** Oatman, Ariz.**Officers:** H. E. Ittner, pres.; E. C. Anderson, v. p.-supt.; C. A. Schoemaker, sec.-treas., with E. B. Garner and C. H. Schoemaker, directors.**Inc. Dec., 1915, in Ariz. Cap., \$1,000,000; shares \$1 par.****Property:** 6 claims, 120 acres, in San Francisco mining district, 2½ miles S. E. of Oatman.

Developing at last accounts. Stock campaign launched by Harry E. Thompson Co., New York.

ARIZONA GOLD STAR MINING CO.**ARIZONA****Office:** 347 Title Insurance Bldg., Los Angeles, Cal.**Officers:** R. Mansard, pres.; R. H. Sayers, v. p.; M. M. Miles, sec.-treas.**Cap., \$100,000; shares 10c par; issued \$50,000.****Property:** owns the Valkyrie and La Paz claims, 40 acres, 2 miles west of the Gold Road mine, in the Tom Reed-Gold Road mining district, Mohave Co., Ariz. Developed by 100' shaft, to be sunk to 400' depth. Equipped with hoist and compressor.**ARIZONA REX MINING CO.****ARIZONA****Office:** 1202 Hollingsworth Bldg., Los Angeles, Calif.**Officers:** Frank A. Keith, pres.; J. L. McIver, v. p.; R. I. Rogers, sec.-treas., with Geo. W. Long, W. K. Ridenour and S. W. Mudd, directors.**Inc. Sept., 1915, in Ariz. Cap., \$1,000,000; shares \$1 par; 636,200 shares outstanding. Annual meeting, first Monday in December.****Property:** 14 claims, at Oatman, Arizona, only slightly developed. Idle, 1917.**ARIZONA TOM REED GOLD MINES CO.****ARIZONA****Oatman, Mohave Co., Ariz. Officers:** Geo. F. Moser, pres.; Chas. S. Seeley, sec.; C. L. Moser, v. p.; Geo. F. Moser, gen. mgr.**Inc. July, 1915.****Cap., \$1,000,000; shares \$1 par, non-assessable; issued 657,903. Stock listed in Los Angeles and San Francisco.****Property:** owns 7 claims, 97 acres, and has a lease and bond on the Snowball group, 90 acres, all adjoining the property of Aotman Pioneer Gold Mines, Inc., on the north. Main ledge of the Pioneer continues into company's claims.**Development:** by several shafts 10' to 100' in depth and on the 400' level by a crosscut from the Aotman Pioneer. Company sinking a main working shaft on the Trio claim.**BANNER GOLD MINING & MILLING CO.****ARIZONA****Address:** C. H. Vaughan, Kingman, Ariz. H. E. Benedict, sec. J. C. Brian, former owner.**Property:** in the Union Pass district, Mohave Co., Ariz., reported under bond to C. H. Vaughan, 1917.

Mine is said to carry the extension of the rich Sheep Trail vein, and a shaft has been sunk 250' on ore of milling grade. Developing, 1917.

BIG JIM CONSOLIDATED MINING CO.**ARIZONA****Office:** 561 I. W. Hellman Bldg., Los Angeles, Calif. **Mine office:** Oatman, Mohave Co., Ariz.**Officers:** C. C. Spicer, pres.; E. H. Newland, v. p.; S. M. Warmbath, sec.-treas., with E. H. Woods, directors. A. G. Keating, supt.**Inc. 1917. Cap., \$1,500,000; shares \$1 par, non-assessable. Stock listed in Los Angeles, San Francisco and on New York Curb. Is the successor of Big Jim Mng., which see.****Property:** 7 claims, unpatented, in the Tom Reed Gold Road mining district. The Bluebird group is 3,000' west of the Tom Reed. Ore is gold, occurring in andesite.

Development: 240' shaft on the Bluebird group, reported to cut the vein in a crosscut on the 200' level. Shaft will be deepened to 500' in hopes of finding the westerly extension of the United Eastern orebody.

Equipment: includes 25 h. p. gasoline hoist and Ingersoll-Rand compressor. There has been no production and property is still in the development stage.

BIG JIM GOLD MINING CO.

ARIZONA

Dissolved by vote of stockholders, April 24, 1917. The Big Jim and Monarch claims were sold to the United Eastern Mng. Co. in 1917, owners of Big Jim G. Mng. Co.'s stock receiving 1/6 share of United Eastern stock and one share of Big Jim Cons. Mng. Co. stock.

BLACK RANGE MINING CO.

ARIZONA

Address: Oatman, Mohave Co., Ariz.

Officers: D. P. Wright, pres. and treas.; Del Sherer, v. p.; Mitchell Carter, sec., directors.

Inc.: Oct. 30, 1913, in Ariz. **Cap.**, \$1,000,000; shares \$1 par; outstanding, \$682,750. Listed on San Francisco Exchange. Annual meeting, 1st Tuesday in Nov.

Property: 8 claims, 2 patented, 150 acres, located 5 miles south of Oatman, shows fissure veins in andesite. Ore is said to run from \$2 to \$20 per ton. Developed by 300' shaft.

Equipment: includes a gasoline hoist, air-compressor and pumps. Property is still in the development stage.

BOUNDARY CONE GOLD MINES CO.

ARIZONA

Oatman, Ariz. **Officers:** F. H. Biles, pres.; J. D. L. Williams, Rex Arms Apt., Los Angeles, sec.; Calvin Hartwell, treas.; preceding, with W. F. Ball, S. M. Barnes, T. C. Job, directors. Frank Dryden, supt.

Inc. in Ariz. Cap., \$1,500,000; shares \$1 par; reserved in treasury, 500,000 shares.

Property: 8 claims, 82½ acres, patented, 1 mile S. W. of Oatman. **Ore:** gold.

Development: shaft 750' deep, December, 1916, sinking to 800' level; 4,000' workings on upper levels. On the 450' level management reports an oreshoot 150' long, 15' in width, with average assays of \$14 per ton, and on the 550' level to have a shoot that was 150' long when work was stopped and shaft-sinking resumed. Shaft makes 15,000 gallons water daily, handled by bucket.

Equipment: hoist, 300 cu. ft. air compressor, blacksmith shop. Plans cross-cutting to vein on 750' level, development of orebody and erection of a mill.

CARTER GOLD MINING CO.

ARIZONA

Oatman, Ariz. **E. A. Shaw**, pres.; **Henry Lovin**, v. p.; **W. K. Ridenour**, sec.; **H. H. Watkins**, treas. **Dan Bosque**, in charge.

Inc. in Arizona. Cap., \$1,000,000; shares \$1 par.

Property: New York, Giant and Gold Cross patented claims, 55 acres, in Tom Reed-Gold Road mining district, near Oatman, Mohave Co., Ariz. Developed by incline shaft, being sunk from the 250 to the 500' level with several hundred feet of workings on the 150 and 250' levels. The vein on the 150' level is said to be 12' wide, but contains small values. On the 250' level management reports that the vein is over 7' wide and averages \$3.60 gold per ton. On the 350' level 1,200' of drifting was done.

CASEY JONES MINING CO.

ARIZONA

Oatman, Ariz. **Officers:** **H. M. Caswell**, pres.; **V. S. Rowley**, v. p.; **J. E. Shank**, sec.-treas., with **J. J. Casey** and **Geo. Z. Mellen**, directors.

Inc. in Ariz. Cap., \$100,000; shares 10c par; 600,000 shares in treasury. Listed in San Francisco.

Owns the Swallow group, 12 claims, 120 acres, adjoining the Oatman Gold

group on the east, said to show 3 veins from 6' to 25' wide and assaying on the surface from \$0.80 to \$2.86 gold per ton. Management plans sinking two 2-compartment shafts; east shaft will be 300', the west shaft 500' deep. In March, 1916, the east shaft was 60' deep. Property in the development stage.

CLARISSA MINING & MILLING CO.**ARIZONA**

Gold Road, Mohave Co., Ariz. E. M. Rabb, pres.; A. W. Sydnor, v. p.-treas.; F. T. Bragonier, sec.

Inc. 1915, in Ariz. Cap., \$1,000,000; shares \$1 par, non-assessable; 550,000 shares in treasury. Owns 7 claims, 80 acres, adjoining the United Western on the north, at Oatman, Ariz. Company is sinking a shaft, 80' deep. Cut 4' of quartz vein matter at 65'.

CONE MINING & MILLING CO.**ARIZONA**

Office: 132 Edgerly Bldg., Fresno, Calif.

Officers: J. P. Eaton, pres.; M. J. Walsh, v. p.; Hugh Sparkman, sec.-treas.

Inc. Aug., 1911, in Arizona. Cap., \$1,500,000; shares \$1 par; 778,875 shares issued.

Property: 12 claims, unpatented, 240 acres, 2½ miles S. W. of Oatman, in the Tom Reed-Gold Road district, Mohave Co., Ariz. Ore occurs in veins in rhyolite dike, traversing ground from E. to W.

Development: 235' shaft, with crosscutting to reach ledge on 200' level.

Equipment: includes a 15 h. p. Fairbanks-Morse hoist.

CRESCENT MINING CO.**ARIZONA**

Geo. W. Pierce, mgr., Oatman, Ariz.

Has 1,000' tunnel, looking for oreshoot cut 300' above. Still operating, 1917.

CROWN CITY GOLD MINES CO.**ARIZONA**

Idle. Last address: John C. Dalton, 6 Union Savings Bank Bldg., Pasadena, Cal. See Vol. XII.

DOME MINING CO.**ARIZONA**

Office: 805 H. W. Hellman Bldg., Los Angeles, Calif. Mine is at Oatman, Ariz.

Directors: C. P. Campbell, pres.; C. C. Spicer, v. p.; A. M. Wheelock, sec.-treas.

Inc. Oct 9, 1915, in Arizona. Cap., \$100,000; shares 10c par, non-assessable; 500,000 shares in treasury. Annual meeting, last Saturday in Sept. Listed on Los Angeles Exchange. Company reports \$1,000 in treasury, April 17, 1916.

Property: 32 acres, unpatented, at Oatman, Mohave Co., Ariz. Developed by 40' shaft and a little trenching. Management states that a hoist will soon be added. Property is a prospect. Idle, and probably moribund.

EAST BLACK RANGE MINING CO.**ARIZONA**

Address: W. S. Tarbell, 668 I. W. Hellman Bldg., Los Angeles, Calif.

Inc. 1916, to operate 6 claims adjoining the Black Range Mng. Co., at Oatman, Ariz. Fifty thousand shares of stock were offered to the public in April, 1916, at 15c a share.

Is a prospect of unproven merit.

ESPERANZA EXPLORATION CO.**ARIZONA**

Address: Joseph Krauss, pres.-mgr., P. O. Box 149, Oatman, Ariz.

Officers: E. L. Terwilliger, v. p.; Jos. Kielen, sec.-treas.

Inc. Dec. 6, 1915, in Ariz. Cap., \$150,000; shares 10c par; 884,000 issued. Operating expenses, 1916, \$35,000.

Property: 10 claims, 170 acres, in San Francisco mining district, which show an E.-W. 15' fissure vein, with 15° dip N. Ore carries gold, average value being \$3 per ton.

Development: by 217' shaft. Equipment: 25 h. p. engine, 320 cu. ft. compressor, etc.

FESSENDEN GOLD MINING CO.**ARIZONA**

Oatman, Ariz. **Officers:** M. A. Fessenden, pres.; F. W. Crosley, v. p.; H. A. Culloden, sec.-treas., with J. O. A. Carper and C. M. Moses, directors.

Inc. in Arizona. **Cap.**, \$100,000; shares 10c par; treasury, 250,000 shares. Listed in Los Angeles.

Property: the Sunlight and Moonlight claims, 40 acres, adjoining the United Eastern on the north, at Oatman. Developed by 500' shaft and equipped with 3-drill compressor.

GILT EDGE MINES CO.**ARIZONA**

Idle. Oatman, Ariz.

Officers: E. A. Burns, pres.; E. A. Shaw, v. p.; S. W. Klass, sec.-treas., Kingman, Ariz.

Inc. in Ariz. **Cap.**, \$150,000; shares 10c par; 800,000 in treasury. Listed on San Francisco and Los Angeles Exchanges.

In Oct., 1916, company was trying to interest New York capital to the extent of \$30,000 for development.

Property: 95 acres, 2 miles S.W. of Oatman, adjoining the old Vivian mine, said to show 4 parallel veins varying from 4' to 60' in width.

Development: 4 tunnels, one claimed to have opened a vein for 50', with gold values from \$5 to \$12 per ton. Company sank a shaft, 250' deep, April 26, 1916, at which depth altered andesite was found, said to show quartz and spar and to contain fair values. Crosscutting done on the 100' and 200' levels.

Equipment: includes 25 h. p. Fairbanks-Morse hoist and a 52 h. p. air compressor. Plans sinking 600'.

GIRARD MINING CO.**ARIZONA**

Address: Oatman, Mohave Co., Ariz. H. B. Magill, pres. and gen. mgr.

Property: 6 claims, also leases on the Della claim of the Tango group and W. R. Hearst claim of Meals group, Silver Creek district, said to show gold ore. Tests to be made to find suitable treatment.

GOLD CLIFF EXPLORATION CO.**ARIZONA**

Address: P. O. Box 412, Oatman, Ariz.

Officers: Stephen E. Barren, pres. and mgr., Oatman; H. H. Alvey, sec.; Thos. Devine, treas.; Axel E. Johnson and Asa W. Le Barron, directors.

Inc. 1914, in Arizona. **Cap.**, \$1,000,000; shares \$1 par; 136,212 shares sold; 363,788 shares in treasury.

Property: 19 claims, 285 acres, adjoining the Tom Reed Gold Mines Co. property, near Oatman. Developed by 53 shallow openings.

In 1916 company sold to the Copper Fame Mining Co. 10 claims in the Chloride district, Cerbat Mts., between the Tennessee and Golconda mines. The price was 700,000 shares of Copper Fame stock.

Is a prospect.

GOLD KEY MINING CO.**ARIZONA**

Office: 733 Central Bldg., Los Angeles, Calif. Mine near Old Trails, Mohave Co., Ariz.

Officers: W. H. Wise, pres.; H. M. Hall, v. p.; B. E. Shaw, sec.; with W. K. Ridenour and Raymond A. Carr, directors.

Inc. 1915, in Arizona. **Cap.**, \$1,250,000; shares \$1 par. Listed in San Francisco.

Property: the Treasure Key group, 4 claims, 50 acres, between the Boundary Cone and Orion groups, west of Old Trails and near Oatman, Ariz. Contains the Oatman type fissure veins in andesite, showing gold quartz ore. The one under development is 20' wide.

Development: by a 310' shaft with drifts on 300' level. The east drift exposes an ore-shoot 75' long and 4'-6' wide, showing 3' of \$30 ore. A second shoot 75' to the west is said to average \$12. Property is a "likely" prospect.

GOLD ORE MINING CO.**ARIZONA****Address:** A. G. Keating, Goldroad, Ariz.**Officers:** A. C. Werden, pres.; S. M. Warmbath, v. p.; I. W. Werden, sec.; A. F. Pollock, treas., with E. A. Shaw, directors. A. G. Keating, cons. eng.**Inc. in Arizona. Cap.,** \$1,000,000; shares \$1 par; 819,310 issued. Listed on San Francisco and Los Angeles Stock Exchanges. H. E. Teter & Co., Los Angeles, transfer agents; Security Trust and Savings Bank, Los Angeles, registrar.**Property:** 6 claims, 120 acres, ½ mile N. of the Gold Road mine, Mohave County, which the Gold Ore is said to resemble and which has yielded \$5,-000,000.**Development:** by 560' main shaft and over 2,000' of drifts, etc. Levels have been driven at 350' and 530' E. and W. along the vein. On the bottom level is a shoot 5' wide, 200' long and 200' high. The Gold Road mill treated 2,300 tons from this, returning \$14.50 net per ton. A winze 125' below 530' shows a better vein than above. Reserves are placed at 30,000 tons of \$15 to \$20 ore.**Equipment:** a tramway has been constructed and the 300-ton Gold Road cyanide mill leased for ore treatment, about a third capacity to be used for a start.**GOLD RANGE MINING & MILLING CO.****ARIZONA****Oatman, Ariz. Company reorganized March, 1916, with W. H. Reeves, pres., Pasadena, Cal.; J. E. Nelson, sec.****Cap.,** \$1,000,000; shares \$1 par. **Treasury,** 400,000 shares. Charter altered July, 1917; now levies assessments for development funds. Listed on Los Angeles Exchange.**Property:** Esmeralda group at Oatman, adjoining the Ivanhoe on the south. Shaft down 260', said to show \$4 to \$8 ore. Work resumed in July, 1917.**GOLD REED MINING & MILLING CO.****ARIZONA****Address:** J. C. Connors, Colorado Springs, Colo. **Mine office:** Oatman, Ariz., T. L. Welp, supt.**Property:** claims in Oatman district, Ariz., developed by 570' shaft and drifts.**GOLD ROAD ANNEX MINING CO.****ARIZONA****Office:** Goldroad, Mohave Co., Ariz. L. M. Hopkins, pres.**Property:** near Gold Road mine, Oatman district, Ariz. Machinery installed for sinking shaft to 500'. Prospects fair.**GOLD ROAD BONANZA MINING CO.****ARIZONA****Oatman, Ariz. Officers:** F. T. Torpey, pres. and treas.; W. B. Ross, v. p.; W. P. DeWolf, sec. E. M. Rogers, supt.**Inc. in Ariz. Cap.,** \$1,000,000; shares \$1 par. In treasury, 250,000 shares. Listed in San Francisco.**Property:** 90 acres, adjoins the Gold Road mine on the S. W. Shaft sunk 500', with considerable drifting at that level. Vein up to 4' wide said to average \$30 per ton.**GOLD ROAD MINES CO.****ARIZONA****D. R. Muir, mgr., Gold Road, Ariz.****Inc. in Maine. Cap.,** 400,000 shares; \$5 par; entirely owned by U. S. Smelting, Refining & Mining Co., which see for officers.**Property:** 15 patented claims, 216.52 acres, at Gold Road, Mohave Co., Ariz., 22 miles west of Kingman, on the Santa Fe R. R.**Ore:** gold-bearing quartz occurring in a fissure vein with E.-W. strike. Company owns about 1¼ miles on the strike of this vein. The mine had a good record of production prior to its purchase by this company in 1912.

Stopping operations had been carried down to the 500' level and were extended on the strike of the vein and also in depth to the 900' level. Company now extracting ore from the 800' level. Assay value of ore diminishes with depth as far as explored to date, and only a small percentage of ore found on the 800' level is of commercial grade, though the vein continues strong and permanent.

Development: to a depth of 1,100' by 5 miles of workings. There are 2 shafts, one reaching the 800 and the other the 900' level, equipped with cages and skips. Property is fully equipped with power house, air compressors, shops, warehouse and dwellings; has a 40-stamp 300-ton cyanide mill, located within a few hundred feet of the mine. Electric power is purchased from power plant at Kingman.

Production: for 1915 was 96,272 tons. Cost of mining averages \$3.15 per ton; milling about \$2.13 per ton. Recovery of gold per ton is \$6.77.

The mine has considerable unexplored territory within the depth to which it has been worked, and the prospects are that it will yield a small profit for some time to come from ore reserves now existing, or which may be found within this depth. Larger earnings may be expected in case exploration at depth discloses increased ore values.

Operations were suspended for a time, but resumed at end of 1916. Ore has been opened up, but not enough to warrant re-starting mill.

GOLD TRAILS MINING & MILLING CO.

ARIZONA

Address: Oatman, Mohave Co., Ariz.

Cap., \$100,000; shares 10c par.

Officers: W. Mellen, pres.; R. L. Stevens, v. p.; G. Z. Mellen, sec.-treas.; preceding, with W. P. Mellen and R. Mangrum, directors.

Property: at Oldtrails, Ariz. Nothing new reported since company was formed in 1916.

IVANHOE CONSOLIDATED MINES CO.

ARIZONA

Main office: 591 I. W. Hellman Bldg., Los Angeles, Calif. **Mine office:** Oatman, Ariz.

Officers: E. A. Carter, pres.; C. C. Spicer, v. p.; S. M. Warmbath, sec., with Fred Fox and F. P. McLain, directors. A. G. Keating, supt.

Inc. March 29, 1915, in Ariz. **Cap.,** \$1,000,000; shares \$1 par; 790,800 shares issued. Stock listed on New York Curb and Los Angeles Stock Exchange. Security Transfer & Registrar Co., New York, transfer agents and registrar.

Property: 5 claims and 2 fractions in the N. W. section of Oatman mining district, Mohave County. Claims cover about 3,000' along the strike of the main vein. Four veins have so far been disclosed. Developed by 500' shaft. A crosscut at 204' intersected a vein, 60' wide, showing average values of \$9 per ton. A crosscut is now being driven S. on the 500' level to encounter this vein. A drift will also be carried westward to intersect the Nancy Lee vein, from which a 20-ton shipment of \$150 gold-silver ore was made early in 1916. Company leased the Nancy Lee claim to L. V. Le Grand in 1916. Is a promising prospect.

In 1917 work was proceeding at the Nancy Lee No. 2, but nothing of importance was reported.

JEROME-OATMAN MINING CO.

ARIZONA

Office: Jerome, Ariz. **Mine office:** Oatman, Ariz.

Officers: Walter C. Miller, pres.; D. J. Shea, v. p.; S. F. Denison, sec.; H. W. Lewis, treas.; with H. E. Campbell and Henry Lovin, directors. Jas. P. Rice, supt.

Inc. July, 1915, in Arizona. **Cap.,** \$150,000; shares 10c par; 442,251 shares in treasury, Oct., 1915. Stock is listed on Los Angeles Exchange.

Property: 11 claims, unpatented, in San Francisco mining district, 8 miles

N. W. of Oatman, Mohave Co., shows gold-silver ore in quartz veins cutting andesite and rhyolite. The veins run N. W.-S. E. and dip N. 70°.

Shut down in 1917 on account of water on the 390' level, machinery being unable to cope with it. As practically no commercial ore was proved by 390' shaft and 600' of drifts, the resumption of work is indefinite. Claims being patented in 1917.

LAZY BOY GOLD MINES CO.

ARIZONA

Address: Oatman, Ariz.

Officers: Joseph Krauss, pres.; J. H. Move, v. p.; W. K. Ridenour, sec.-treas.

Inc. Sept. 9, 1915, in Ariz. **Cap.**, \$1,000,000; shares \$1 par; 604,500 issued. Listed on San Francisco Exchange.

Spent \$25,000 on development work, 1916. Had \$7,500 cash on hand, Aug., 1917.

Property: 9 claims, 150 acres, in San Francisco mining district, Mohave Co., Ariz., shows several veins in andesite carrying gold values.

Development: by 220' vertical shaft, with total workings of 750'.

Equipment: includes 300 cu. ft. compressor, 3 jackhammer drills, 40 h. p. gasoline hoist. Is considered one of the best prospects of the camp, having actual ore already exposed.

LEXINGTON-ARIZONA MINING CO.

ARIZONA

Office: 538 Merchants' Natl. Bank Bldg., Los Angeles, Calif. **Mine office:** Old Trails, Ariz.

Officers: Dr. C. H. Phinney, pres.; Dr. C. M. Heberton, v. p.; J. A. Small, sec.; H. R. Woods, treas., with R. M. Keeney, directors.

Inc. Feb. 12, 1912, in Ariz. **Cap.**, \$1,000,000; shares \$1 par; 836,832 shares issued. Stock listed on San Francisco and Los Angeles Stock Exchanges. Annual meeting, 4th Tuesday in Sept.

Property: 15 claims, 8 patented, 155 acres, at Old Trails, in the Tom Reed Gold Road district, shows fissure veins, from 6'-25' wide, running N. W.-S. E. and dipping 75° N.-N. E. Ore occurs as quartz-spar, in andesite, and is said to assay from \$2-\$14 gold per ton.

Development: by numerous shafts from 45' to 225' in depth. A 3-compartment vertical shaft is now being sunk to 600'.

Equipment: includes hoist, compressor and Cornish pump. Company also owns the townsite of Old Trails.

LOST TREASURE MINING CO.

ARIZONA

Idle. Oatman, Mohave Co., Ariz.

Officers: Geo. W. Long, pres.; J. F. McConnell, v. p.; J. L. McIver, sec.-treas.; J. E. Strumquist and L. J. Hammell, directors.

Inc. 1915, in Ariz. **Cap.**, \$150,000; shares 10c par.

Property: the Gold Ore Extension Nos. 1 and 6, 120 acres, at Gold Road, adjoining the Gold Ore on the N. and W., and claimed to carry the extension of the Gold Ore vein. A 700' vertical shaft is now being sunk. The mine is one of the many new prospects in the Tom Reed district yet to be proved.

LUCKY BOY MINING & MILLING CO.

ARIZONA

Office: 668 I. W. Hellman Bldg., Los Angeles, Calif. **Mine office:** Oatman, Ariz.

Officers: F. W. Remy, pres.; N. A. D'Arcy, v. p.; W. S. Tarbell, sec.-treas.-gen. mgr.

Inc. 1915 in Ariz. **Cap.**, 1,000,000 shares; 10c par. Stock listed on San Francisco and Los Angeles Exchanges.

Property: 200 acres in the Tom Reed district, adjoining the Telluride on the S. and the Tom Reed on the S. W., said to show gold ore occurring in stringers of quartz and calcite. A shaft on the Friday claim was down 425' in April, 1917. Crosscut being run to vein.

Equipment: includes 25 h. p. hoist, 200 cu. ft. air compressor, 35 h. p. engine, compressor and Jackhammer drills, installed 1915. Property considered promising.

LUCKY SAM MINING CO.**ARIZONA**

Office: 678 I. W. Hellman Bldg., Los Angeles, Calif.

Officers: W. S. Tarbell, pres.; G. M. Gilbert, v. p.; Geo. E. Fairhead, sec.-treas.; L. C. Randall, supt.

Inc. 1915, in Ariz. **Cap.**, \$100,000; shares 10c par.

Property: 12 claims, 235 acres, in the Tom Reed district, Mohave Co., Ariz., carries 2 main parallel veins, 4-6' wide. Developed by 2 shafts, deepest 163'. A prospect.

LUCKY SEVEN GOLD MINING CO.**ARIZONA**

A. L. Krous, pres., Oatman, Ariz.; H. E. Bonnell, sec.

Property: the Eva group at Oatman. Also has bond and lease on the Ibex mine, 4 miles from Klinefelder, near Needles, Calif., from which several carloads of ore shipped ran \$37 per ton. Developed by 227' shaft.

MURDOCK MINING & MILLING CO.**ARIZONA**

Oatman, Mohave Co., Ariz. Officers: S. R. Porter, pres., treas. and supt.; D. Gibson, v. p.-sec.; F. L. Porter, asst. sec., with D. P. Wright and G. D. Page, directors.

Inc. Dec. 3, 1915, in Ariz. **Cap.**, \$1,000,000; shares \$1 par; 600,000 issued. Transfer office and registrar: Security Transfer & Registrar Co., New York. Listed on New York Curb as a prospect.

Property: near Oatman, shows a vein in andesite. Ore is gold-bearing and of the usual dense quartz type.

NAVY GROUP M. & M. CO.**ARIZONA**

Office: 1029 Higgins Bldg., Los Angeles, Calif.

Officers: Dr. Geo. P. Waller, pres.; F. M. Townsend, sec.-treas.; R. E. Zuver, agent at Gold Road, Ariz.

Inc. 1915. **Cap.**, \$1,000,000; shares \$1 par.

Property: 3 claims, 48.26 acres, in Tom Reed-Gold Road district, Mohave Co., developed by 750' tunnel. A prospect.

NELLIE MINING CO.**ARIZONA**

Mine office: Oldtrails, Mohave Co., Ariz.

Officers: F. M. Woods, pres.; R. C. Wilson, v. p.; E. T. Walmsley, sec.-treas., with H. E. Woods and C. S. Buck, directors; D. F. Meikeljohn, supt.

Inc. July 3, 1906, amended Aug. 4, 1915, in Ariz. **Cap.**, \$1,000,000; shares \$1 par; 790,000 outstanding. Stock is listed on the San Francisco and Salt Lake Exchanges. Registration Surety Co., 205 Russ Bldg., San Francisco, registrar. Annual meeting, first Wednesday in June.

Property: 11 claims, 190 acres, in Tom Reed-Gold Road mining district, 5 miles S. of Oldtrails, shows a fissure vein in andesite and andesite tuff, with gangue consisting principally of fine grain quartz and adularia and calcite. The values are exclusively gold, although traces of copper stain are found in the 2 altered dikes which strike out from the main lode, having a general strike N. 52° W., with dip about 55° N. E. Assays said to average \$5.90 gold per ton. Developed by 530' 2-compartment vertical shaft.

Reported that on the 350' level 200' of drifting opened ore worth up to \$35 per ton. At 435', in shaft No. 2, vein is reported to be 24' wide, and on 500' level 25' wide, 10' of it assaying \$5.31 per ton.

Equipment: includes 32 h. p. gas hoist, 55 h. p. compressor, 3,600' water pipe line, bunk and boarding houses. Property reported on by A. G. Keating.

OATMAN CRESCENT MINING CO.**ARIZONA**

Office: 25 Broad St., New York. **Mine office:** Oatman, Ariz.

Officers: Geo. W. Peirce, pres.-gen. mgr.; W. T. Esser, v. p.; Gowen Peirce, sec.-treas.; with A. G. Reynolds, directors.

Inc. 1915. Cap., 1,000,000 shares; 10c par; 650,000 issued. Security Transfer & Registrar Co., New York, registrar and transfer agents.

Property: 9 claims, 170 acres, 4 miles S. E. of Oatman, said to show 3 strong veins outcropping at surface for 3,000' in length and giving average assays of \$6.13 per ton in gold. The veins strike N. W. and dip steeply S. The Highland Chief vein, from 10-40' wide, consists of altered and brecciated wall rock, with quartz and calcite, associated with black oxide of manganese.

Development: by 112' crosscut tunnel, several shallow pits and openings. In 1916, 1,200' of drifting and tunnel work was done. Drift said to be within 200' of ore zone, June, 1917.

Equipment: includes 50 h. p. engine, compressor, jackhammers, etc. Management plans driving the tunnel to 500'. Is regarded as a promising prospect.

OATMAN GOLD MINING & MILLING CO. ARIZONA

Kingman, Ariz. Eli Hilty, pres.-mgr.; S. W. Klass, sec.

Inc. 1915, in Arizona. Cap., \$1,000,000; shares \$1 par.

Property: 10 claims, about 160 acres, in the Tom Reed Gold Road mining district, shows several well-defined veins with stringers of quartz and calcite carrying free gold.

The Kokomo vein is a fault fissure, 40' wide at surface, and said to show for 4,500' on company's ground, with strike N. 62° W. and dip 80° N. E., cutting the andesite, or occurring in a contact between rhyolite and andesite.

Development: a 500' shaft was sunk on the Kokomo vein in 1915, and crosscuts are being run N. and S.

Equipment: includes compressor and 25 h. p. hoist. Management hopes to cut the main orebody within 90' of the shaft on the 500' level. A prospect. Reported on by E. W. Brooks.

OATMAN GOLD TOP MINE ARIZONA

J. P. Loftus and J. K. Turner, of Goldfield, Nev., operators. Mine is in the Secret Pass district, 10 miles from Oatman, Ariz. Said to have sufficient gold ore to keep mill running until October, 1917.

Has 30-ton ball and amalgamating mill.

OATMAN-JUMBO M. & M. CO. ARIZONA

Oatman, Ariz.

Cap., \$150,000; shares 10c par. Paid \$65,000 in stock for property; \$50,000 worth of stock was offered the public, May, 1917, at 7½c per share.

Property: 80 acres, adjoining the United Northern and Gold Road Bonanza Mines near Oatman, Ariz., and said to carry extensions of veins in these properties. Some shallow development work reported to show assays up to \$19 gold per ton. Will be worked by tunnels.

OATMAN NORTH STAR MINES CO. ARIZONA

Oatman, Ariz. A. O. Parsons, pres., with C. E. Gilman, R. R. Moore and Lloyd Tevis, directors.

Inc. 1915, in Ariz. Cap., \$150,000; shares 10c par. Stock is listed on San Francisco and Los Angeles Exchanges.

Property: 17 claims, 250 acres, at Oatman, claimed to carry extension of Tom Reed vein system. Sinking a 400' shaft in 1916.

OATMAN SOUTHERN MINING & MILLING CO. ARIZONA

Oatman, Ariz.

Officers: S. R. Porter, pres. and treas.; B. W. McCloskey, v. p.; with R. C. Curry, directors; Mrs. J. C. Garinger, sec.

Inc. Oct. 9, 1915, in Ariz. Cap., \$100,000; shares 10c par; outstanding, 520,000. Security Transfer & Registrar Co., New York, transfer agt. and registrar. Listed on New York Curb as a prospect.

Property: 11 claims, 220 acres, in S. W. end of the Oatman camp, on the Black Range vein system.

Development: 2 inclined shafts, 64' and 108' deep, on the veins, said to show bodies of low-grade quartz ore. Shafts are 280' apart, but said to be unfavorably located for development purposes, so a new shaft was started.

No returns, 1917. Probably idle.

OATMAN SYNDICATE MINING CO.

ARIZONA

Oatman, Ariz. **Officers:** J. L. McIver, pres.-mgr.; Geo. W. Long, v. p.; C. W. Herndon, sec.-treas.

Inc. Oct. 29, 1915, in Ariz. **Cap.**, \$100,000; shares 10c; 500,000 shares issued. Valley Bank, Phoenix, Ariz., transfer agent. Operating expenses to March, 1916, were \$30,000.

Property: the Putney group, 11 claims, 4 patented, about 200 acres, 6 miles S. of Oatman, embraces about 3,500' on the main Black Range-Nellie lode system. Mine shows a quartz contact deposit surrounded by andesite, rhyolite and granite, with N. W. strike and dip of 45°.

Development: by 400' vertical shaft. Drifts are being run both ways on the vein from the 400' level.

Equipment: includes 40 h. p. hoist, 5-drill compressor and gasoline power. No 1917 returns.

OATMAN UNITED MINES CO.

ARIZONA

Oatman, Ariz. **Officers:** Chas. S. Sprague, pres.; C. C. Spicer, v. p.; L. Ashmun, sec.-treas.; J. K. Turner, cons. engr.

Inc. 1915, in Ariz. **Cap.**, \$2,000,000; shares \$1 par; 750,000 shares in treasury.

Property: 150 acres, surveyed for patent, 1½ miles N. E. of Oatman, adjoining the United Eastern on the N. and the Tom Reed on the S. W., shows 3 well-defined gold-bearing fissure veins in andesite and along andesite-rhyolite contact. The ore is oxidized and occurs irregularly.

Development: by 400' shaft, with E. and W. crosscuts under way, 1917.

Equipment: includes 5-drill Ingersoll-Rand compressor, 40 h. p. hoist and 50 h. p. engine. A prospect.

ORION MINING & MILLING CO.

ARIZONA

Office: 733 Central Bldg., Los Angeles, Calif. **Mine office:** Oatman, Mohave Co., Ariz.

Officers: J. L. Humble, pres.; C. J. Rhodes, v. p.-gen. mgr.; Wm. H. Wise, sec.-treas.; F. F. Brush, mgr., Oatman.

Inc. 1915, in Ariz. **Cap.**, \$1,250,000; increased March, 1916, to \$1,500,000; shares \$1 par.

Property: 170 acres, 70 patented, at Oatman, includes the Gold Dust group, one of the oldest gold producers in the district.

Development: by several shafts from 100' to 550' deep, a 100' tunnel, cross-cuts and drifts.

Equipment: includes 360 cu. ft. compressor, 75 h. p. electric hoist, 20-stamp mill and cyanide plant, mine buildings and dwellings. Developing at last accounts. No late returns.

PITTSBURG MINING & MILLING CO.

ARIZONA

Oatman, Ariz. **Officers:** L. P. Hansen, pres.-treas.; M. J. Walsh, v. p.; S. R. Porter, asst. sec.; above are directors; Jas. McLachlan, sec.

Inc. Jan. 31, 1912, in Arizona. **Cap.**, \$1,500,000; outstanding April 1, 1916, \$723,900; shares \$1 par, assessable. Security Transfer & Registrar Co., New York City, transfer agent and registrar. Listed on New York Curb as a prospect.

Balance sheet of April 4, 1916, shows assets of \$1,500,000, which includes: mining claims, \$504,000; unissued stock, \$776,700; discount on stock, \$169,487; development and construction account, \$46,142; general expense, \$3,671.

Property: 11 claims, 220 acres, 1 mile W. from Goldroads and 1½ miles

N. W. from Oatman, is said to show 3 distinct veins. The main vein strikes E.-W., dips N. 80°, and has a width of 6' to 40' along an outcrop said to be traceable for over 5,000', in which distance it shows two faults. Vein filling is chiefly quartz, with some calcite. Paralleling the main vein and 20' from it there is another vein 4' to 8' in width and nearly vertical, which is supposed to intersect the main vein. Near the center of the property these two veins merge and form one vein 40' wide. A third or footwall vein parallels the main vein and has a similar dip; at east end of property this vein is 200' back in the footwall; but is supposed to join main vein near center of property.

Development: 300' double compartment vertical shaft, sunk on E. end of Pittsburgh claim between main and hanging-wall veins; water prevented sinking deeper; at this level 125' of work has been done, but to date the ledge where opened has been low-grade. Total workings, about 1,000'.

Equipment: includes a 20 h. p. gasoline hoist.

RECORD LODGE MINING CO.

ARIZONA

J. J. McCarthy, supt., Oatman, Ariz.

Officers: Chas. A. L. Gehrman, pres.; Lee R. Myers, v. p.; L. L. Wallace, sec.-treas., with J. J. McCarthy, directors.

Inc., Jan., 1916, in Arizona. **Cap.**, \$250,000; shares 25c par.

Property: 10 claims, located on Hardy vein.

Equipment: hoist, compressor, etc.

Developing since January, 1917. An incline shaft is being sunk on the vein.

RED LION MINING CO.

ARIZONA

Address: Oatman, Ariz. Frank W. Strong, pres. Mine lies between the Ben Harrison and Gray Eagle claims, supposedly on the Tom Reed vein.

A 500' shaft is to be sunk and machinery installed, 1917.

SECRET PASS GOLD TOP MINING CO.

ARIZONA

Address: J. P. Loftus, 1615 Martel Ave., Hollywood, Cal.; and Kingman, Ariz.

Officers: J. P. Loftus, pres.; C. S. Sprague, v. p.; G. P. Loftus, sec.-treas.; with F. Kemp, J. K. Turner and S. L. Carpenter, directors.

Inc. May 30, 1916, in Arizona. **Cap.**, \$100,000; shares 10c par, non-assessable; 587,000 issued.

Property: 5 claims, 100 acres, in Oatman (San Francisco district), Mohave County, Ariz. Open cuts and other shallow workings show 5,000 tons of \$6 to \$15 gold ore developed.

Equipment: 30-ton plant, including 3' Hardinge ball mill.

SUN DIAL GOLD MINING CO.

ARIZONA

A. F. Carper, supt., Oatman, Ariz. Is one of the big crop of wildcats that have been born in Oatman since the strike in the United Eastern.

SUNNYSIDE MINING CO.

ARIZONA

Office: Oatman, Mohave Co., Ariz.

Officers: C. H. Palmer, Jr., pres.; F. A. Keith, v. p.; R. I. Rogers, sec.-treas., with S. W. Mudd, Philip Wiseman, P. L. Mullen and M. R. Sullivan, directors. C. R. McCollan, supt.

Inc. in Ariz. **Cap.**, \$1,500,000; shares \$1 par.

Property: Sunnyside group of 3 claims, 2 miles S. E. of Oatman, said to have a vein with assay values of from \$2 to \$8 gold per ton. Development proceeding on vein at 400' level, considered promising. Property is in the development stage.

TELLURIDE M., M. & DEV. CO.

ARIZONA

Office: Oatman, Ariz.

Officers: G. W. Long, pres.; J. L. McIver, sec.-treas. and mgr.; H. Y. Basham, asst. sec.; with W. Matthie and P. C. McDonald, directors.

Inc. 1915, in Ariz. **Cap.**, \$220,000; shares 20c par; treasury shares, May 1, 1917, 382,266.

Property: 10 claims, 200 acres, at Oatman, Mohave Co., said to carry gold ore of milling grade.

Development: by 535' shaft with crosscutting and drifting on 475' and 535' levels.

Equipment: includes 40 h. p. White & Middleton engine, double-friction hoist, Fairbanks-Morse and Chicago Pneumatic compressors, mine buildings, etc.

Mine examined in Jan., 1917, by Etienne A. Ritter, who discusses the geology and development in 13 pages. He suggested diamond-drilling, and considers that the property is well situated, also that some important bodies of commercial ore should be uncovered. Some fair ore has recently been opened.
TIMES MINING CO.

ARIZONA

Oatman, Ariz. **Officers:** Z. J. Bergeron, pres.; W. E. Gray, v. p. and gen. mgr.; F. H. Lathrop, sec.; L. L. Wallace, treas.; preceding and L. R. Myers, directors.

Inc. 1915, in Ariz. **Cap.**, 1,500,000 shares; 25c par; non-assessable; outstanding, 768,000 shares. Listed on San Francisco Stock Exchange.

Property: 12 claims, about 240 acres, in the Oatman district, said to show an almost vertical fissure vein occurring in granite porphyry, andesite and rhyolite. Pay ore occurs in shoots and values are gold.

Development: includes shaft, which it is planned to sink to 550'. Crosscutting reported to have developed ore of both shipping and milling grades.

Equipment: includes a 40 h. p. hoist, 500' compressor, 80 h. p. engine, power drill sharpener, etc., costing \$28,000.

Work was suspended July, 1916, on account of financial condition.

In April, 1917, the property was sold at sheriff's sale for \$9,000 to the Grapevine Springs Water Co. of Oatman. This is apparently the finish of one of the 200 companies born during the Oatman boom.

TOM REED APEX MINING CO.

ARIZONA

Address: Oatman, Ariz.

Is a prospect, on which company was developing a strong vein exposed on Ricebird claims. On Feb. 16, 1916, 50,000 shares were offered at 15c each.

Letters returned unanswered in July, 1917.

TOM REED GOLD MINING CO.

ARIZONA

Office: 604 Chamber of Commerce Bldg., Pasadena, Calif. **Mine office:** Oatman, Ariz.

Officers: Chas. Mushrush, v. p.; W. J. Lawrence, sec.; C. N. Post, treas.; with C. L. Wohld, directors. W. B. Phelps, mgr.; H. P. Flint, metallurgist.

Inc. Dec. 17, 1906, in Arizona. **Cap.**, \$1,000,000; shares \$1 par; outstanding, 909,555. No bond issues, mortgages or indebtedness. Listed on Los Angeles Stock Exchange.

Earnings in 1916 were \$486,678, and operating expenses, \$432,000.

Dividends: aggregate \$2,600,000. The first dividend of 6% was paid in 1908. In 1910 the present 20-stamp was built and a second dividend of 3% was paid. Since then dividends have averaged 4½% per month for five years. In 1916, 10½c per share was paid.

History: the mine was discovered in 1900, 20 years after the discovery of the Gold Roads mine nearby. Early development proved unsuccessful and in 1904 the mine was sold for \$75,000, one-tenth cash. The purchasers failed to meet payments and the property passed to the Title Insurance & Trust Co. of Los Angeles, representing creditors, for \$45,000. The present company was formed and deeper developments undertaken. The Ben Harrison shaft was then 150' deep and the Tom Reed 90'. The first shoot of commercial ore was encountered on the 150' level.

Property: 27 claims, in three distinct groups, 374¼ acres. Also owns water

rights and mill sites in Cottonwood Canyon. Thus far most of production has been from the Tom Reed group, but development on the Black Eagle group promises early production.

At 400' depth in the Aztec claim there has been opened 1,000' of mill ore.

The claims cover the outcrop of the big Tom Reed lode, one of the typical quartz-adularia veins of the district, which has been reopened and crushed by strike faulting with enrichment of the primary ore. The oreshoots persist to the deepest level developed (1,400'), with no change in size or value.

Ore: is gold-bearing; average value about \$20 per ton.

Development: to a depth of 1,400', vertical, with total workings of 14,850'. Ore reserves are estimated at 180,000 tons, averaging \$10 per ton.

Equipment: working shaft has a 150 h. p. electric hoist. Power is supplied by the Desert Light & Power Co., Kingman. Also includes 5 other mine hoists and compressors with capacity of 2,000 cu. ft.

The mill rebuilt in 1917, of 300 tons capacity, has ball mills, classifiers and counter-current decantation system of cyanidation. Mine has machine shops, supply store, hospital, recreation hall, etc. Present equipment cost more than \$300,000.

Production: for year ending March 31, 1916, \$486,678, against \$614,333 in 1915 and \$1,002,284 in 1914. Recovery was 97% from 46,000 tons of \$11.03 ore, at cost of \$6.48 per ton.

Property is a good one, and equipment complete. During the past 2 years there have been many changes in the Tom Reed management, the last being in Sept., 1917. It is now reported that development will be modified. Rumors of consolidation with the United Eastern again are current. The new mill is working well and profitably treating lower-grade ore, but management is not so liberal about information as formerly.

TOM REED, JR., MINING CO.

ARIZONA

Office: Citizens' Bank Bldg., Los Angeles, Calif. **Mine office:** Oatman, Ariz.

Officers: E. S. Moody, pres.; J. L. Mason, v. p.; C. S. Baxter, sec.; with H. G. Peabody and W. S. Morse, directors.

Inc. 1909, in Ariz. **Cap.**, \$1,000,000; shares \$1 par, non-assessable; issued 786,226 shares. Annual meeting in Nov. Listed on Los Angeles Stock Exchange.

Property: 6 unpatented claims, about 120 acres, in the San Francisco district, Mohave Co., ½ mile from Oatman. The fissure vein occurs in andesite-rhyolite and varies in width from 4' to 12'. Pay ore occurs in shoots, and is said to run from \$4 to \$15 per ton in gold.

Development: by inclined shaft, 300' deep. Lateral workings amount to 330'.

Equipment: includes 2 hoists, a 344' compressor, with gasoline power, shaft house, etc. A larger hoist has been provided to sink a new shaft to 500'. Is a prospect.

UNITED EASTERN MINING CO.

ARIZONA

Office: Oatman, Ariz.

Officers: Philip Wiseman, pres.; F. A. Keith and G. W. Long, v. p's.; R. I. Rogers, treas.; with S. W. Mudd, J. L. McIver, W. K. Ridenour, D. C. Jackling and R. C. Nowland, directors; W. K. Keith, sec.; J. A. Burgess, supt.

Inc. in 1914, in Ariz. **Cap.**, \$1,500,000; shares \$1 par; outstanding, 1,360,000; non-assessable. Equitable Trust Co., New York, transfer office. Listed on Los Angeles Stock Exchange and on New York and Boston Curbs.

Dividends started in July, 1917 at rate of 5c per share monthly, equal to \$68,150. To October, distributions totaled \$204,450.

Property: 27 claims, 800 acres, patented, at Oatman, Mohave County, ad-

joining the Tom Reed mine on the N., and covering the N. W. extension of Tom Reed vein.

In April, 1917, the Big Jim mine adjoining was purchased for 160,000 United Eastern shares, or over \$800,000. The Sunnyside mine, 3 miles away, is also owned by United Eastern.

Development: main shaft 790' deep, with crosscuts opening the vein on the 303', 465', 565' and 665' levels. On the 3 latter levels the orebody was 42' wide, 400' long and 200' high, equal to 320,000 tons in June, 1917; and in August on the 665' level the shoot was opened for 650'. In the Big Jim there is reported to be ore worth \$3,000,000; and in the Sunnyside there is 15' of ore on the 400' level. On the 565' level of the United Eastern a 4 to 7' intrusion reduced the ore value in June.

Geology: calcite vein, irregularly banded with quartz, in andesite. Geology of the district is complex and has been studied by many engineers. Veins outcrop either as prominent silicified ribs in the softer andesites, or as shallow depressions in quartz-porphry, all showing more or less brecciated rock fragments cemented by calcite or quartz. Ore occurs as a series of lenses pinching vertically and horizontally within the vein-filling. Gold is seldom found near the surface in commercial quantities. None of the mines are wet.

Equipment: complete, with electrically driven hoists, compressors, and 200-ton mill, which is to be enlarged. It includes Marcy ball mills, tube mills, and the counter-current system of cyanidation.

The United Eastern mine and mill are described by Otto Wartenweiler in the November, 1917, Bull. of the A. I. M. E. The machinery includes an Allis-Chalmers double-drum 150 h. p. electric hoist, 150 h. p. 888 cu. ft. Ingersoll-Rand compressor, 100-ton coarse ore bin, No. 6 Tel-smith gyratory crusher driven by 50 h. p. motor, 400-ton mill ore bin, 2 No. 64½ Marcy mills driven by 100 h. p. motors, Callow belt screens, Dorr classifiers, three 5x6' Allis-Chalmers ball-mills driven by 75 h. p. motors, Callow tanks, 5 Dorr 40x12' thickeners, 4 Dorr 24x14' agitators, 5 diaphragm pumps, Krogh centrifugal pumps, Merrill classifying and zinc dust precipitating presses, refinery and the necessary cyaniding accessories. The whole surface equipment including water system, houses, roads, etc., cost \$248,468.

Production: for first half of 1917, 37,565 tons of \$21.12 ore were treated, yielding 96%. Profit for the period was \$491,130. Costs are about \$6.50 per ton.

This is the big gold mine whose splendid orebody caused the Oatman boom. Its discovery and development is the result of study of geological conditions and intelligent mine exploration. In March, 1915, ore was first found on the 400' level; in Jan., 1917, the mill was treating 200 tons daily; and in July dividends commenced, with every chance of being continued indefinitely.

UNITED NORTHERN MINES CO.

ARIZONA

Office: 434 I. W. Hellman Bldg., Los Angeles. **Mine office:** Oatman, Ariz.

Officers: C. T. Howland, pres.; W. H. Thomas, sec. and treas.

Inc. 1915, in Ariz. Cap., 1,000,000 shares; par 10c; in treasury, 500,000.
Listed on Los Angeles Stock Exchange.

Property: the Lion, Kennedy Fraction, and Poorman claims, 40 acres, between United Eastern and Gold Road mines, N. of west end of Fessenden claims.

Equipment: 25 h. p. gasoline hoist, compressors, etc. Sinking 2-compartment shaft to explore two veins. In Dec., 1916, \$2 to \$12 ore had been opened on 400' level, the vein being 50' wide.

UNITED WESTERN MINES CO.

ARIZONA

Address: Oatman, Ariz.

Officers: W. K. Ridenour, pres. and treas.; H. E. Woods, v. p., with S. E. Vermilyea, E. H. Newland and M. Lines, directors.

Inc. in Arizona. **Cap.**, \$1,000,000; shares \$1 par; in treasury, 600,000. Listed on San Francisco and Los Angeles Stock Exchanges.

Property: 4 claims, 65 acres, one mile S. W. of Oatman, Mohave Co., crossed by main road connecting Gold Road and Oatman, and adjoining property of the United Eastern Company along what appears to be a continuation of the main ore zone of that property. Also owns the Oofy Goofty group and water rights 4 miles N.W. of Oatman, total, 125 acres. Ore is free-milling gold, containing little silver. Pay ore occurs in shoots of undetermined extension. Development shows strong vein on the upper levels but below milling grade. On 505' level the vein is large, wet, and reported to show milling value.

Development: comprises a shaft 500' deep with crosscuts at 200' and 500'. At the latter depth a heavy flow of water from the vein temporarily stopped work, 1916.

Equipment: includes 50 h. p. hoist, compressor, buildings, etc.

Property a good prospect, but drifting alone can determine its value.

VIVIAN MINING CO.

ARIZONA

Office: Merchants' National Bank Bldg., Los Angeles, Calif. **Mine office:** Oatman, Ariz.

Officers: E. M. Ross, pres.; G. A. Hancock, v. p.-gen. mgr.; E. A. Olson, sec.; the foregoing and E. P. Thom, C. Leonhardt, R. Deving, directors. Farmers' & Merchants' National Bank, treas.

Inc. in Cal. **Cap.**, \$500,000; shares \$1 par; assessable; outstanding, 410,292. No bonded indebtedness. Annual meeting, first Saturday in July.

Property: 11 claims, 183 acres, 2½ miles W. of Oatman, Mohave Co.

Development: 450' shaft; workings, 5,400'.

Equipment: two Fairbanks-Morse 40 h. p. oil engines, steam compressor, 8 h. p. hoist, electric light plant, buildings, etc. Developing in 1917, being financed by assessments.

WEST GOLD ROAD MINING CO.

ARIZONA

Office: Crocker Bldg., San Francisco, Calif.

Officers: T. C. Petersen, pres.; R. L. Mann, v. p.; Gurdon Bradley, sec.

Inc. in Calif. **Cap.**, \$1,000,000; shares \$1 par.

Property: 5 claims, 63 acres, near Oatman, said to contain the W. extension of the Gold Road mine.

Development: consists of main shaft 455' deep, and several crosscuts and drifts. Stock unlisted.

WINCHESTER GOLD MINING CO.

ARIZONA

Address: L. E. Hesla, Prescott, Ariz.

Officers: L. E. Hesla, pres.-treas.; A. W. Bark, v. p.; C. F. Paul, sec., with C. J. Dalken and O. H. Hesla, directors.

Inc. July, 1915, in Arizona. **Cap.**, \$1,500,000; shares \$1 par; non-assessable; 535,000 outstanding. Annual meeting, first Monday in July.

Property: 6 claims and 2 fractions, 140 acres, 2 miles W. of Oatman, Ariz. During 1916 owners spent \$3,500 on prospecting and report good surface results. A lode 17' wide assayed from a trace to \$2.30 gold per ton at depth of 50'. Another 30' shaft, 1,000' away, opened \$7 ore. Placer work years ago yielded considerable gold on part of the property.

PARKER, YUMA COUNTY

ARIZONA EMPIRE COPPER MINES CO.

ARIZONA

Mine office: Parker, Yuma Co., Ariz. W. A. Moses, pres.; Gen. E. Bouton, v. p.; L. H. Knowlton, sec.; Newton Evans, treas.; preceding officers and F. X. Pfaffinger, directors; Jas. H. Watson, gen. mgr.

Inc. Aug., 1909. **Cap.**, \$5,000,000; shares \$5 par.

Property: bought of Carnation Mining Co. 41 contiguous claims, 820 acres, about 10 miles north of Parker and 3 miles from Eagle Landing, on the Colorado River, include the Eagle, Carnation, Belcher and Cyclone groups. Company also has 160 acres of ranch lands on the Colorado River, including Eagle landing, held for a smelter site. Geological conditions are markedly similar to those at the Planet and Clara mines. The property, as a whole, has about 6,000' of workings, deepest 300', showing a large amount of copper carbonate, with sulphide zone not yet reached. On the 200' level of the Carnation shaft is an orebody said to assay 5% copper and \$5 gold per ton, carrying a 10' paystreak estimated to average 10% copper and \$6 gold per ton.

Surface showing is interesting, but development work is disappointing. Shallow excavations show irregular areas, often 50' wide, well stained with copper carbonate; much of it could be shipped. This green carbonate ore has been carefully piled and makes beautiful patches of color on the desert scenery. Development usually reveals a sheared zone, copper-stained, but only a few feet wide. Throughout this region there are occasionally encountered pockets of rich gold ore with the copper. These seem to be lenses interbedded in the schist, and while one or two important orebodies have been found in the region, no mines of importance have been developed. Mines reported taken over by a Los Angeles syndicate and shipments being made to Hayden smelter, Feb., 1917.

ARIZONA MCGINNIS COPPER CO.

ARIZONA

Address: Parker, Ariz.

Officers: B. L. Vaughn, pres.-gen. mgr., San Diego, Calif.; E. C. Fleet, sec. C. E. Boydston, supt.

Inc. 1916, in Calif. **Cap.**, \$1,000,000; shares \$1 par.

Property: 13 claims, adjoining the holdings of the Empire Copper Co., about 12 miles N. W. of Parker, Yuma County, developed by 200' shaft and a tunnel, 200' long, July, 1917. Ore occurs as a contact deposit in limestone and quartz schist, running N. 65° E., with 30-70° dip. The orebody is reported to be 50' wide and 200' long, opened to depth of 20' on surface, with 2' shoot of shipping ore containing cuprite, malachite and chrysocolla, and said to run 10% copper and \$8 gold.

Equipment: includes 35 h. p. oil engine, compressor and 1,100' aerial tram. Several carload shipments made in 1917. Management plans sinking shaft and driving tunnel to get below the surface ore.

ARIZONA REVENUE COPPER CO.

ARIZONA

Officers: David F. Johnson, pres., Phoenix, Ariz.; W. L. Williams, v. p.; Oscar M. Spence, sec.-treas., Parker, Ariz., with A. J. Beecher and Paul C. Thorne, directors. H. A. Morse, supt.

Inc. Dec., 1916, in Arizona. **Cap.**, \$2,500,000; shares 50c par, of which 2,200,000 shares were given the owners for the claims and 200,000 shares offered to the public, March, 1917, at 15c.

Property: 72 claims, about 1,400 acres, in Cieniega district, Yuma County, includes the Echo, Milton, Cecil, El Moline, Revenue and Elephant groups.

Development: amounts to about 3,000' of underground workings, at a cost of \$40,000. A 185' shaft on the Echo group is said to show ore running better than 8% copper. The Revenue group is developed by 2 incline shafts, 285' and 150' deep. Ore consists of hematite containing oxidized copper minerals; and occurs as a replacement of limestone lenses in schistose rocks. Surface showings are promising and warrant further development at depth. Geology of the district fully described in U. S. G. S. Bull. 451.

Ore reserves: about 400 tons of high-grade ore on the dumps. Shipments to begin in 1917. Reported, June, 1916, that A. S. & R. had option on the property. Property formerly owned by E. S. Osborne.

ARIZONA STANDARD COPPER CO.**ARIZONA****Address:** J. T. Carrigan, mgr., Parker, Arizona.**Officers:** T. Spellacy, pres.; O. M. Spence, sec.-treas.; with C. Leonardt and J. P. Sweeney, directors.**Inc.** 1917. **Cap.**, \$5,000,000.**Property:** 21 claims, 420 acres, 14 miles E. of Parker, and about 4 miles from Midway, on the Swansea Railroad. Claims reported to show surface indications of a disseminated copper deposit, which is interesting if true.**Development:** by 3,000' of underground workings. Plans prospecting at depth by means of churn drills.**BILLIE MACK MINING CO.****ARIZONA****Address:** W. Dowe, mgr., Parker, Yuma Co., Ariz. Operating property of Ruby Gold & Copper Co.**Property:** the Billy Mack mine, 8 miles from Parker, Ariz.**Geology:** an area of pre-Cambrian limestone and schist, whose beds dip steeply N. W. Ore occurs as a contact vein between schist and limestone, the deposit being an irregular replacement with no known connection between the small ore pockets. Ore consists chiefly of malachite, chrysocolla and specularite with porous quartz. In the main mine workings a bunch a few feet across consisted of a mass of needle malachite shot through with threads and stringers of gold. As a rule the ore, though often rich, occurs in short and very thin bunches, and so far as known does not afford a basis for profitable mining on a large scale.**Development:** by 200' shaft with levels at 100', 150' and 200' below surface, and by several lesser prospect tunnels and inclines.

In 1917 shipments of high-grade ore were made to the smelter. A 75-ton mill was erected early in the year.

CONTINENTAL COPPER & GOLD MINING CO.**ARIZONA****Office:** 319 Douglas Bldg., Los Angeles, Cal.**Officers:** Jas. R. Haddock, pres.; Coyle J. Tracy, v. p.; Herbert T. Muzzy, sec.; Fred Knoblock, treas.; preceding, with John Breiner, E. P. Clapp, J. F. Halsted, directors.**Inc.** June, 1905, in Arizona. **Cap.**, \$1,000,000; shares \$1 par, non-assessable; issued, \$900,000. Annual meeting, first Saturday in November.**Property:** 6 claims, patented, 120 acres, in the Bill William, Yuma Co., district, shows slates, schists and limestones, with igneous intrusives, said to carry 12 fissure veins and contact deposits of which one, of 8' estimated average width, traceable 1,500', has been developed by a 100' shaft, a 429' cross-cut tunnel and 20' and 161' drift tunnels, with 700' of workings, showing occasional oxidized ores, estimated to average 10.87% copper and \$4 gold per ton.

Property leased in Jan., 1916, to H. T. Muzzy, who made ore shipments to Selby smelter at San Francisco. Several lenses of 36% ore are said to be opened up.

EMPIRE ARIZONA CONSOLIDATED CO.**ARIZONA****Address:** Milton Sutherland, supt., Parker, Ariz.**Officers:** John E. Coffin, pres., 312 Merchants' Nat'l Bank, Los Angeles, Calif.; Truman Berry, v. p.; C. A. Musselwhite, sec.-treas.; E. W. Brooks, cons. engr. Company is the successor of Empire Arizona Copper Co.**Inc.** Feb. 1, 1917, in Arizona. **Cap.**, \$2,500,000; shares \$1 par; 1,270,000 issued. No bonds. Annual meeting in February.**Property:** 34 claims, patented, in the Cienega mining district, Yuma Co., Ariz., about 12 miles from Parker, is under lease and bond for 15 years at a royalty of 15% of the net returns. Company is reported to have an option to purchase property within three years at \$300,000.

Claims are said to show 3 large veins occurring in a porphyry limestone-

schist contact, with outcrops of iron oxide carrying copper values. The iron is hematite, carrying gold values, and the copper occurs as oxides and carbonates. Shipping ore was found at 100' in depth. Orebody said to be 4' to 25' wide, and to average 2.7% copper, 49% insoluble, 17% iron, 12-20% lime.

Development: by leasers during many years consists of shallow shafts, open cuts and tunnels. Company has sunk a 300' shaft on the Carnation claim and a 240' two-compartment shaft on the Eagle's Nest. Several adits have also been driven for over 350' on the veins and are said to show copper-gold values. Average assays are given as 5% copper and \$3 to \$8 gold.

Equipment: includes 25 h. p. hoist and 6-drill compressor. Management plans sinking Eagle Nest shaft to 1,000' level, 1918.

Production: shipping about 30-35 tons daily of 6.3% copper ore, May and June, 1917.

JUNIATA GOLD & COPPER CO.

ARIZONA

Office: 315 South Broadway, Los Angeles, Cal. **Mine address:** Parker, Yuma Co., Ariz.

Officers: P. W. Powers, pres.; E. S. Field, v. p.; Dalton S. Patterson, sec-treas.; H. B. Ailman, supt.

Inc. Oct. 29, 1907, in Arizona. **Cap.**, \$1,000,000; shares \$1 par.

Property: 10 claims, 200 acres, lying between the Gray Eagle and Carnation mines, in the Seneca district about 9 miles N. E. of Parker, on the E. side of the Colorado River. Claims show gray micaceous schists with interbedded limestone. The schists dip about 45° and are cut by shear zones in which copper ores occur.

Development: by 200' shaft with 2 prospect shafts reported to expose 8' of ore carrying 4% copper and \$9 gold per ton. A second vein said to be 18' wide is reported to carry 2½% copper and \$6 gold. Property is a prospect. No recent returns secured.

MAMMON GOLD & COPPER CO.

ARIZONA

Address: W. M. Boyce, mgr., Parker, Yuma Co., Ariz.

Officers: E. S. Osborne, pres.; J. M. Patterson, v. p.; C. Bowman, sec.; H. H. Stone, treas.

Property: 32 claims in Senator district, 10 miles E. of Parker. In about 1904 several carloads of oxidized copper ore were mined. Property passed through several hands until present owners acquired it.

Geology: ground largely covered with basalt. Schists show in water-courses and on lower slopes. The copper and accompanying hematite occur in distinct but small fractures, also in a persistent bedded or blanket deposit, apparently conformable to the overlying gneiss. The bedded vein has been the source of the ore mined, and must be relied upon as the main source of ore. Where fissures cross the orebed, ore occurs in fair quantities.

Development: apart from shallow shafts, consists of 3 short tunnels, connected by stopes. No. 3 produced some ore; No. 2 is not promising; No. 1 workings, below No. 2, show the downward extension of the orebed. An incline shaft was down 175' in June, 1917, from which crosscuts have opened gold-copper ore. Churn-drilling is under way to cut the bedded deposit and the cross-fissure. Examined by W. H. Weed in 1917.

Production: about 500 tons, shipped at various times in past 5 years, ore averaging well in copper.

Is a property worthy of careful exploration by churn-drilling.

RED METAL COPPER CO.

ARIZONA

Address: Parker, Ariz.

Officers: Dr. A. H. Littlefield, pres.; Lee Pritt, v. p.; Fred M. Hall, sec.; O. M. Spence, treas., with John Pritt, directors.

Property: adjoins the Western Arizona Copper Co. holdings on the S.

and is said to show a contact deposit of porphyry with an iron gossan carrying gold and copper values.

Development: by 225' shaft. Company offering stock at 25c per share, April, 1917, to procure funds for further development.

RUBY GOLD AND COPPER CO.

ARIZONA

Property near Parker, Ariz. Apparently acquired by the Billie Mack Mining Co., which see.

WARDWELL & OSBORNE COPPER MINES CO.

ARIZONA

Dead. Property lost by failure to do assessment work, and subsequently relocated and now held by Mammon Copper Co., which see. Described in Vol. XII.

WESTERN ARIZONA COPPER CO.

ARIZONA

Office: Miami, Ariz.

Officers: N. D. Brayton, pres.; J. P. Downey, v. p.; C. D. Duncan, sec.; F. E. Gassaway, treas.; G. R. Stewart, gen. mgr.; H. M. Foster, atty.

Property: 11 miles from Parker, on the Arizona side of the Colorado River. In April, 1917, two cars of ore averaged 12% copper and \$4 gold per ton.

YUMA CONSOLIDATED MINING CO.

ARIZONA

Address: F. W. Dunn, mgr., Quartzite, Ariz.

Property: placer ground in Quartzite district, Yuma Co., Ariz. Late in 1916 a dry treatment plant, including a Lidgerwood shovel, grizzly, Quenner crusher and Stebbing dry concentrators of 2,000 yards daily capacity was erected at a cost of \$65,000. Shortage of water is the reason for this type of plant. As much as 97% of the gold was said to be extracted. Gravel containing \$2, \$6.65 and \$12 per yard was reported as available. Nothing has been heard of the venture for nearly a year.

PATAGONIA, SANTA CRUZ COUNTY

AMERICAN BOY MINE

ARIZONA

Owned by Geo. Clarke, J. Petersen and J. B. David, Patagonia, Santa Cruz Co., Ariz.

Property: 6 claims near Patagonia, shows several veins from 6" to 18" wide. Ore contains gold, silver, copper and lead, and is said to average \$5 gold, 12 oz. silver and 10% copper.

Development: by an 80° incline shaft, 120' deep, and a 370' tunnel that cuts the bottom of shaft. On the 40' level 200' of drifting has been done, on the tunnel level 250'. The small shipments made have consisted of ore extracted by development work. Assessment work only being done.

BRADFORD MINE

ARIZONA

See Sonoita Copper Co.

CASANECA-DALY MINING & REDUCTION CO.

ARIZONA

Amadoville, Santa Cruz Co., Ariz. A. D. Daly, supt.

Property: 7 claims, 140 acres, in the Tyndall mining district, Santa Rita Mountains, Santa Cruz Co. Sulphide ore said to contain copper, gold, silver, lead and molybdenum, occurs in orebodies 3 to 8' wide in monzonite.

Development: by 600' tunnel, said to have blocked out 50,000 tons ore.

Equipment: includes a 50-ton concentrator, that started operating in Dec., 1915. Twenty men employed. Management plans driving a 1,000' development tunnel and increasing mill equipment.

CONSOLIDATED ARIZONA COPPER CO.

ARIZONA

Fred J. Miller, supt., Mowry, Ariz.

Property: 12 claims, in Patagonia district, with 60' shaft, said to show high-grade chalcopyrite and chalcocite ore.

DUQUESNE MINING & REDUCTION CO.**ARIZONA**

Main office: 53 State St., Boston, Mass. **Mine office:** Duquesne, Santa Cruz County, Ariz.

Officers: Geo. Westinghouse, Jr., pres.; H. H. Westingham, v. p.; W. Grosvenor Calkins, sec.-treas.; Murray G. Day, gen. mgr.

Property: the Duquesne or Westinghouse mines, comprise half a dozen mines, 84 claims, patented, 1,000 acres, near the Pride of the West and 5 miles south of the Mowry, in the Washington camp, Patagonia mining district, Ariz. Shows a contact deposit between limestone and granite-porphry, carrying argenteriferous and auriferous chalcopryrite, sphalerite, galena and pyrite, opened by a shaft 650' deep.

The Pride of the West and the Washington mines have large bodies of complex ore which have been the subject of numerous experiments in wet, electrolytic, magnetic, dry and other systems of concentration for many years past. At present the workings on the Bonanza mine are 650' deep and the Duquesne shaft 120' deep. The Bonanza shaft is equipped with a 50 h. p. electric hoist and an Ingersoll compressor. The Duquesne shaft has a 12 h. p. gasoline hoist.

Mill and oil-flotation installed 1917.

The mine is shipping to the Douglas-Arizona smelter, shipments running about 16% copper and 5 oz. silver per ton.

Operations, 1917, were very successful, the company's debts being paid off and a surplus acquired. The property and its history, geology, etc., is very fully described in U. S. Geological Survey, Bull. 582, pp. 321-334; 1915.

FLUX MINE**ARIZONA**

R. R. Richardson, owner, Patagonia, Ariz. Mine formerly owned by Hardshell-Flux Mng. & Dev. Co., dissolved in 1910. Worked by owner, 1917, and shipping 300 tons of lead-silver ore monthly.

HAPPY JACK MINING & REDUCTION CO.**ARIZONA**

Office: 530 Land Title Bldg., Philadelphia, Pa.

Mine office: Patagonia, Santa Cruz Co., Ariz.

Officers: Alfred W. Barnett, pres. and gen. mgr.; W. H. Barnett, v. p.; Henry W. Scattergood, sec.-treas.; preceding, with Martin Stotz and Theo. Myers, directors.

Inc. Oct., 1908, as successor of Happy Jack Mining Co., in Arizona. **Cap., \$1,000,000;** shares \$1 par, fully paid and nonassessable; issued, 304,709 shares.

Property: 9 miles from Patagonia, shows several veins, carrying silver-lead ore with gold and copper values.

Development: by 3 tunnels, longest 950'. Total development work, 4,000.'

Has shipped considerable ore averaging 42% lead, 2½% copper, 20 oz. silver and \$2 gold. Several hundred tons of concentrating ore reported on dump.

Assessment work only done. Is considered promising.

HARDSHELL MINE**ARIZONA**

R. R. Richardson, owner, Patagonia, Ariz. Mine formerly worked by the Hardshell-Flux Mng. & Dev. Co., dissolved in 1910.

Ore is silver with some lead, copper and gold values. Mine bonded, 1917, and shaft will be sunk to 500'. Concentrator to be installed.

HAVALINA MINING CO.**ARIZONA**

Sold its Santa Nino property, Patagonia mountains, S. W. of Duquesne, Santa Cruz Co., Ariz., to J. Wells Smith, Feb., 1913. Property was being developed by 800' crosscut tunnel to reach a rich copper shoot said to have been found in the mine. Claims said to have a big showing of molybdenum ore. Litigation has stopped work.

HOSEY GROUP**ARIZONA**

Owned by W. B. Ramsdell and operated by Colin Timmons.

Property: 7 claims, including the Augusta mine, about 6 miles from Patagonia. The Augusta has 1,000' of development showing 3 veins, 3-15' wide, carrying copper, gold and silver. Assessment work in 1915 opened up several rich payshoots and the management is sinking a new shaft about 300' east of the old one.

IVANHOE MINE**ARIZONA**

Patagonia, Santa Cruz Co., Ariz. Formerly owned by Ivanhoe Mining Co., which has been dissolved. Property now owned by A. H. Ives, of Minneapolis, and J. E. Hurd, who, in 1915, did assessment work only.

Property: the Ivanhoe mine and various claims, 25 in all, unpatented, 500 acres, in the Wrightson district, 4 to 6 miles S. W. of Patagonia, the nearest rail point. The group shows rhyolite, andesite and diorite, with brecciation zones carrying orebodies, of which 5 are estimated by owners to average 27' in width, carrying chloride, silver ore, gray copper and chalcocite, estimated by management to average 16% copper, 6% lead and 225 oz. silver per ton.

Development: by the 200' Commercial shaft, with considerable cross-cutting, developing, it is said, large bodies of milling ore. There are also several tunnels, with 2,700' of workings, estimated to show 100,000 tons of ore.

Equipment: includes a 70 h. p. steam plant with a 50 h. p. hoist good for 1,000' depth. There are 5 buildings, and water is supplied by a 6 h. p. gasoline pump.

MANSFIELD MINING & SMELTING CO.**ARIZONA**

Office: 303 Railway Exchange Bldg., Kansas City, Mo. **Mine office:** Patagonia, Santa Cruz Co., Ariz.

Officers: Frank D. Reasor, pres.; H. A. Sutermeister, v. p.; C. E. Sweet, sec.; Chas. L. Cookson, treas.; preceding with Harry J. Richards, A. W. Safford, and A. E. White, directors.

Inc. May 26, 1906, in Arizona. **Cap.**, \$8,000,000; shares \$1 par, non-assessable; issued \$7,156,905. Bonds, \$100,000 authorized, at 6%, all outstanding. Annual meeting second Monday in January. Company owns no mining property, but in the reorganization proceedings, 1914, acquired stock interests in the Ruby Copper Co. and Southern Arizona Mining Co. See Vols. VIII and XI, Copper Handbook, for early history.

MORNING GLORY MINE**ARIZONA**

Chas. B. Wilson, owner and manager, Patagonia, Santa Cruz Co., Ariz.

Property: 12 claims, 240 acres, 12 miles from a railway, in the Harshaw district of the Patagonia mountains. Claim said to show 4 veins 6' wide in limestone and porphyry, carrying sulphide ore, estimated by owner to average 3% copper, 3 oz. silver, 60c gold, 35% iron and 35% sulphur per ton. A shoot of zinc-copper ore is reported to have been opened in 1916.

Development: 2 shafts of 80' and 200', with about 1,475' of workings, are estimated by owner to give 50,000 tons of 3½% copper ore blocked out for stoping. Ore is hand-sorted; crosscut tunnel is in over 500'.

Equipment: includes a small hoist.

Production: 10,000 tons to date. Developing only in 1916, but will start shipping when a favorable contract can be secured. Mine has been worked for over 30 years.

MUMME MINING CO.**ARIZONA**

Office: 1502 S. Flores St., San Antonio, Tex. **Mine office:** Patagonia, Santa Cruz Co., Ariz.

Officers: T. E. Mumme, pres. and gen. mgr.; E. J. Mockert, v. p.; H. P. Mockert, sec.; Geo. F. Wieland, supt.

Inc. Sept. 20, 1910, in Arizona. **Cap.**, \$100,000; shares \$1 par; issued 61,000 shares. Also has \$10,000 debentures authorized, but unissued.

Property: 7 claims, patented, in the Harshaw district, 6 miles from Patagonia, shows 2 veins of about 7' average width, carrying ore said to average 9% copper, 22 oz. silver and \$4 gold per ton.

Development: 50' shaft and 3 tunnels, longest 320'. Mine has no power equipment.

NEW STATE MINING & REDUCTION CO.**ARIZONA**

Office: 316 New England Bldg., Topeka, Kan.

Property: near Amadoville, Santa Cruz Co., Ariz., 26 claims, showing veins said to carry lead-zinc-copper ores, with gold and silver values.

Development: by 150' shaft with 950' tunnel.

Equipment: includes gasoline hoist and Ingersoll compressor. Was planning to erect a 100-ton dry concentrator to treat low-grade ores, at last accounts.

PATAGONIA MINES & DEVELOPMENT CO.**ARIZONA**

Office: Schmid-Shattuck Bldg., Patagonia, Santa Cruz Co., Ariz. Thos. Ewing, pres. and gen. mgr.; John A. Campbell, sec.-treas.; D. W. R. Davis and Charles Wighard, directors.

Cap., \$1,000,000; shares \$1 par; 850,000 shares in treasury.

Lands: 4 claims, including the Santa Rita in Josephine canyon, Patagonia, the Oklahoma group of 8 claims, and the San Antonio mine, in the Sierra Azul mountains, 30 miles S. W. of Cananea, Mexico.

Shipments from Patagonia in 1914 to the Copper Queen smelter assayed 30 oz. silver, 13.72% copper, netting \$46.28 per ton. No returns reported since.

RED MOUNTAIN COPPER MINING CO.**ARIZONA**

Idle.

Property: 60 claims, 1,200 acres, includes the Four Metals mine at Mowry, Santa Cruz Co., Ariz. Was worked unsuccessfully by Oscar A. Turner, 1914-15.

Development: by several tunnels, longest 1,300', said to show pyrite and chalcopryrite ore, assaying from 1-3% copper for over 300'.

RUBY COPPER CO.**ARIZONA**

Office: 303 Railway Exchange Bldg., Kansas City, Mo. **Mine office:** Patagonia, Santa Cruz Co., Ariz.

Officers: H. A. Sutermeister, pres.; H. J. Richards, v. p.; C. E. Sweet, sec.; Chas. L. Cookson, treas.; preceding, with A. E. White, R. W. Pierce, Harry J. Richards, F. P. Greenwood, Dr. Emil Thielman, F. D. Reasor and W. W. Ross, directors; C. A. Pierce, gen. mgr. and supt.

Inc. 1912 in Arizona. **Cap.**, \$2,000,000; shares \$1 par; issued, 1,493,922 shares. Debentures, \$200,000 at 6%; issued, \$98,185.

Property: the Lee group of 9 claims, 6 patented, about 12 miles N. of Patagonia. Claims show remnants of Tertiary lavas capping a series of limestones and other sedimentary rocks, altered by metamorphism and underlain by a dense black crystalline rock that carries ore. This rock, though seemingly devoid of crush zones or fissures, contains disseminated particles of chalcopryrite with occasional bunches and patches

of high-grade ore assaying as high as 27% copper and 100 oz. silver per ton. This rock also holds kidneys, or globular masses of primary copper glance and bornite. Ores are estimated to average about 6% copper, 12 oz. silver and 11 cts. gold per ton.

Development: by 460' shaft and a drift tunnel, with about 5,000' of workings. The shaft is dry, unlike that of the Hosey mine to the N., and the Happy Jack to the S., both in higher ground.

Equipment: includes 30 h. p. gasoline hoist, Cameron pump and Leyner compressor.

In 1917 company was prospecting its disseminated deposits by churn drilling.

SOUTHERN ARIZONA MINING CO.

ARIZONA

Office: 303 Midland Bldg., Kansas City, Mo.

Officers: H. A. Sutermeister, pres.; F. D. Reasor, v. p.; C. E. Sweet, sec.; Chas. L. Cookson, treas., with A. E. White, Emil Thielmann, H. J. Richards, E. P. Greenwood and R. W. Pierce, directors. C. A. Pierce, supt., Patagonia, Santa Cruz Co., Ariz.

Inc. 1912 in Ariz. **Cap.**, \$4,000,000; shares \$1 par; non-assessable; 1,409,079 shares outstanding. Authorized bond issue, \$400,000; \$84,160 outstanding. Annual meeting third Tuesday in January.

Property: the Sweet group, 23 claims, 3 patented, in Wrightson mining district, 10 miles N. W. of Patagonia, shows gold-bearing copper ore, occurring as contact deposit between granite and monzonite. Mine has 365' shaft equipped with steam hoist and air compressor.

See Mansfield M. & S. Co.

STANDARD METALS CO.

ARIZONA

Address: Security Bond Co., 530 Title Insurance Bldg., Los Angeles, Cal.

Officers: O. B. Bachman, pres.; A. G. Kohnhorst, sec.; W. J. Mitchell, supt.

Inc. in Arizona. **Cap.**, \$1,000,000; shares \$1 par.

Property: over 1,000 acres, including the Denver, Standard, Tres de Mayo, Bob Lee, Mowry and North Mowry mines, in Santa Cruz Co., Ariz. Ore carries silver and lead.

Development: workings said to aggregate 12,000' to 15,000'. In the Denver, G. R. Hay estimates an output of \$400,000 for 10 years. The Mowry has a large past production, and is said to have 100,000 tons on dumps worth \$5 per ton net. E. W. Brooks considers the Bob Lee "one of the most promising undertakings of its kind."

It is to be hoped that those interested are not banking too much on past production of the mines.

THREE R MINE

ARIZONA

R. R. Richardson and A. E. Crepin, owners, Patagonia, Santa Cruz Co., Ariz. Mine was operated under option from April, 1912, to Oct., 1914, by N. L. Amster, 67 Milk St., Boston, Mass.

Property: 55 claims, about 1,000 acres, unpatented, on the westerly slope of the Patagonia mountains, 9 miles S. of Patagonia, at an elevation of 5,000'. Claims show alaskite with small, irregular areas of trachyte and rhyolite porphyries.

Ore: occurs mainly along several lodes in a N.-S. shear zone as chalcocite in high-grade shoots and also disseminated low-grade values. The first orebody opened had stopes 70 to 80' long and 40' wide, extending from the 50' to the 400' level; a second parallel ore-shoot, 100' from the first, was 23' wide and carried 8% ore.

Development: the Colossus tunnel, Evening Star tunnel and the

260' Colossus shaft, with total underground workings of 8,740'. Practically all the high-grade ore has been mined.

Equipment: includes a 50 h. p. Fairbanks-Morse oil-type hoist at the Colossus shaft, 40 h. p. and 60 h. p. oil-type engines operating individual belt-driven Sullivan air compressors.

Production: from April to Sept., 1913, 3,717,571 lbs. fine copper from 22,253 tons dry ore, averaging 9.1% copper. During 1914 about 100 tons of 12% copper ore was shipped daily.

Owing to litigation involving title between R. R. Richardson and Ben Heney, a former partner, the Amster lease was relinquished in 1914.

Reported in May, 1916, to have been sold to the Harrison Bros. of San Antonio, Texas, for \$500,000. In May, 1917, a 150-ton mill was reported as operating.

TRENCH CONSOLIDATED MINES CO.

ARIZONA

Address: care of Chas. W. Clark, Jerome, pres.; John Hoy, mgr.

Property: known as the Farrel mine, is near Patagonia and Harshaw, Santa Cruz Co., Ariz. The mines were acquired in 1913 by Senator W. A. Clark at a price said to be \$250,000. A 500' shaft being sunk 1917.

VICEROY MINING CO.

ARIZONA

Office: Janesville, Wis. Mine near Patagonia, Santa Cruz Co., Ariz..

Officers: Frank H. Baack, pres.; M. G. Jeffris, v. p.; M. O. Mouat, sec.-treas., Janesville, Wis.

Inc. Oct., 1912. Cap., \$1,000,000; shares \$1 par; non-assessable; issued, \$600,000.

Property: 8 claims, unpatented, 164 acres, in the Tyndall district, 20 miles N., N. W. of Patagonia, shows a number of fissure veins, traversing porphyry or following contacts between diorite and porphyry and dipping 45°. The vein is said to range from 6 to 75' in width. Ores are principally silver-bearing, but show occasional bornite and a little lead ore above the water level, reported to carry from 16 to 199 oz. silver per ton.

Development: by shafts of 40' and 100' with about 400' of tunnel workings in leached ore.

Idle for lack of funds, but company plans to resume operations soon.

WANDERING JEW MINE

ARIZONA

Comprises a group of four claims in the Tyndall district on the W. slope of Santa Rita mountains, near Alto, Santa Cruz Co., Ariz., owned by M. & L. Lulley and R. R. Richardson. Operated under bond and lease by E. B. & W. E. Holt and M. L. Kaiser of Nogales. First shipments made February, 1916.

Development: to 100' depth by 2 shafts, 300' apart, drifts and cross-cuts aggregating about 2,000' of workings. Country rock is gray diorite. Vein varies from 6" to 4' in width and contains argentiferous galena. About half the deposit is said to be shipping ore, the rest, concentrating grade. Ore is galena from the surface down, but in places contains a little copper carbonate and chalcopyrite.

In April, 1917, J. H. Verfurth and F. B. Kollburg were to erect a 75-ton mill. In a 10-ton test plant 60% lead concentrate was made, presumably by flotation.

WORLD'S FAIR MINE

ARIZONA

Patagonia, Santa Cruz Co., Ariz.

Property: 13 claims, near Harshaw, S. of Patagonia, in the eastern end of the Salero mountains, has a 600' main shaft, with about 2 miles of workings, developing an 8' orebody, carrying silver-lead ore.

The mine has been a shipper, since about 1893, of high-grade silver ore, and is credited with past production of about \$500,000 worth of ore.

PARADISE, (see Douglas)

PHOENIX, MARICOPA COUNTY

APACHE CHIEF MINING CO.**ARIZONA****Office:** 10 No. 2nd Ave., Phoenix, Ariz.**Officers:** Geo. H. Holgate, pres.; Dr. D. L. Conner, v. p.; Dr. Wm. G. Lentz, sec.; Dr. W. E. Severn, treas., with Sam Bradner, directors. Chas. M. Donohoe, supt.**Inc. in Arizona. Cap.,** \$1,000,000; shares 50 cts. par; non-assessable.**Property:** a group of claims at Apache Springs, about 23 miles N. of Glendale, said to show ore that averages 8% copper, \$1.20 gold and 90 cts. silver. Stock being sold, 1917, at 25 cts. per share to raise necessary funds for development work.**ARIZONA CACTILONE COPPER CO.****ARIZONA****Address:** P. O. Box 1007, Phoenix, Ariz.**Officers:** J. G. Hardin, pres.; S. C. Kingsbury, v. p.-gen. mgr.; I. J. Lipson, 2nd v. p.; C. D. Montgomery, sec.-treas.**Inc. Feb. 8, 1917, in Arizona. Cap.,** \$3,000,000; shares \$1 par; 400,000 sold at 25c each.**Property:** 21 claims of the Slocum Copper Co., in Maricopa Co., Ariz., 22 miles N. of Phoenix. Ground was examined by C. H. James in May, 1917, who recommended expenditure of \$30,000 to \$50,000 in exploration.**Geology:** main formations exposed are a more or less schistose pre-Cambrian granite and an altered diabase, the latter intruded by 2 prominent iron-stained quartz dikes showing a little copper carbonate and pyrite. Ore consists of copper and iron minerals in a diabasic porphyry.**Development:** by shafts 106' and 200' deep, midway between the quartz dikes. No important zone of secondary enrichment is expected.**ARIZONA DIXIE COPPER CO.****ARIZONA****Officers:** R. J. Shultz, pres.; J. W. Ambrose, v. p.; F. H. Larson, sec.-treas., all of Phoenix, Ariz.**Inc. 1917 in Ariz. Cap.,** \$1,500,000; shares 25c par.**Property:** 13 claims, 25 miles S. W. of Hassayampa, developed by 80' shaft and 40' drift, said to show a 5' vein carrying ore that assays 4% copper, with gold and silver values. Plan churn drilling in 1917.**BIG COPPER CHIEF CO.****ARIZONA****Address:** care Thomas Boyd, pres., Mound City, Ill.; S. E. Jordan, sec.-treas., Phoenix, Ariz.; R. E. Grace, v. p. **Mine address:** Canyon, via Bumblebee, Ariz.**Property:** the Jasper N. Nellis groups, 1½ m. S. W. of Bumblebee, shows schist mineralized by copper glance, etc., in a zone 300' wide.

Developed by shaft 50' deep and a 250' tunnel and many pits.

Is a prospect.

BUCKEYE COPPER & GOLD MINING CO.**ARIZONA****Main office:** New Philadelphia, Ohio. **Mine office:** Turkey, Yavapai Co., Ariz.**Officers:** Michael Siebold, pres.; Wm. Rommel, v. p.; Fred Graff, sec.; C. D. Grimes, treas.; with A. W. Reiser, L. Hardman, Geo. Edel, M. M. Davis; Alvin Graff, mine supt.**Inc. July 24, 1912, in Arizona. Cap.,** \$3,000,000; shares \$1 par; non-assessable; issued \$1,790,000. Annual meeting, first Tuesday in September.**Property:** 35 claims, 720 acres and a 20-acre smelter site, in 3 groups,

is 2 miles from Turkey, in Black Canyon district of Bradshaw mountains. Claims show chloritic schists and diorite, carrying fissure veins with occasional native copper and malachite, but mainly azurite, chalcopryrite and bornite, estimated to average 4% copper, 3.5 oz. silver and from a trace to \$6 gold per ton.

Development: 728' two-compartment shaft on the Columbia claim, a 520' two-compartment shaft on the Sullivan claim, with 2 other 200' shafts, various pits of 10 to 40' depth and tunnels of 87' and 314', with about 5,000' workings.

Equipment: includes 15 h. p. and 40 h. p. gasoline hoists, a small air compressor and several mine buildings.

CARMELITA MINING & MILLING CO.

ARIZONA

Office: 142 W. Washington St., Phoenix, Ariz.

Officers: P. P. Parker, pres.; M. S. Weyant, v. p.; J. A. Marr, sec.-treas., with H. J. McCoy and J. H. Williams, directors.

Inc. in Arizona. Cap., \$350,000; shares \$1 par; 30,782 shares outstanding.

Property: 17 claims, 340 acres, in the Harqua Hala mountains, Maricopa Co., 14 miles from Wenden, said to carry a body of free milling ore, from 2 to 8' wide and assaying \$17 per ton. It is stated that there are 3,000 tons of \$15 milling ore on the dump. Treasury stock is to be sold to provide funds for a 50-ton mill.

CARNEY MINING CO.

ARIZONA

P. G. Carney, pres. and business mgr., Mesa, Maricopa Co., Ariz. Homer Davidson, supt.

Property: the Royal Gorge mine, shows a vein with gold-copper ore.

Development: by 800' tunnel and 100' shaft.

Equipment: includes gasoline engine and air compressor. Plans to erect cyanide mill.

GILA COUNTY CINNABAR MINING CO.

ARIZONA

Address: Phoenix, Ariz. Owns quicksilver claims in the Sunflower mining district, Mazatzal mountains, Maricopa Co., 30 miles from Phoenix. Ores occur in ancient schists, and consist of cinnabar and an opaline silica.

Erected a 30-ton furnace for recovery of metal. Geology described by Ransome, U. S. Geological Survey, Bull. No. 620, pp. 111-128, 1915.

GRAND TRAVERSE & ARIZONA MINING CO.

ARIZONA

Idle since 1910.

Office: 129 East Front St., Traverse City, Mich. Mine near Cave Creek, Maricopa Co., Ariz. Owns 3 patented claims. Fully described Vol. X, Copper Handbook.

HARRIS COPPER CO.

ARIZONA

Offices: Findlay, Ohio, and 319 Van Nuys Bldg., Los Angeles, Cal.

Officers: C. C. Harris, of Findlay, Ohio, pres., treas., gen. mgr. and purch. agt.; W. J. Martin, v. p.-mine supt.; Harry W. Moore, sec.; preceding officers, W. J. Sease, Los Angeles, and Fred F. Harris, San José, directors.

Inc. July 10, 1910, in Arizona. Cap., \$1,000,000; shares \$1 par; non-assessable; issued, \$710,001. Annual meeting, second Tuesday in January.

Property: 34 claims, 550 acres, in the Tip Top district, about 50 miles north of Phoenix and 30 miles east of Wickenburg, on the Agua Fria river, at the mouth of Black Canyon creek. Claims, partly purchased with stock and partly located by the company, show schists cut by dia-

base intrusions. The company's map shows 2 groups of claims, the Cascadilla, or western, being in part 3,000' wide and 1,200' long; the group covers 3 veins running north and south. Development is meagre; one shaft in diabase and 2 tunnels with an aggregate of 800' of work, costing \$9,000.

The Copper Reef, or east group, covers 2 veins, 1 alongside the Agua Fria river claimed to be an extension of the vein mined by the Kay Copper Co. Company claims 1,000 tons of \$15 ore blocked out, which is reasonable. One vein said to be 500' wide and another 90' in width, the observers evidently considering altered schist to be vein matter.

The president of the company writes the editor as follows: "We insist that the report speaks the truth quoted as we make the report to you, and if any embellishment is placed on the wording of our report, it must conform in meaning to give the information that can be construed from the wording that we give."

The property may have a great outcrop and it may contain copper in commercial quantities, but we defy any mining engineer to find out what the company does have on its property, from the report issued by the management and reprinted as a gem of humor in the Mining & Scientific Press, and in part reproduced herewith: "COPPER.—A red, ductile, tenaceous, malleable metal of great and varied use, originally called brass of cypress, copper sand, alacaunte, C group of minerals, mostly soft, included C, suprite, malaconite, malachite, chessylite, chrycopyrite, olivinite, etc. Black C ore, malaconite, gray C ore, Chalcocite, C Purite, yellow C ore, variety Chalcopyrite, the common ore.

"The formation of the Harris Copper Co. have blended with the iron, lime and porphyry with quartz. Many of the above minerals, but more especially the commoner forms with oxides condensed formation on the top with the iron and lime, with a great amount of carbon and sulphur in the schist formation, with an amalgamated condition of the various mineralizations where gold and silver predominates. The schist formation being soft, it stands to reason that when the sulphides appear in the lower rocks, I am led to believe from the geological lay of the uplift that is now held and owned by the Harris Copper Co., there is beneath the surface of this great iron-capped ledge a great body of copper ore." Enough said.

Despite the unfavorable impression created by the company's literature, it is understood that the property has genuine merit, has large orebodies, and with cheaper transportation will make a good mine. Part of property reported leased to Wilson Foster of Los Angeles in 1914 for ten years; lessee is required to spend \$20,000 and company to receive 15% of gross output.

HAUXHURST MINE

Jas. Hauxhurst, owner and mgr., at last accounts.

Property: 900 acres, in the Big Horn mountains, about 65 miles W. of Phoenix and 27 miles S. W. of Wickenburg. Mine, formerly owned by the Hauxhurst Copper Co., was under bond for about 3 years to the United States Copper Mines, Inc., which forfeited same, 1909; leased to F. C. Alsdorf, 1913, but relinquished. See Vol. XI, Copper Handbook.

KAY COPPER CO.

ARIZONA

S. J. Tribolet, pres. and mgr., Phoenix, Ariz. Company owns the Starkweather mine and claims on the Agua Fria river, at the mouth of Black Canyon creek, 50 miles N. of Phoenix and some 9 miles from Cave creek. Past reports indicate that company developed a body of high-grade ore. The main shaft, 350' deep, is said to have shown 17' of 10%

ore on the 260' level and 8' of gray copper ore, averaging 17.7% copper, on the S. drift of the 300' level.

In May, 1917, reported that 9' of 10% ore had been cut on 350' level. Ore sent to Cons. Arizona smelter at Humboldt last year totaled 45 tons.

L. & N. GROUP (Quicksilver)

ARIZONA

Owned by Christopher Martin, et al.

Property: 7 claims, about 7,500' along the Gila county belt, in the Sunflower mining district, Maricopa Co., Ariz., shows stringers of quartz and cinnabar. Development work and prospecting in progress. A furnace with 1 retort was built in 1914 and 2 flasks of quicksilver were shipped March, 1915. Geology fully described U. S. G. S. Bull. 620-F. (1915).

NORTH PINAL MINING CO.

ARIZONA

C. W. Cisneey, pres., 228 E. Jefferson St., Phoenix, Ariz.

Property: formerly held by La Coronado Development Co., is in the Mineral Hill district, 10 miles from Price, Pinal Co., Ariz.

Development: by a 300' shaft, shows a lens of copper ore at depth of 260' in the shaft, said to carry up to 70% copper. Ore is mainly bornite.

Equipment: includes a 25 h. p. gasoline hoist and an air compressor.

PARADISE GOLD MINING CO.

ARIZONA

Address: P. O. Box 1095, Phoenix, Ariz. F. Obermuller, v. p.-mgr.; Jos. L. Obermuller, cons. engr.

Property: 6 mining claims and 3 mill sites in Paradise Valley mining district, Maricopa county, 23 miles from Phoenix, said to have 2 parallel veins about 300' apart, traceable at surface for 3,000', 45' wide at depth of 100' and averaging about \$5 in gold. Sinking shaft to 200' level in 1917. Stock offered to the public at 25c., Feb., 1917.

RED ROVER COPPER CO.

ARIZONA

Reorganized, 1917, as Red Rover Mining Co., which see.

RED ROVER MINING CO.

ARIZONA

Address: care of J. Apfield, Phoenix, Maricopa Co., Ariz. Is a reorganization of the Red Rover Copper Co.

Lands: 12 claims, known as the Red Rover Group, 12 miles north of Camp Creek and 50 miles N. E. of Phoenix, the nearest rail point.

Development: by 10,000' of underground workings, including a 200' tunnel and a 370' incline shaft, showing a 10 to 16' orebody between limestone and porphyry, carrying a 3' paystreak estimated to average 10% copper, 6 to 60 oz. silver.

The Red Rover mine, discovered 1882, has shipped from shallow workings about \$200,000 worth of high-grade ore, running about 15 to 25% copper, with values mainly in silver chlorides, 1 carload of 20 tons netting \$41,000, with no allowance made for copper contents.

Production: for 1913-14 was 440 tons of ore.

ROOSEVELT LAKE COPPER CO.

ARIZONA

Address: 17 E. Adams St., Phoenix, Ariz.

Officers: R. H. Williams, pres.; A. J. Matthews, v. p.; W. E. Laird, sec.; C. E. Ashley, treas.; with C. H. Prather and J. R. Murdock, directors.

Inc. in Arizona. Cap., \$1,000,000; shares \$1 par; 400,000 issued.

Property: the Humdinger and Orocobre claims in the Mazatzal mountains, 20 miles from the Roosevelt dam, and the Virginia claims, 9 miles from Phoenix, Ariz. One claim said to have ore worth \$1,000,000 on hand.

Development: by tunnels; churn-drilling contemplated.

Extravagant statements have been published about this company's possibilities, a full-page advertisement including this gem: "In this vast treasure-house—in vaults of porphyry and quartz, with walls of adamant—what wealth awaits the drill and blast, only the most active imagination can conceive." At last report company had sold its Roosevelt Lake property and will use the cash to develop the claims near Phoenix.

ROWLEY COPPER MINES CO.

ARIZONA

Office: Kansas City, Mo. **Mine office:** Gila Bend, Maricopa Co., Ariz.

Officers: E. D. Lysle, pres.; J. O. Goodwin, v. p.; J. T. McRuer, sec.; C. D. French, treas.

Inc. June, 1909, in Arizona. **Cap.**, \$10,000,000; shares \$1 par.

Property: 6 claims, patents pending, 124 acres, about 28 miles N. W. of Gila Bend, and 65 miles S. W. of Phoenix, Ariz.

Development: by inclined shaft to 292'; being 32' below water-level, with about 700' of crosscuts and drifts. Has uncovered 3 strong veins of copper-gold and silver-lead ore. Main, or vertical shaft, is 300' deep.

Equipment: includes 2 steam boilers, 1 Fairbanks-Morse, 150 h. p. oil engine, 2 compressors, one 300' and one 1,000' hoisting, ventilating apparatus, assay office and all necessary tools. Also five storage oil tanks, ore trailers, etc.

Ore is delivered to railway by caterpillar 75 h. p. tractor owned by the company, capacity 30 tons to the load.

Property was bought for \$20,000 cash and 1,000,000 shares in 1909, and is in active operation.

SAN CARLOS MINING CO.

ARIZONA

Address: D. Rowley, Gila Bend, Ariz.

Officers: Dora Rowley, pres.; J. C. Rowley, v. p.; Daisy Rowley, sec.-treas.; also directors.

Inc. Oct., 1914, in Arizona. **Cap.**, \$1,500,000; shares \$1 par, non-assessable; 500,000 issued. Expenditures in 1916, about \$2,500.

Property: 11 claims, 220 acres, 18 miles W. and 7 miles N. of Gila Bend, Ariz., said to show contact fissures in rhyolite. Orebody is 8 to 12' thick. Shoots are from 2 to 36" wide and ore carries copper, gold and silver. Ground is considered to contain extensions of the Rowley veins.

Development: incline shaft to 238' depth. An E. crosscut is to be driven to main contact.

Edwin Walters, J. F. Price and others have examined the property.

SILVER BUTTES MINING CO.

ARIZONA

Address: C. P. Crawford, 121 South Central Ave., Phoenix, Ariz.

Inc. in Arizona. **Cap.**, \$1,200,000; shares \$1 par; 503,839 issued.

Property: 12 claims in Mazatzal mountains, Gila Co., Ariz. Geological conditions are said to be similar to those of Jerome. According to a report by A. F. Muter, there are two vein systems in diorite, really fault fissures containing ore, especially at junctions of the two. All ore near the surface shows intense leaching. A winze is yielding good sulphide ore, and should be deepened. An incline shaft is recommended on the N.-S. vein, which can be traced on surface for 3,000'. The Butte vein, 2 to 7' wide, is said to contain from 25 to 300 oz. silver per ton, \$2 to \$15 gold, and 2 to 12% copper. Some rich ore has been shipped.

Prospectus contains a map showing position of property, with a straight line drawn through it from Jerome to Miami and Globe.

Such matter is misleading and reprehensible, as tending to convey a wholly untrue and erroneous impression.

In Sept., 1917, work was resumed.

SLOCUM COPPER CO.

ARIZONA

Succeeded by the Arizona Cactilone Copper Co., which see.

STURDY GOLD MINING CO.

ARIZONA

Montgomery, Maricopa Co., Ariz.

Officers: John Sturdy, pres.; F. H. Lerch, v. p.; N. Sturdy, sec-treas. and mgr., Montgomery; with Wm. H. Sturdy and Albert Martin, directors.

Inc. June 16, 1915, in Arizona. **Cap.**, \$750,000; shares \$1 par; outstanding, \$500,000. Annual meeting, second Thursday in January.

Property: 4 claims, 65 acres, in the Winifred mining district, formerly owned by Fortuna Gold & Copper Co., described in Copper Handbook, Vol. XI. Was acquired by present management at sheriff's sale. Claims are said to show six parallel quartz veins in granite, averaging 4' in width and carrying gold and silver ore.

Development: 125' vertical shaft, with 1,000' of workings. Claims to have 6,000 tons ore blocked out, average grade \$10 per ton.

Equipment: includes a 6 h. p. Fairbanks-Morse gasoline hoist. New management raised \$7,900 to build a small mill and develop. At last accounts, shaft was being sunk to 600' level.

SUPERSTITION CONSOLIDATED MINING CO.

ARIZONA

General Office: 44 Broad St., New York. **Mine office:** Phoenix, Ariz.

Officers: J. P. Bickell, pres.; Louis Ford, v. p.; A. W. Scott, sec., treas.-gen. mgr.

Inc. Jan. 7, 1915, in Arizona. **Cap.**, \$2,000,000; shares \$1 par; outstanding, \$500,000. Security Transfer & Registrar Co., New York, transfer office and registrar. Listed on New York Curb as a prospect. Liabilities in Feb., 1915, a 2-year 6% note of \$10,000, dated Jan. 20, 1915.

Property: 7 claims, Arizona King group and 2 adjoining claims in the Pioneer mining district, Pinal Co., 60 miles E. of Phoenix and 7 miles from a railroad. Said to show schist and intrusive porphyry with a vein outcropping for 3,000', from 5 to 40' in width; strike N. W., dip 65° E. The ore is gold claimed to assay from \$3 to \$48 per ton, with very little copper present.

Development: a 400' shaft with several hundred feet of workings. Ore reserves not given. A 50-ton flotation mill was built in 1915.

Is considered a meritorious prospect.

WOODBURY COPPER CO.

ARIZONA

H. G. Murphy, Phoenix, Ariz., agt. Reported in July, 1916, that H. Cavanaugh and associates of Seattle, Wash., had purchased the property for \$200,000 and that work would be begun on the claims. No later returns.

YOUNG MINES CO., LTD.

ARIZONA

Office: 413 Fleming Bldg., Phoenix, Ariz. **Mine office:** Goldfield, Ariz.

Officers: Geo. U. Young, pres.-gen. mgr.; E. C. Moore, v. p.; G. H. Cunningham, sec.-treas., with Frank H. Parker and W. S. Goldsworthy, directors.

Inc. 1910 in Arizona. **Cap.**, \$1,500,000; shares \$1 par; non-assessable; outstanding, 20,000. Annual meeting in June.

Property: the Mammoth group, 12 claims, about 220 acres, 20 miles E. of Mesa, Maricopa Co., Ariz., contains a large disseminated low-grade orebody, said to carry sufficient free milling gold for mining on a large

scale by steam shovel or caving. Low-grade dump is said to average \$4.50 per ton.

Development: includes 3 shafts, 150', 320' and 445' deep and about 3,000' of laterals.

Equipment: includes 3 steam hoists, 3 pumps, small compressor, a 20-stamp, 60-ton mill, buildings, etc.

The president reports that: "Property may also be worked on a 350-ton basis on high-grade ore on a 6 to 8 year supply now developed, in addition to 20 years' operation on 1,000 tons per day basis according to engineers' estimates on hand."

PRESCOTT, YAVAPAI COUNTY

ANGLO SAXON SMELTING & REFINING CO.

ARIZONA

Officers: J. E. Russell, managing director, Bank of Ariz. Bldg., Prescott, Ariz. Hugh Rose Croup, pres.; Robt. L. Service, sec., with G. G. Lemons, directors.

Inc. 1916 in Arizona. **Cap.**, \$1,500,000. The company is to be financed in England.

The corporation has a lease on 200 acres of land from the City of Prescott for a smelter site and has also acquired several water rights. Owing to the war, no active work is being carried on, and the so-called "Lemon" smelter is, it is feared, not destined to materialize.

ARIZONA CALIFORNIA MNG. CO.

ARIZONA

Address: Prescott, Ariz.

Officers: W. S. Wilhelm, pres.; G. W. Lavender, v. p.; H. G. Wilhelm, sec.-treas.

Inc. April, 1915, in Arizona. **Cap.**, \$250,000; shares \$1 par; outstanding, \$100,000.

Property: 6 claims, 122 acres, patented, in the Hassayampa mining district, 6 miles south of Prescott, show a quartz vein containing gold, silver, zinc and lead ore.

Developed by the Shamrock and Ruth mines, latter having a 250' vertical shaft.

Equipment: includes a 10 h. p. hoist and a 40-ton mill, with Huntington mill and Wilfley tables. Mill concentrates said to assay 36% zinc, 55% lead and 30 oz. silver. Driving a 1,200' tunnel, in 500', March, 1917.

ARIZONA PORTLAND MINES, LTD.

ARIZONA

Address: Prescott, Ariz.

Officers: A. C. Nichols, pres.; A. S. Sittes, v. p.; Q. W. Blickenstaff, sec.-treas.-mgr., with S. Q. Tucker, directors.

Inc. 1914 in Arizona. **Cap.**, \$1,500,000; shares \$1 par; 600,000 outstanding. Annual meeting January first.

Property: 30 claims, 600 acres, in Copper Basin mining district, Yavapai county, about 12 miles S. W. of Prescott, adjoining the Loma Prieta on the S. and reported to carry the extension of Loma Prieta orebodies. Ore carrying copper, with slight silver and gold values, occurs as chalcopryrite, disseminated through a monzonite porphyry formation. The orebody is reported to be from 20 to 100' wide, with N.-S. course and easterly dip.

Development: by 500' of workings, including a 190' incline shaft and 3 tunnels.

Equipment: includes a 2-drill compressor, hoist and steam power. Operating expenses for 1916 were \$6,000. Plan sinking a new 3-compartment shaft in 1917.

AZTEC MINES CO.**ARIZONA**

Apparently dead. If so, R. I. P., as it is ill form to criticize the defunct. See Vol. X of the Copper Handbook.

BEEMER CONSOLIDATED GOLD & COPPER CO.**ARIZONA**

Owns the Stormcloud Mine at Mt. Union, 12 miles south of Prescott, Yavapai Co., Ariz. Idle.

BIG BUTTE COPPER CO.**ARIZONA**

Address: H. E. Shumate, sec., Prescott, Ariz.

Officers: Geo. L. Reed, pres.; Ed. Shumate, v. p.; Geo. C. Ruffner, treas.

Inc. April, 1917, in Montana. **Cap.**, \$1,500,000; shares \$1 par.

Property: 43 claims in Copper Basin district, near Prescott, developed by tunnel, shafts and open cuts.

BIG PINE CONSOLIDATED MINING CO.**ARIZONA**

Prescott, Ariz.

Officers: A. Bjorkman, pres.; Richard Lamson, sec.; A. Bergquist, treas.; with Felix Durocher and C. H. Dunning, directors. C. H. Dunning, supt.

Inc. April 30, 1915, in Arizona. **Cap.**, \$500,000; shares \$1 par; outstanding, \$400,000. Annual meeting 1st Monday in April. Commercial Trust & Savings Bank, Prescott, registrar. Is a consolidation of the Big Pine Mng. Co. and the Lake Superior & Western Mng. Co.

Property: 14 claims in Senator district, 12 miles south of Prescott.

Ore: gold occurs in 3 parallel veins, which cross the claims.

Development: by 7 tunnels, principally on a vein claimed to show ore for 700' in one tunnel, 1,100' in a second, 1,600' in a third, and 400' in a fourth. Company claims ore reserves of 70,000 tons, average grade \$9 per ton.

Mill: the 100-ton cyanide plant of the Mascot mine, Lake Sup. & Western Co. was moved to the Big Pine property and erected near portal of tunnel No. 6. Electric power is obtained from the Arizona Power Co. H. C. Shotwell, who sampled the mine and assisted in the promotion of the company, reports that there is ample ore of milling grade to keep the mill supplied, but mill returns from two months' run were apparently unsatisfactory and mine was shut down for a while. Reported to have started again in Oct., 1917.

BLOCK MINES CO.**ARIZONA**

Address: Prescott, Ariz.

Officers: A. J. Head, pres.; E. Block, v. p., treas.-mgr., with H. Brinkmeyer and M. Goldwater, directors.

Inc. August, 1913, in Arizona. **Cap.**, \$1,000,000; shares \$1 par; 500,000 shares in treasury.

Property: owns the Billy Boy and Christmas group of mines on the Hassayampa river, Yavapai county. Billy Boy mine developed by 225' tunnel showing 14" paystreak carrying gold, silver, lead and copper ore, said to assay \$70 per ton.

Is a prospect with some merit but needs financing and competent management to prove its possibilities.

BONNIE MINING CO.**ARIZONA**

Address: R. M. Garrett, Prescott, Ariz. Mine on upper Lynx creek, Yavapai Co., Ariz., is an old one reopened in 1916. The shaft, 123' deep, at last accounts, will be carried down to 250', when drifting, to cut the face of the main tunnel 500' distant, will begin. The ores, formerly gold-silver, are now high-grade copper, in a vein 26" wide at 123' in depth.

CASH MINE**ARIZONA**

Prescott, Ariz.

Property: leased to N. E. Getchell, Maxton, Yavapai Co., Ariz., shows

veins with gold-silver-copper-lead ore. Developed by a shaft with extensive workings.

Equipment: includes a 10-stamp mill. Six men employed. Shipments of concentrates made in 1915.

CASTLE COPPER CO.

ARIZONA

Property: 11 claims, known as the Dunkirk or Mt. Tritle group, 12 miles south of Prescott, on the southern slope of Mt. Tritle, near the head of Slate creek, in the Hassayampa district. Formerly owned by Dunkirk Gold & Silver Mining Co., later by Mt. Tritle Copper Co., and purchased in 1914 by D. M. Clark of Prescott, Ariz. Is an old mine, with tunnels of 150', 160', 170' and 300', driven at vertical intervals of 100', showing copper and lead sulphides, with values in copper, gold and silver, in about the order named.

Equipment: includes steam and gasoline power, air compressor and electric light plant. A 40-ton mill has 4 Nissen stamps, 3 Wilfley tables, 100-ton ore bin and a 10,000-gal. water tank. Oil flotation unit installed 1915, reported to be an unqualified success, saving as high as 98% on assay value of ore.

C. B. S. MINING CO.

ARIZONA

Near Prescott, Ariz., in the Copper Basin district, Yavapai Co. Claims show several veins with 62' shaft developing a 6' orebody, assaying 9% copper, \$10 silver and \$3 in gold. Vein dipped out of shaft and bottom of workings show a 10" ore streak of native silver. Contract is said to have been given to sink shaft 100'. Owned by same people as the Climax Mining Co., near Prescott, Ariz.

CLIMAX MINING CO.

ARIZONA

Prescott, Ariz. M. E. Spaulding, supt. Owns the Climax gold mine on the Hassayampa river, near Prescott.

Development: by 5 tunnels, longest 1,000', having a pay shoot 2' to 3' in width. Average grade of mill ore, oxidized, is said to be \$35. Sulphide ore in No. 5 tunnel is said to average \$21 per ton. It is claimed the mine has paid for itself since 1904. Company claims to have a large vein, 40' to 150' wide, and 7,000' long, with ore that mills \$454 per ton in gold. Property is equipped with 10-stamp mill, air compressor and good camp buildings.

COMMERCIAL MINING CO.

ARIZONA

Office: care Phelps, Dodge Corp., 99 John St., New York. **Mine offices:** Prescott and Skull Valley, Yavapai Co., Ariz. Maj. A. J. Pickerell, gen. mgr. Is controlled by Phelps, Dodge Corp'n.

Property: includes the Senator and Snoozer mines, producing high-grade sulphide ore from fissure veins and the Copper Basin mine with 18 claims, patented, in the Copper Basin, about 6 miles from the Santa Fé railroad.

Development: by a 300' two-compartment shaft, bottomed in good ore and 2 tunnels, that opened up large bodies of 3% oxidized ores. Employs an average of 25 men and ships from 80 to 100 tons per day of 7 to 10% oxidized ore.

Copper Basin mine yields oxidized ores found as segregations in altered monzonite, but despite a promising outcrop, no body of commercial ore has yet been found in depth as on the adjacent Loma Prieta mine. Much of the ore shipped is a cemented stream gravel.

CONSOLIDATED HOMESTEAD MINES, INC.

ARIZONA

Subsidiary of U. S. Continental Mines Co., which see.

Mine at Walker, Yavapai Co. Cap., 600,000 shares, \$1 par.

Property: a mineral claim, patented, carries a vein yielding a complex

sulphide, ore containing copper, lead and zinc, with gold and silver values. Former production is said to be \$35,000. New machinery is reported as being installed in 1917. Development work on the 100' level is reported to have opened up 70' of ore. W. W. Lewis, Prescott, Ariz., is consulting engineer.

COPPER HILL GROUP**ARIZONA**

Mine is at Skull Valley, Prescott, Ariz. Owned by E. S. Clark and J. J. Jackson. Reported under option to A. L. Garford of Ohio, with G. M. White in charge.

Property: 14 claims, unpatented, 245 acres, in Copper Basin mining district, Yavapai Co., Ariz. Main shaft reported as being sunk to 1,000' level.

Ore: copper bearing, with molybdenite, gold and silver in shoots and streaks in breccia, surrounded by granite, diorite and porphyry. Ore shoots vary from 5' to 15'. Average assays reported as copper, 3.75%; molybdenite, 4.25%; gold and silver, \$1.15. Property has shipped about 200 tons.

Development: in 1916, 1,500' of development work was reported and 75,000 tons were blocked out. Property has three shafts 45', 50' and 140' deep.

Equipment: steam hoist, and No. 5 Cameron pump.

COPPER VALLEY MNG. CO.**ARIZONA**

Inc. April, 1917, by D. C. McIver and Rich. Lamson.

Property: 10 claims in Copper Basin, about 4 miles from Skull Valley, Yavapai Co., Ariz., said to show a mineralized schist belt over 100' wide and carrying some ore of commercial grade.

Development: by 3 shafts 30', 45', 60' deep.

DEVELOPMENT COMPANY OF AMERICA**ARIZONA**

Reorganization committee: Room 514, 49 Wall St., New York. Company's affairs are in hands of a bond and stockholders' committee. (See Copper Handbook, Vol. X, for officers and organization.)

Inc. Nov. 23, 1901, in Delaware, as a holding company. Controlled through stock ownership, the Tombstone Consolidated Mines Co., Ltd., Imperial Copper Co., Congress Consolidated Mines Co., Ltd., and Poland Mining Co. Company also owned large stock interests in the Gila Copper Sulphide Co.; the Lookout Copper Co.; controlled the Southern Arizona Smelting Co. through Imperial Copper Co., and owned a large block of stock in the London-Arizona Copper Co., which company had a large interest in the London Range Copper Co. Company organized the Arizona, Mexico & Gulf of California Railroad Co., 1910, planning to build a railway from the Arizona Southern Railway, which is owned by the Imperial Copper Co., a subsidiary, to Port Lobos on the Gulf of California, a distance of approximately 200 miles. The authorized bonds and stocks of the Arizona, Mexico & Gulf of California Railroad Co. were never issued.

The Tombstone Co. owned, or controlled, practically all the mines of Tombstone, Ariz., that once wonderful camp, closed down in the 80's when a heavy influx of water drove the miners from the workings. The Tombstone Co. installed enormous pumps and succeeded in controlling the water, the Development Co. supplying nearly \$2,500,000 in addition to funds realized by the sale of its special contract bonds, before it came to the end of its resources, when, being unable to meet its bills, the company suspended operations.

Failure of the Development Co. to supply further funds to the Tombstone Co. and subsidiaries in 1910, with a loss of credit at various banks and indeed of its own stock and bondholders, is, it is said, directly due to

responsible financial interests in New York refusing to carry out their pledged word and agreement, a contract upon the strength of which the Development Co. implicitly relied and therefore made no effort to raise money elsewhere, until such refusal when it was too late to make other arrangements to meet its interest charges and other pressing obligations.

One of the most promising subsidiaries was the Imperial Co., whose property had to shut down because development work was not sufficiently advanced to supply the smelting plant with 700 to 800 tons per day of smelting ore, of high enough grade to yield a profit with 12½¢ copper. An important shaft lost by fire, would, in a few feet more depth, have entered a large body of sulphide ore, which would have supplied the necessary tonnage and flux for the smelter. The Imperial Copper Co., temporarily needing assistance, could not get it from the Development Co. for the reasons above stated, and as it could not do development work, repair the burned shaft, or sink a new shaft, it, too, had to shut down.

In 1913 the securities behind the bonds were sold at public auction, and purchased by Wallace Fairbank, Frank M. Murphy and Thomas W. Synnott, acting as a bondholders' and stockholders' committee. The securities included 250,000 shares of the Imperial Copper Co., and 400,000 shares of the Tombstone Consolidated Mines Co., Ltd., both without value. The stock of the Poland Co. and \$1,211,340.91 certificates of indebtedness, control that company, and the Congress Co. having no bonded debt, is controlled by its stock. The stock and certificates of indebtedness of the Poland Co. and the stock of the Congress Co. were also purchased by the committee.

All the securities purchased by the committee were placed in the treasury of the Congress Co., with the exception of such Congress stock as was set aside to be exchanged for the bonds of the Development Co., on the basis of 50% in stock for 100% in bonds. The committee hopes, even though it has not received much support, to get something worth while for the bondholders.

The Development Co. is reported to have brought suit against the Southern Pacific R. R. Co. for \$15,000,000, alleging that loss of its property is directly due to the refusal of the corporation to fulfill its pledged agreement to loan the \$500,000, thus bringing about insolvency to both the parent company and its various subsidiaries.

FORTUNE MINING CO.

ARIZONA

Address: 19 Lawler Blk., Prescott, Ariz.

Officers: A. W. Davis, pres.-gen. mgr.; H. J. Marshall, v. p.; J. P. Dillon, sec.-treas.; preceding, with J. E. Russell, A. E. Broas, J. L. Dennerlein, M. Collins, directors. W. W. Lewis, cons. engr.

Property: the Wizard mine and other claims in the Big Bug mining district, Yavapai county. Is a gold mine in which some high-grade copper ore occurs.

Development: 1,200' tunnel on the vein showing 4 to 6' of ore in a shoot 800' long; 225' shaft and crosscuts.

Equipment: includes 10-stamp mill and two 50 h. p. gas engines. 10,000 tons of milling ore reported on dumps.

GOLD WARRIOR MINING CO.

ARIZONA

Office: Prescott, Ariz.

Officers: O. S. Wakeling, pres.; A. M. McOmie, v. p.; D. C. MacIver, sec.-treas.; foregoing, with P. H. Osborne and J. R. Esposito, directors.

Inc. 1916 in Arizona. **Cap.**, 500,000 shares, \$1 par; outstanding, 210,000.

Property: 6 unpatented claims in the Hassayampa district, 11 miles from Prescott and about three-fifths mile from the Big Pine mine, at which mill Warrior ore is to be treated.

Geology: gold-silver contact deposit in blue diorite and quartz-diorite, dipping 45°, with N. E.-S. W. course. Pay-shoot is said to be 6' wide with metal contents evenly distributed. Ore reported to assay from \$14 to \$37 per ton.

Development: by 100' tunnel on the vein. C. H. Dunning, cons. engr., estimates if conditions hold, the first 1,000' of level should yield 25,000 tons of \$10 ore.

HANEY COPPER CO.

ARIZONA

Company owns properties at Ramsgate, 12 miles west of Prescott, with pyritic ore of very low gold-silver-copper values. Idle.

JEROME PRESCOTT COPPER CO.

ARIZONA

Address: W. A. Cline, Prescott, Ariz.

Officers: W. A. Cline, pres.; A. J. Matthews, v. p.; F. R. Dyas, sec-treas.; above with F. O. Smith and W. E. Saunders, directors.

Inc. in Arizona. Cap., \$1,500,000; shares \$1 par; 500,000 issued. Registrar and Transfer Agent, New York, registrar and transfer agent. Kastel & Co., 20 Broad St., N. Y., fiscal agents.

Property: the Hub, or Sanders group of 33 claims, about 660 acres, several miles west of Copper Basin in Skull Valley, 4 miles from the railway and 12 miles from Prescott, Yavapai Co., Ariz. Claims cover a schist belt 30' wide, along a monzonite contact, which shows green copper stains; also several quartz veins carrying gold values and one containing hornblende with associated chalcopyrite.

An examination by W. H. Weed showed the property worthy of very modest development for gold, but lacking any of the earmarks of a successful copper mine. Promoters are sending out garbled copy of above report, in which all unfavorable comments and opinions have been eliminated.

LITTLE JOHNNIE MINE

ARIZONA

Owned by Harrington Blauvelt, Prescott, Ariz.

Property: in the Hassayampa district, Yavapai Co., shows a 3' fissure vein, carrying gold ore said to run 2 oz. gold, with 1% copper values appearing at depth. Average assays given as \$18 gold per ton.

LOMA PRIETA MINES CO.

ARIZONA

Address: Prescott, Ariz.

Officers: T. G. Norris, pres.; J. I. Gardner, v. p.; O. A. Hesla, sec-treas., above with R. H. Burmister and E. J. Mitchell, directors. B. V. Woodward, asst. sec., 7 W. 37th St., N. Y.; J. E. Packer, 2nd v. p.; A. B. Peach, mgr.

Cap., \$1,500,000; shares \$1 par; 900,000 issued.

Property: 27 claims, 500 acres in the Copper Basin mining district, Yavapai Co., Ariz., 12 miles S. of Prescott, adjoining the Commercial mine of the Phelps, Dodge Corporation.

Ore: minerals are primary, chalcopyrite occurring with secondary quartz, and while high-grade bunches of sulphides appear, the deposit must be mined as a mass of low-grade concentrating ore of disseminated character. Samples show an average of about 2% copper, and 36 to 48c silver per ton.

Development: by 414' shaft with drifts and crosscuts at 400' level.

Equipment: includes steam hoist and compressor.

Production: one carload shipped in 1917 assayed 8.6% copper, \$1 gold and 1.5 oz. silver per ton.

Is a meritorious property, which is likely to develop a very large tonnage of concentrating ore.

LOOKOUT COPPER CO.**ARIZONA**

Main office: Prescott, Ariz. **New York office:** Room 514, 49 Wall St.
Officers: T. G. Norris, pres.; A. W. Edwards, v. p.; Geo. D. Morris, sec.-treas.; L. B. Mulhearn, asst. sec.-treas., N. Y.

Property: the Lookout group, 5 copper claims; Mark Twain group, 3 silver-lead claims; Davis group, 8 gold-silver-copper claims, in the Slate Creek mining district, Yavapai Co., Ariz.; Bodie group, 13 silver-lead claims, in the Hassayampa mining district, Yavapai Co., Ariz.

Development: a 100' shaft was sunk on the Lookout property with short levels at 45, 60 and 100'; 800' north of the shaft are other workings, consisting of a crosscut to the vein and two drifts north and south with a 60' winze and raise to the surface from the north drift. At the mouth of the raise a gallows frame was erected and a hoisting plant installed. An excellent wagon road about 3¼ miles long connects the mines with the main road leading to the Davis mines.

On the Mark Twain group very little development work was done, although the mine had been worked in a small way at a profit, before acquired by the Lookout Co. The Mark Twain, Blue Dick and several other promising properties should be consolidated, insuring, under good management, a profitable mining enterprise.

The Davis group is one of the old mines of the district. From the surface and shallow workings much high-grade ore was shipped in the early days. The principal development work was by tunnels and winzes, all showing good ore; the high-grade ore carries considerable copper, though principal values are in gold and silver.

On the Bodie group of mines a good deal of development work was done on the patented claims. A shaft was sunk some 340', with levels at 55, 85, 170, 230 and 335', all said to show ore. The 3-compartment vertical shaft was started at a central point. Work was stopped on all the Lookout properties in 1910.

Surveys were completed for an ore road from the Walker end of the Poland tunnel, through the Senator district to Lookout camp. A branch was also surveyed from this line to the Bodie. The road measures 13.6 miles from the tunnel to Lookout and 8 miles to Bodie, with a maximum grade of 4%. It was intended to build a 30" gauge road with good roadbed and heavy rails, and operate it by steam. Two miles of railroad purchased from the Metals Milling Co. constituted the first 2 miles of the Lookout ore road. This contemplated road would furnish cheap transportation and tap a country that should produce large amounts of ore.

Part of the company's property is now being operated under lease.

MADIZELLE MINING CO.**ARIZONA**

Address: 413 Fleming Bldg., Phoenix, Ariz.

Officers: G. U. Young, pres.; E. C. Moon, v. p.; G. N. Cunningham, sec.-treas.; above are directors.

Inc. 1905 in Arizona. **Cap.**, \$500,000; shares, \$1 par; non-assessable; 3 issued; proposed in Aug., 1917, to sell 30,000 shares.

Property: 25 patented claims, 2½ miles N. of Copper Basin and 6 miles W. of Prescott, said to show a quartz vein with schist hanging and porphyry foot-wall. Ore carries copper as chalcopyrite and bornite, with gold and silver values, and assays from \$12 to \$40 per ton, 25,000 tons and 5,000 tons in reserve, respectively.

Development: by tunnels from shafts, 500, 700, 800 and 130' long, with total of about 5,000' of workings.

Equipment: includes steam hoist, compressor, pump, steam and gas power, and 5-stamp mill.

Idle since 1911, but development work is contemplated at an early date.

McKINLEY MINING & DEVELOPMENT CO. ARIZONA

Prescott, Ariz. A. M. Gough, pres.; Chas. E. McKinley, gen. mgr.
Inc. 1906 in Arizona. Cap., \$1,000,000; shares \$1 par.

Property: 38 claims, 760 acres, in the Copper Basin district, 11 miles south of Prescott. The Dixie group of 6 claims has veins of 5 to 15' width, carrying copper ore. The Peacock group has a vein of 60' claimed width, carrying surface ores said to average 3.7% copper, developed by the Peacock shaft; sunk to a depth of 700'.

In 1917, a crosscut at 700' depth was driven 500', where a strong flow of water was met with. High-grade ore is said to have been exposed at that point, also on the 400' level.

Equipment: includes power plant with hoist good for 1,000' depth.

McMAHAN GROUP ARIZONA

Zonia, via Kirkland, Yavapai Co., Ariz. Owned by C. H. McMahan and brothers.

Property: the Cuprite mine and a group of 8 claims, unpatented, south of Zonia. Ore zone reported as 700' long, containing 8 shoots, 50 to 75' long and 3 to 20' wide, assaying 2 to 9% copper in oxidized zone.

Development: consists of several shallow shafts. Assessment work done in 1916. Planning to sink a 450' vertical shaft. Considerable open-cut work done in 1916 and 1917 to locate ore zone.

MONROE COPPER MINE ARIZONA

Address: John Curran, owner, Walker, Yavapai Co., Ariz. Mine, once owned by the Monroe Cons. Mines Co., long dead, is near the junction of Knapp gulch and Lynx creek, near Prescott. Formerly worked as a gold mine and said to have a 50' dike carrying copper ore on the 300' level. Development work consists of various tunnels.

OLD VESUVIUS MINE ARIZONA

Address: C. H. McMahan and brothers, owners, Kirkland, Yavapai Co., Ariz.

Property: the City Group, known as the Old Vesuvius mine, 6 claims, unpatented, 9 miles S. E. of Kirkland. Shows 4 veins at contact of diorite and granite and diorite and quartz diorite. Developed by several shallow incline shafts. Small shipments made in 1916-1917 are reported to have carried from 4-7 oz. gold per ton. Sinking resumed in shaft on E. vein where high-grade ore is said to have been extracted.

PALO VERDE COPPER CO. ARIZONA

Office: Akron, Ohio. C. H. Howland, Cuyahoga Falls, Ohio, mgr.

Officers: Will Christy, pres.; J. P. Loomis, v. p.; I. M. Shively, sec., with Chas. Currie, E. E. Quirk and C. H. Howland, directors.

Inc. in Arizona. Cap., \$2,000,000; shares \$1 par; issued \$1,000,000.

Property: 8 claims, is a copper prospect about 60 miles west of Phoenix, in the Saddleback mountains, between White Tanks and Eagle Tails districts, Yavapai Co., Ariz.

Mine is opened by shafts of 50, 112 and 210' depth and a 130' tunnel. Surface ores said to contain 2 to 15% copper. Plans to resume work.

PAN-AMERICAN MINING CO. ARIZONA

Is a close corporation. C. P. Collins, pres., Tulsa, Okla.

Cap., \$600,000; shares \$1 par.

Property: 8 patented claims, near Prescott, Yavapai County, developed by several thousand feet of underground workings. Ore contains gold, silver, lead values, mostly of milling grade. Mine has been idle for several years.

POLAND MINING CO.**ARIZONA**

Office: Room 514, 49 Wall St., New York. **Mine office:** Prescott, Ariz. T. G. Norris, pres.; A. W. Edwards, v. p.; George D. Morris, sec.-treas.; L. B. Mulhearn, asst. sec.-treas.

Property: 37 claims, about 750 acres, extending through a highly mineralized mountain lying between the Big Bug and Lynx mining districts, Yavapai County, about 35 miles from Prescott by rail, or 15 miles by wagon road. The claims cover a granite mountain intersected by a number of well-defined, persistent fissure veins, disclosed in a tunnel which goes through the mountain a distance of some 8,000'. Two of these veins, the Poland and Accidental, have been extensively developed.

The property is equipped with air compressors, drills, cars and tools, and a thoroughly modern 20-stamp 100-ton mill.

The tunnel will be of considerable value as a transportation tunnel when a railroad is built from Lynx Creek end, connecting the mines in the Walker district with the Prescott and Eastern Railroad at the Poland end of the tunnel.

PRUDENTIAL COPPER MINING CO.**ARIZONA**

Idle. Office: 322 Federal St., Chicago, Ill. **Mine office:** 35 Bank of Arizona Bldg., Prescott, Ariz. H. H. Linney, agt.

Officers: Shea Smith, pres.; G. T. Clark, v. p.; F. B. Gibbs, sec.; G. H. Jenkins, treas., with W. H. Newhall and Mrs. E. A. Ewing, directors.

Cap. is 500,000 shares, and company is controlled, through the ownership of 422,778 shares, by the Estate of Maj. Shea Smith.

Property: 12 claims, patented.

QUAKER GOLD MINES CO.**ARIZONA**

Address: care Thos. J. Brodnax, Board of Trade Bldg., Kansas City, Mo.

Property: 10 claims, patented, the Gold Note and Richinbar mines, 12 miles from railway, in Harper district, Bradshaw Mts., Yavapai Co., Ariz., shows quartz vein carrying gold ores, reported to average \$8 per ton.

Development: 5,000' of work, in shafts, levels and tunnels.

Equipment: includes 20-stamp mill, hoist, etc., with electric power. Is a big low-grade proposition.

SHELDON MINING CO.**ARIZONA**

Address: care Stukey Bros., Walker, Ariz. John F. Pell, Pres., Newark, N. J.; A. R. Ackerman, treas., Walker, Ariz.

Inc. Aug., 1916, in Arizona, as a merger of the Sheldon group, the H. T. Andrews holdings and those of the Empire Mining Co., Metals Mining Co. and the Majors Mining & Milling Co. These holdings include nine very attractive copper-gold properties, several of them pioneer mines of the district. The tract is a few miles south of Prescott.

Idle and change of management being made in 1917.

SWASTIKA DEVELOPMENT CO.**ARIZONA**

F. W. Woods, mgr., 1832 E. 16th St., Los Angeles, Calif.

Property: in the Bradshaw mountains, Yavapai county, is leased to Frank W. Giroux, Prescott, Ariz. Mine, the Black Warrior, is again a producer of silver-lead-copper ore, one carload netting \$3,000 in 1916.

Development: by 410' shaft with 2' vein of galena exposed on 400' level.

TILLIE STARBUCK MINES CO.**ARIZONA**

Address: A. J. Pickrell, Prescott, Ariz.

Officers: A. J. Pickrell, pres. and treas.; Alan Gardner, v. p.; Richard Lamson, sec.; also directors.

Inc. July 17, 1916, in Arizona. **Cap.**, \$125,000; shares \$1 par; non-assessable; 100,000 issued.

Cash on hand in June, 1917, \$45,242. Operating expenses in 1916 were \$4,758.

Property: 12 claims, 1 patented, 242 acres, on Slate creek, 15 miles S. of Prescott, Ariz., said to show a quartz fissure vein in porphyry and granite; 2 to 6' wide, dipping nearly vertical with N.-S. course. Three shoots, each 100' long, have been developed, with ore reported to assay \$12 per ton in gold and silver.

Development: by tunnels, 2,000, 800, 150 and 600' long. Workings total 4,000' to depth of 600'. Raises have been driven between tunnels to cut the vein.

A cyanide plant is proposed.

TIP TOP CONSOLIDATED MINING CO.

ARIZONA

Prescott, Ariz.

Officers: C. W. Davis, pres.-treas.; A. F. Muter, v. p.; F. L. Haworth, sec., with W. W. Elliott and D. E. Nelson, directors.

Inc. 1916, in Arizona. **Cap.**, \$375,000. Company was organized to operate the old Tip Top silver mine about 25 miles south of Prescott, credited with a production of several million dollars, 1875-85, under Haggin, Head and Hearst.

The mine was originally opened to the 800' level; the present management has reopened it to the 200' level. The dumps, stope filling and low-grade ore left in the mine will be worked for silver and for the tungsten, which was formerly passed over. It is reported that there are 120,000 tons in the dumps that will assay 1½% tungstic acid, and over \$5.20 per ton silver, largely as chloride.

Mine examined by G. A. Thayer, who estimated ore worth \$792,000 to 300' depth and \$2,000,000 under water to 800'.

UNITED STATES CONTINENTAL MINES CO.

ARIZONA

Office: I. K. Farrington & Co., 30 Broad St., New York.

Officers: J. H. Shockley, pres.; P. O. Abbe, v. p.; A. P. Monk, sec.-treas.

Cap., \$1,000,000; shares \$1 par; outstanding, \$720,000; non-assessable. Registrar & Transfer Co., New York, transfer office and registrar. Controls 80% of capital stock of the Cons. Homestead Mines Corp., cap. \$600,000; shares \$1 par; payment for this stock being 50,000 shares U. S. Cont. M. Co.'s stock, placed in pool, and \$7,500 payable within one year.

Property: includes the Copper Bullion mine of the Continental and the Homestead mine, acquired in 1916; the latter consists of one patented claim in the Lynx-Creek mining district, near Walker, Yavapai Co., Ariz. This claim is said to carry the Homestead-Eureka vein, 4' to 7' wide in porphyry and diorite, showing gold ore, partly free milling, silver, lead, zinc and copper ore. The mine workings opened years ago were badly caved when present management acquired it.

Management reported in 1916 "two powerful veins opened for 1,500'"; that the deepest shaft is 120' and estimates \$210,000 yearly earnings on a basis of 100 tons ore daily, an output which will require much development work to realize.

New work on the Continental consists of one 60' and one 100' shaft, and total openings of 450'. A vein in quartz-diorite carries gold-copper ore with silver, lead and zinc values. The 100' shaft is being deepened.

Equipment: one report in 1916 stated there is a 5-stamp mill on the property, another that there is a 5-stamp mill building; also that "management therefore does not contemplate reconstructing its 5-stamp mill until a tonnage is developed that will warrant larger mill construction than 5 stamps."

Company's president is an able engineer and will make the mine a success.

Y. P. MINING CO.**ARIZONA**

Address: N. H. Getchell, mgr., Prescott, Ariz. Operates the Cash property, 14 miles S. of Prescott in the Senator district, Yavapai Co.

Dividends paid are said to amount to \$15,000.

Development: has continued for 3 years and is now at 750'. The 60-ton mill and concentrating plant has 5 Wilfley tables and a Monell slimer and was reported as producing \$8,000 gold bullion per month.

RAY, PINAL COUNTY**ARIZONA HERCULES COPPER CO.****ARIZONA**

Stock control passed to Ray Hercules Mining Co., which see.

ARIZONA RAY COPPER CO.**ARIZONA**

Address: 115 N. First Ave., Phoenix, Ariz.

Officers: W. A. Stuart, pres.; F. M. Dorsey, v. p.; J. L. Milligan, sec., with Fred. E. Young, L. L. Wallace and W. Laurence Barnard, directors.

Inc. in Arizona. Cap., \$1,000,000; shares 10c par; 5,000,000 shares paid promoters for the claims.

Property: 12 claims, adjoining the Ray Consolidated, at Ray, Pinal county, considered to be outside the ore zone and valueless.

Company has been exposed and denounced by the California Corporation Commission, by the Mining & Scientific Press, and lately by the New York Tribune. The exposé drove the promoting firm out of California and to Phoenix, Ariz., where its business is said to have been bought out by the Arizona Securities & Trust Co., which company was still peddling stock, March, 1917, at 12c a share. In July stock was quoted at 2c.

Arizona Ray is considered a fraud of the worst type.

COPPER BUTTE MINES**ARIZONA**

Property under bond and lease to Ray Hercules Copper Co. of Ray, Ariz. Shipping 50 tons daily, 1917. Described in Vol. XII.

COW BOY MINE**ARIZONA**

C. W. McGraw, owner and mgr., Kelvin, Ariz.

Property: 5 claims, 85 acres in Dripping Springs district, Gila county, about 10 miles E. of Ray. Is a contact deposit in monzonite and lime, that carries gold, silver, lead values.

Development: hv 150' shaft and 150' tunnel. Equipment consists of a 6-ton Gardner grinder and hand-jig.

Production: Gold, \$1,705 in 1915; \$2,940 in 1916; \$1,600 to Aug., 1917. Also 15 tons of 31% lead ore in 1917.

EAGLE MOUNTAIN COPPER CO.**ARIZONA**

Probably dead. Col. P. T. McGrath, gen. mgr., but his whereabouts unknown at Kelvin, Pinal Co., Ariz.

Property: 27 claims, known as the Copper Queen group, in the Riverside district, is slightly developed. Idle several years and lands of doubtful value.

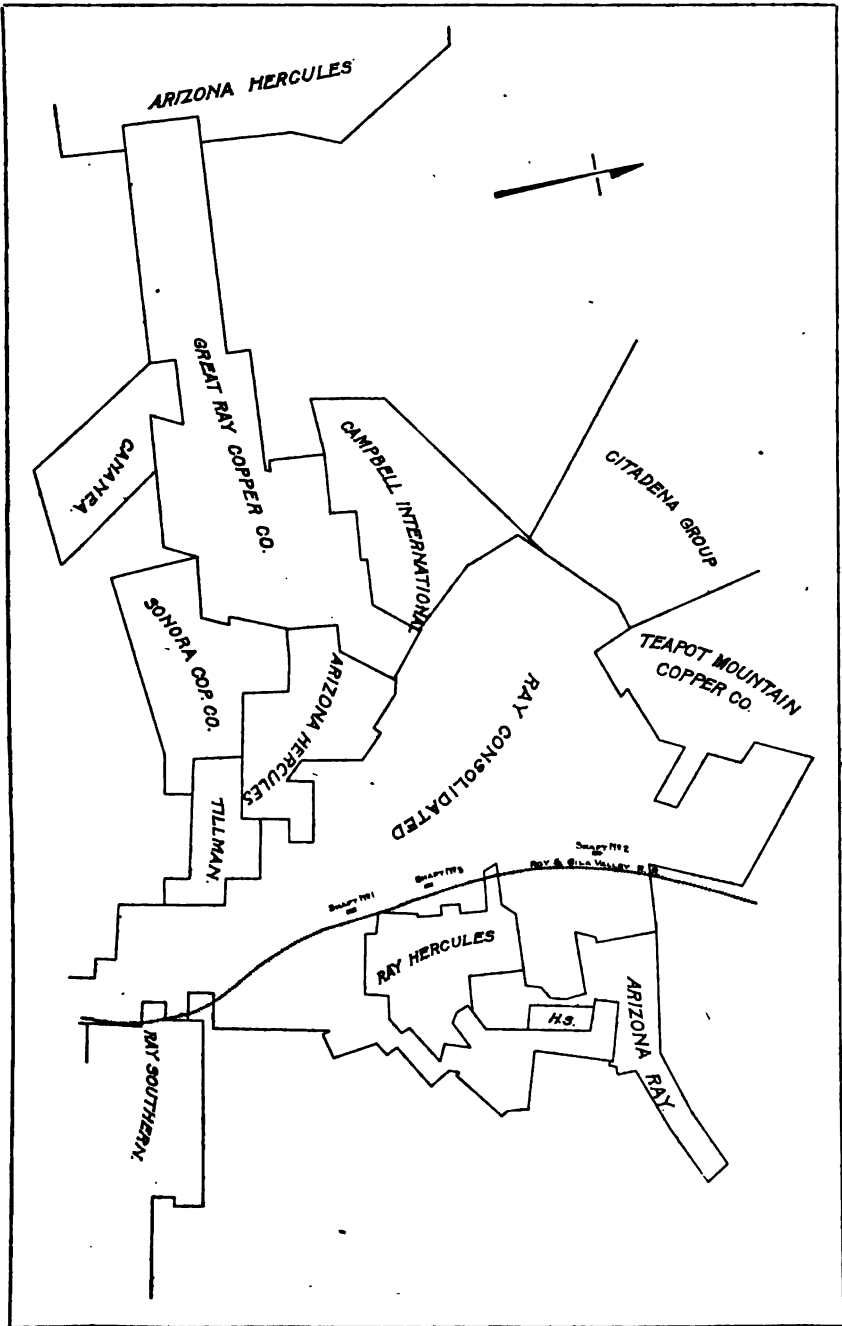
GOLDEN BELL MINING CO.**ARIZONA**

Idle. Kelvin, Pinal Co., Ariz. L. W. St. Charles, pres.; Geo. H. Sarrick, v. p. and gen. mgr.; G. L. Sarrick, sec.; L. C. St. Charles, treas.

Inc. 1910. Cap., \$1,000,000.

Property: 9 claims, near the Southern Pacific railway, 5 miles west of Kelvin, shows gold-copper ore in veins in altered diorite.

Developed: by 100' tunnel, shaft and crosscuts. Equipped with 25 h. p. hoist and air compressor. No 1917 returns secured.



GRAND REEF MINE**ARIZONA**

R. V. Dey, owner, 28 W. 88th St., New York.

Property: 14 claims patented, in the Aravaipa district, Graham Co., Ariz.**Ores:** occur in fissure veins between granite and porphyry, with average values of 3½% copper, 24% lead, 12 oz. silver and \$2.30 gold per ton. Developed by 7,500' of workings in which superintendent estimates 175,000 tons of ore blocked out.**Equipment:** includes steam hoist and 7-drill air compressor.

Property worked under lease by Laurel Canyon Mng. Co. in 1915-16 and reported shipping 1-2 cars of concentrates per week to El Paso smelter. Thirty men employed.

No late returns.

GREAT RAY COPPER CO.**ARIZONA****Address:** C. A. McDonald, Citizens Bank & Trust Co., Bisbee, Ariz.**Property:** 20 claims on both sides of Sulphide canyon, about 1 mile W. of the town of Ray, Pinal Co., Ariz., adjoining holdings of Ray Consolidated Copper Co. and the western group of the Ray Hercules Co.**Geology:** Great Ray is outside the area of secondary enrichment—unlike the developed deposits of the district—but shows abundant copper stains and some sulphide in both the granite and schist rocks exposed in the walls of Sulphide canyon. The area of most intense primary mineralization is at least 1,500' broad and 3,000' long. This ground warrants drilling to determine the copper content.

Considered a legitimate, speculative mining venture to see if the ground contains a primary deposit with one per cent or better copper in it.

GREATER MIAMI COPPER CO.**ARIZONA****Address:** Box 14, Miami, Ariz.**Officers:** W. E. Sorrels, pres.; R. H. Emery, v. p.; C. G. Van Lewenen, sec.; M. N. Kiamy, treas.; foregoing, with H. C. Malloy, M. Raiss and E. W. Wentworth, directors.**Inc. Feb., 1916, in Arizona. Cap., \$1,500,000; shares \$1 par; 8,000 outstanding; non-assessable.****Property:** 32 unpatented claims. 9 miles N. of Ray Cons. Copper Co. and 16 miles S. W. of Globe and Miami, reported to have 100,000 tons of copper carbonate ore blocked out, also some sulphide ore. Lack of roads, now being constructed, prevented shipments.

Present earnings are from sale of shares. Expenses in 1916 were \$14,000.

INSPIRATION CENTRAL MINING CO.**ARIZONA****Address:** 1113 G Ave., Douglas, Ariz. A. J. Krison, gen. mgr.**Officers:** W. E. Tester, pres.; J. M. Bedore, v. p.; J. A. Karlson, sec.-treas.; also directors. J. M. Bedore, supt.**Inc. Sept. 28, 1916, in Arizona. Cap., \$1,000,000; shares, 50c par; 800,000 issued; non-assessable.****Property:** 54 unpatented claims about 14 miles west of Geronimo, in the Turnbull and Santa Terressa mountains, Black Rock district, Graham Co., Ariz.**Geology:** vein occurs at contact of schist, porphyry and limestone, dipping 85° S. Ore in streaks, is from 2 to 10' wide, and contains copper carbonates and sulphides. Average assay is 9% copper, \$11.50 silver and \$3 gold per ton.**Development:** by tunnels, lowest 400', but still driving. Workings total 1,000' to depth of 580'. Reserves are estimated as 7,000 tons. Work contemplated, improvement on road, erection of ore bins and compressor.

Expenses in 1916 amounted to \$10,000. Haulage of ore will be to Geronimo on the Arizona Eastern line, thence to smelters at Globe or Miami.

KELVIN-SULTANA COPPER CO.**ARIZONA**

Office: 339 Monadnock Bldg., Chicago, Ill. **Mine office:** Kelvin, Pinal Co., Ariz.

Officers: A. H. Westfall, pres.; J. A. Russell, v. p.; G. O. Swarts, asst. sec.-treas., with G. P. Baldwin, A. A. Knapp and J. A. Glenn, directors. A. L. Flagg, supt.

Inc. April 19, 1910, in Arizona. **Cap.**, \$3,000,000, increased Dec., 1914, to \$5,000,000; shares \$1 par, non-assessable; issued 3,842,752 shares. Authorized bond issue to Nov. 1, 1919, \$200,000, \$198,700 outstanding. Company was a reconstruction of the Sultana-Arizona Copper Co., financed by the Baldwin Syndicate of Chicago and the entire floating indebtedness eliminated.

Property: 21 claims and 3 fraction, 530 acres; all patented but 2 claims and fraction, in Ray-Kelvin district, Pinal Co., Ariz. Company also owns 30 acres of gold and silver lands in Ures district of Mexico.

The Arizona mines were formerly known as the Riverside and Bryan groups, and are across the Gila river from and 1½ miles S. E. of Kelvin. Management reports 21 contact deposits, between granite and diorite, of which 5 veins have been developed; reported as 18" to 6' wide, and estimated to average 5' in width, with a generally N. W. trend: The property also was said, formerly, to show a 6' vein carrying chalcopyrite in the lower workings, from which shipments to the Humboldt smelter returned 8.7 to 10.6% copper. Average tenor of ore in all veins is estimated by the company as 6% copper and 3 to 4 oz. silver per ton.

Development: by 6 shafts, deepest 590', and the Hunter and Agnes tunnels. About 10,000' of underground work has been done and is said to show widening of veins at depth. A 165' shaft on Diamond Joe claim is reported by Ralph Harris, mining engineer, to cut cuprite, chalcocite, chalcopyrite and pyrite. Vein No. 2 is said to show 6' of 4% ore and in winze from the 300' level 3' of 6% ore. On the Bryan claim, a 175' incline shaft has exposed shipping ore, reported to be very rich.

A crosscut on the 540' level, being driven 2,000' and 1,267' long, Feb., 1916, is reported to have intersected 3 veins which are now under development; No. 510—a vein 4' wide, carrying 2% copper ore, and No. 510-b, about 1' wide, with from 8-17% copper, 4½% lead and 2½ oz. silver.

Equipment: includes a 575 h. p. oil-burning electric plant, a 1-mile aerial tram across the Gila river, to the railway station of Kelvin and a concentrator of 200 to 300 tons daily capacity.

Production: of old company, to end of 1909, was 522 tons of ore, yielding \$12,450. Production in 1907 was 45,838 lbs. fine copper and 653 oz. silver. Daily shipments of 20 tons to the Hayden smelter were made in summer of 1913. The mill has been closed down until sufficiently large reserves have been blocked out to insure profitable operation. Lessees are working on the surface and have made shipments said to average 8-14% copper.

Property held by receiver for sale in May, 1917. Re-organization contemplated and exploration by drilling. Ore shipments in 1916 were only 32 tons.

LITTLE BOBBIE MINING CO.**ARIZONA**

Office: Room 3, 102 N. Central Ave., Phoenix, Ariz.

Officers: W. J. Graham, pres.; J. Pollard, v. p.; S. J. Ross, sec.-treas., above with Geo. Hershman and J. A. Ganz, directors.

Inc. 1917, in Arizona. **Cap.**, \$450,000; shares \$1 par; 312,500 issued. Stock being offered the public at 20c a share.

Property: 9 unpatented claims, known as the Bisbee group, 175 acres, 1½ miles S. E. of Ray, Pinal Co., Ariz., adjoining the Ray-Broken Hill and Ray-Silver-Lead mines.

Ore: silver-lead in limestone, with some gold and copper values.

Development: by 300' tunnel.

Is a prospect.

RAY-ARIZONA COPPER CO.

ARIZONA

Address: 828 Chestnut St., Milwaukee, Wis.

Officers: Fritz Bock, pres.; M. A. McCabe, sec.; Fritz Bock, Jr., mgr., Kelvin, Ariz.

Property: 42 claims, on the south side of the Gila river, opposite Kelvin, shows monzonite porphyry in granite highly mineralized, with impregnations and veins carrying copper ore.

Development: by tunnel shaft and churn drilling. F. L. Underwood is reported to have financed the company under an option on 51% of the stock for \$250,000.

Equipped with Leschen tramway. Lessees shipped several cars of copper ore in 1916 to Hayden smelter.

RAY CENTRAL COPPER CO.

ARIZONA

Formerly the Finney Copper Co.

Address: Box 488, Phoenix, Ariz.

Officers: E. O. Petro, pres.; A. G. Dulmage, v. p.; H. T. Weldon, sec.-treas.-mgr., with W. O. Temple, directors.

Inc. May 20, 1916. **Cap.**, \$1,000,000; shares 50c par; 700,000 shares outstanding. Annual meeting 1st Tuesday in May.

Property: 13 claims, 260 acres in Banner mining district, Gila Co., said to show gold-silver-copper ore in a contact deposit in diabase and lime.

Development: by 165' shaft; drifting being done on the lowest, or 165' level, August, 1917. A prospect.

RAY CENTRAL COPPER MINING CO.

ARIZONA

Company conveyed by direct deed all assets to Ray Consolidated Copper Co. in June, 1912, but has not yet been legally dissolved.

RAY CONSOLIDATED COPPER CO.

ARIZONA

Office: 25 Broad St., New York. **Mine office:** Louis S. Cates, gen. mgr., Ray, Pinal Co., Ariz. **Mill office:** Hayden, Gila Co., Ariz.

Officers: Sherwood Aldrich, pres.; D. C. Jackling, v. p. and managing director; Chas. Hayden, second v. p.; preceding, with Chas. M. MacNeill, Seeley W. Mudd and W. Hinckle Smith, executive committee; Eugene P. Shove, sec.-treas.; L. S. Cates, gen. mgr., preceding officers with Spencer Penrose, directors. W. S. Boyd, supt. of mines; D. D. Moffatt, supt. of mills; E. A. Thornton, mg. engr.

Inc. May 11, 1907, in Maine. **Cap.**, \$16,000,000; shares \$10 par; \$15,711,790 issued, Dec. 31, 1916. Original capital, \$6,000,000, increased to \$8,000,000 in 1908, increased 1909 to \$10,000,000, increased May, 1910, to \$14,000,000. The increase to \$16,000,000, March, 1912, was to provide shares for the absorption of the Ray Central Copper Mining Co., giving 1 share of Ray

RAY CONSOLIDATED COPPER COMPANY

Our Statistical Department will furnish complete information on application.

HAYDEN, STONE & CO.

Members New York, Boston and Philadelphia Stock Exchanges.

25 Broad Street, NEW YORK

87 Milk Street, BOSTON

Cons. for 8 of Ray Central. Company absorbed the Gila Copper Co., through exchange of stock, giving 1 share for 3. Company owns entire capital stock of the Ray & Gila Valley Railroad Co. cap., \$1,629,100. Bankers' Trust Co., New York, and Boston Safe Deposit & Trust Co., Boston, registrars; Guaranty Trust Co., New York, and Old Colony Trust Co., Boston, transfer agents. Fiscal year, formerly ending June 30, has been changed to end with the calendar year. Shares are listed on the New York and Boston Stock Exchanges. Annual meeting, formerly held 4th Tuesday in September, has been changed to 3rd Friday in April.

Comparative General Balance Sheet; Ray Cons. Copper Co. and Ray & Gila Valley R. R. Co.

	Assets:		Metals in		Current	Total
	Property	Const. & Equip.	Devel.	Transit	Assets	
1916...	\$8,715,888	\$9,252,188	\$4,655,381	\$8,084,998	\$2,941,300	\$33,649,755
1915...	8,917,573	7,373,768	4,076,250	3,823,834	1,253,492	25,444,917
1914...	8,917,407	6,961,660	4,024,120	1,753,695	912,892	22,569,774

	Liabilities:		Reserves, Ins.		Total	Total
	Capital Stock	Bonds	Current	Bond Redemp. and Deprec.			Surplus
1916...	\$15,771,790	.....	\$1,037,962	\$1,519,700	\$15,320,303	\$33,649,755
1915...	15,712,790	\$160,500	709,132	974,078	7,888,417	25,444,917
1914...	14,549,290	2,708,000	316,911	905,217	4,090,356	22,569,774

The bonds were called for redemption Jan. 1, 1916. 1916 surplus includes \$1,506,646 from securities sold; earned surplus was \$13,813,657; 1915 surplus from sale of securities, \$1,451,835; earned surplus, \$6,436,581.

Comparative Income Account, Ray Cons. Copper Co.

	Operating Revenue	Operating Expenses	Net Optg. Profit	Total Income	Total Deduct's	Balance Dec. 31
1916...	\$20,060,783	\$8,200,633	\$11,860,150	\$12,264,265	\$4,885,792	\$13,813,177
1915...	10,498,962	6,125,590	4,373,371	5,004,133	2,345,798	6,434,704
1914...	7,597,724	5,281,484	2,316,240	2,655,163	2,655,163	3,776,368

Earnings and Dividends on stock per share:

	1917	1916	1915	1914	1913	1912	1911
Earned.....	.....	\$7.76	\$2.73	\$1.29	\$1.49	\$1.33	\$0.25
Paid.....	*4.20	2.75	1.25	0.75	1.125	nil	nil

Present rate, \$4 per share per annum, payable quarterly, March 31, etc., at Guaranty Trust Co., New York.

A sinking fund of 10c per ton of dry ore treated was in effect from 1914 to 1916, increased to 12½c a ton after 1916. It seems improbable it will ever be needed.

Property: 126 patented claims, 2,143 acres of mining claims, at Ray, 180 acres at Ray Junction for railroad purposes, and a tract of 4,324 acres in Gila and Pinal counties, at Hayden and 21 miles from the mines, for milling and power plant and tailing disposal; 536.5 acres of this are leased to the A. S. & R. Co. for its smelter.

About 580 acres of the Ray property have been proven to be mineralized, and about 183 acres have been developed, with a certainty that more or less of the additional mineral ground will be found to carry workable values.

Geology: the property shows a flat orebody 150 to 400' thick, 1,000 to 3,000' wide and about 9,000' long, through the property. This zone con-

sists essentially of a highly metamorphosed iron-stained schist, whose borders and tongues are also mineralized and cut by diabase dikes. A fault east of the orebody brings the orebody against quartzite and limestone, while unaltered schist is found to the west. The silicified and whitened rock is leached to a considerable depth, the oxidized zone being succeeded by impregnations and seams of chalcocite and pyrite. The ore deposit is almost identical with that of Miami, and genetically similar to those at Bingham, Ely and Morenci. Oxidized copper ores are found near surface, though in much of the ground the top of the belt is leached to depths varying from 30 to 400' and averaging 225', this leached zone being succeeded by ore carrying copper sulphides, greatly enriched by the secondary redeposition of chalcocite, latter constituting the main ore value. At the bottom of the orebody the transition from the ore to rock mineralized with primary sulphides takes place in a few feet. This primary mineralization averages about one-half of 1% copper, whereas an average sample of ore on the 50' level gave 2.4% copper, 3.4% iron, 2.6% sulphur and 90.3% insoluble matter.

The many drill holes bored have shown an average capping of 240' depth, succeeded by an average of 118' thickness of ore, on the Ray proper, with 315' of capping and 171' thickness of ore on the Gila ground. The Ray mine has been developed by both underground workings and extensive churn-drill borings. Six churn drills have been employed, averaging about 50' each daily, boring 340 holes to an average depth of nearly 400' each, with a total of 140,000' of drilling, holes being bored checkerboard fashion, in 200' squares.

Development: by shafts Nos. 1 and 2 about 4,000' apart, and No. 3, the Ray Central shaft, near No. 1. There are many less important workings. The ore supply now comes almost equally from the No. 1 and the No. 2 mines. The No. 3 mine furnishes a smaller tonnage of high-grade ore. No. 1 shaft is 400' deep and has 4 levels at 171' and each succeeding 100' in depth. The shafts are connected by a drift, on the second level, which is run for more than 1 mile, practically through commercial ore. By the side of each shaft is an incline shaft, with a series of stairs used by the men and a haulage way used for the handling of material, the main shafts being used solely for ore extraction. The greatest depth from which ore is to be hoisted will be about 300' for years to come, and the greater part of the tonnage will be taken from the 170' level and above for some years. The mine is operated on the Cates shrinkage-stoping system, the stopes being carried up 15' wide with 10' pillars. When the stoping is completed and ready for drawing, the pillars crush and come down with the broken ore. This method gives a 92% recovery of the ore blocked out. The ore is trammed to 600-ton underground loading bins on each level of each shaft, and drawn therefrom into 12-ton skips through gates operated pneumatically. Ore is hauled underground in trains of 5-ton cars, drawn by compressed air locomotives of the H. K. Porter type, using air with an initial pressure of 1,000 lbs., through the 4,000' 8x14' double-track main haulage tunnel, with which all shafts and working levels are connected. Three cars are dumped at a time into each ore pocket, by a revolving tippie.

The Ray mine, of which the Ray Central or Globe-Isabella mine is now an integral part, has been developed for a maximum width of 3,500' and length of 8,000'. Total underground workings Jan. 1, 1917, amounted to 107 miles, of which mining operations have destroyed about 54 miles. In 1916 new work totaled 66,863', compared with 45,292' in 1915 and 75,261' in 1914. Openings to June 30, 1917, total 608,396'.

Ore Reserves: calculated to Dec. 31, 1914, amounted to 74,765,789 tons, averaging 2.214% copper and underlying an area of 205.2 acres. This is exclusive of 7,061,821 tons, averaging 1.74% copper mined from inception to the end of 1914. The higher grade orebody developed by No. 3 shaft, contained Jan. 1, 1914, approximately 540,000 tons of ore averaging slightly over 5% copper. Ore reserves Dec. 31, 1916, 93,373,226 tons averaging 2.03% copper. This tonnage ensures a life of about 27 years on basis of present production, averaging 10,000 tons per day.

The mine is operated electrically throughout, taking current over a transmission line from Hayden to Ray. There is a crushing plant at the mine, reducing ores to about 1" size before shipping to the mill.

The company owns and operates its own railway, known as the Ray & Gila Valley, from Ray to Kelvin, the trains continuing over the tracks of the Arizona railway (S. P. R. R.) to Hayden Junction and thence over a branch line, belonging to the Ray & Gila Valley to the Hayden concentrator. This line between Ray and Kelvin is standard gauge and is operated as a common carrier. It has 80-lb. rails, Mogul locomotives and 60-ton steel ore cars. The company has a very favorable freight contract with the Phoenix & Eastern for the transportation of ores partially over that line.

The old concentrator at Kelvin, 6 miles from the mine, inherited from the English owners, was enlarged, in 1907, to 300 tons daily capacity and extensive experiments were made until Aug., 1909, these resulting in the concentration of ores 17 into 1, with a 70% recovery of assay values.

Concentrator: occupies a 4,000-acre site at Hayden, about 16 miles from the mine. In its essential features it is a duplicate of the Garfield mill of the Utah Copper Co.

The mill, of 10,000 tons daily capacity, has eight units, and is so designed that it may be enlarged, on the unit plan. The crushing department has 16 sets of 42x16" rolls, and 24 six-foot Garfield Chilean mills. Sizing is done by 48 impact screens, and Janney classifiers, and concentration is effected by Garfield roughing tables, Harz single compartment jigs, Wilfley tables, and Isbell vanners. Water, derived from the Gila river and the adjacent hills, is sent to a 4,000,000-gal. reservoir at the mill site through a 30" pipe, by pumps having a capacity of 7,500 gals. per minute.

The mill started in March, 1911, treating an average of 850 tons of ore daily. The concentrates are well adapted to smelting, as regards sulphur and iron contents, only a small amount of limestone being required for fluxing. Concentrates are treated in the Hayden smelter, owned by the American Smelting & Refining Co.

The power plant at the mill site, of 10,000 h. p. capacity, supplies electric current for the operation of the entire property. The plant has water-tube boilers, burning oil and coal, and running four 2,500 h. p. Allis-Chalmers triple-expansion engines, direct-connected to four 1,750 k. w. electric generators.

Production:

	Tons Treated	Cost per Ton			% Cu.	% Rec.	% Cu. in Concts.	Lbs. Cu. T. Ore	Net Prod. Lbs. Cu.	Cost Cts. per Lb.	Sell. Price Cts.
		Mine Cts.	Mill Cts.	Total							
1917.....								77,951,000*			
1918.....	3,332,340	80.073	55.35	\$2.46	1.607	70.20	19.91	22.56	74,983,540	10.134	26.724
1915.....	2,848,969	62.68	50.96	2.115	1.673	64.11	19.39	21.45	60,328,936	9.497	17.353
1914.....	2,427,700	62.42	49.88	2.174	1.760	67.88	19.25	23.89	57,004,281	8.839	13.267
1913.....	2,365,396	73.23	51.93	2.284	1.719	66.09	18.55	22.72	52,341,029	9.784	15.201
1912.....	1,565,875	77.55	46.38	2.384	1.677	68.28	18.94	22.9	35,861,496	9.828	15.762
1911.....	681,519	81.80	59.45	2.65	1.83	63.01	22.04	32.0	14,935,047	10.765	13.08

*for 10 months

Mine cost includes coarse crushing and loading on cars at mine, from 3.1 to 3.7c per ton. Total cost calculated from income statement includes all operating charges. 1914-16 production of copper is from smelter returns from concentrates and high-grade ore shipments. Cost per pound does not include miscel. income, equal to about 0.1c per lb. Low recovery in 1915 due to construction work in mill improvements at a time when the price of copper made it more profitable to overload such sections as were not undergoing repairs. Ratio of concentration was 17.99 to 1 in 1914.

In 1916 production of silver was 8,125 oz., sold at 71.077c per oz., and 828 oz. gold at \$20 per oz.

The concentrator is now handling its full capacity of 10,000 tons a day. With the mine and works running at full capacity on the average grade of ore, production is now at the rate of over 80,000,000 lbs. of copper yearly. Present costs are 11c per lb. Original estimates by the company's engineers were that a net profit of at least \$1.75 per ton of ore could be secured. The tonnage already developed places the Ray Consolidated among the great copper mines of the world, with a certainty that the present enormous ore tonnage will be increased, and a possibility that it may be doubled. The management is practically the same as that of the Utah Copper Co., the pioneer among the so-called porphyry mines of the world, and is thoroughly experienced, strong and capable.

RAY HERCULES COPPER CO.

ARIZONA

Office: 25 Broad St., New York. Mine at Ray, Ariz.

Directors: Frank C. Armstrong, pres.; J. G. Hopkins, E. P. Earle, Geo. A. Huhn, W. F. Bartholomew, F. C. Armstrong, August Heckscher, Jos. B. McCall. C. E. Addams, gen. mgr.; A. A. Wren, drill supt. and sampler.

Inc. August, 1915, in Maine. Cap., 1,500,000 shares, \$5 par; 1,263,000 outstanding. Company owns 90% of the issued Arizona Hercules Copper Co. stock. When entire stock of holding company is issued, company will have \$1,000,000 cash. No bonded debt, no preferred stock. As the 500,000 shares sold at \$3.75 yielded \$1,875,000, and \$1,000,000 was put in the treasury, the difference must represent part of the purchase price.

Property: 207 acres, in the heart of the Ray district, at Ray, Ariz., surrounded by the holdings of the Ray Consolidated Co. Tract shows Pinal schist, in part capped by dacite, conglomerate and wash and invaded by diabase. Ore developed is an extension and part of the Ray Consolidated orebody. It is crossed by a fault with 350' drop to the east, which fact long retarded development.

Development: in Sept., 1915, Henry Krumb made an examination after drilling 27 drill holes; 17 drill holes showed ore averaging 73.6' thick over 13½ acres with a 257' capping. The total ore developed by these holes was 3,428,774 tons assaying 2.36% copper. The area S. E. and E. has since developed more ore and 4 drills are now working, putting down holes at 200' intervals. A total of the first 30 holes aggregating 89,000' cost \$2.90 a ft., including general expense, 52c; labor and supplies, \$1.55; sampling and technical data, 57c; grading roads and moving drill, 27c. Drills are run in three 8-hour shifts with 1 drill runner at \$6 per day, helper at 40c per hour and sampler at 50c per hour. Drills average 30' per day and consume 1½ tons of coal and 1,500 gals. of water.

Company has sunk one 862' and one 522' shaft at N. W. corner of property and will mine orebody by methods formerly used by C. E. Addams at de Beers diamond mine in Africa. Company is erecting a 1,200-ton mill and figures a recovery of 33.44 lbs. copper per ton at 8½c total cost. If this is done company can earn \$540,000 at 13c copper.

Ore reserves: recent estimates place reserves at 10,000,000 tons of 2% ore, and a total of 25,000,000 tons is expected.

Company is backed by big financial houses, has expert technical advisors, and is very favorably regarded. The stock has been kept down in price by the greed of various brokerage houses, but is understood to now be held largely by strong investment interests.

By Sept., 1917, the mill buildings were nearly complete, the power plant finished, and a spur line is to be constructed costing \$200,000. Mill expected to be ready by end of 1917.

RAY SILVER LEAD MINING CO.

ARIZONA

Address: care Lawhon & Bradford, Phoenix, Ariz.

Officers: William McDermott, pres.; Jos. Cassou, v. p.; A. W. Lantz, sec.; J. H. Page, treas., with K. K. Koontz, directors.

Inc. Dec., 1916, in Arizona. Cap., \$1,500,000; shares \$1 par; 712,505 shares outstanding.

Property: 48 claims, 960 acres, 2 miles E. of Ray, Pinal county, on top of high limestone mountains. Shows replacement deposits of high-grade lead carbonate ore in fissures and along porphyry dikes intrusive in limestone, the ore occurring just above quartzite series.

There are three or four mines on the property, all showing shipping ore.

Reserves estimated by manager at 50,000 tons.

Production: began in June, 1917, 200 tons being shipped that month, 500 tons in July, and an average of 750 tons a month since, ore averaging 21% lead, with small silver-gold values.

Employs 35 men. Uses 231 burros for packing ore into Ray. Shipments made to Empire S. & R. Co., Deming, said to cover all operating expenses and 10% on issued stock.

Management expects to increase shipments to one car per day in September.

SULTANA-ARIZONA COPPER CO.

ARIZONA

See Kelvin-Sultana Copper Co.

UNITED STATES VANADIUM DEVELOPMENT CO.

ARIZONA

Address: E. P. Palmer, Phoenix, Ariz.

Property: 3 miles E. of Kelvin, Ariz. Development by tunnels is said to have opened considerable ore, and in Oct., 1917, a 50-ton mill was authorized. The Bryan dry sizing and concentrating process is to be used.

In May, H. S. Bryan of the Minerals Recovery Co. of Denver reported that a low-grade sample of ore showed 3.68% vanadium, an equal content of "molybdate," gold and silver worth \$76.27 per ton and about 48% "metallic" lead. A process had been evolved to treat this ore at Tucson.

SAFFORD, GRAHAM COUNTY

ATLAS COPPER CO.

ARIZONA

Officers: R. W. Craig, pres., Phoenix, Ariz.; John Barber, v. p.; A. J. McIlhinney, 2nd v. p., 34 Nassau St., New York City; E. W. Clayton, treas.; T. J. Sparkes, sec., with G. H. Hirschfeld, directors. R. J. Young, supt.; L. A. Dunham, cons. engr.

Inc. 1917 in Arizona. Cap., \$1,000,000; shares \$1 par; non-assessable. Is a reorganization of the San Juan Copper Co.

Property: the San Juan mines, 13 claims, 260 acres, in the Lone Star district, Graham county, 8 miles N. of Safford. Ore occurs in granitic porphyry traversing diorite and is said to average 3.6% copper, with gold and silver values. Developed by 330' main shaft, 750' of drifting and 2,500' of diamond drilling, and equipped with hoist, compressor, churn drills and pump. Management is reported contemplating the erection of a 300-ton mill.

Shipments in 1916 to Douglas and El Paso smelters said to have netted the company \$50,000. Shipping 10 tons per day in 1917.

COPPER REEF CONSOLIDATED MINES

ARIZONA

Office: Wm. A. Griffith, sec., 1409 Park Bldg., Pittsburgh, Pa. Inc. Feb. 12, 1910, in Arizona. **Cap.**, \$5,000,000; shares \$5 par; issued 632,000 shares. Union Trust Co., Pittsburgh, transfer agent. Annual meeting, first Monday in February.

Property: 125 claims, 2,500 acres, including 600-acre mill site, in the Stanley Butte district, 15 miles S. W. of San Carlos, and west of Stanley P. O. Claims are on the western slope of a high mountain ridge whose eastern face shows granite overlaid by 600' of quartzite capped by limestone, while the western slope is plated with massively bedded gray limestone. On the claims these rocks are carboniferous and cut by numerous fractures carrying small replacement bodies of silicious copper ore. The rocks dip down the slope at 35°, and most of the orebodies are either in gash veins or occur along fractures, conformable to the bedding. In the many-older pits and shallow shafts, the narrow gash veins were not over 2' wide and the ore pinched out at 20 to 30' in depth.

Development: said to aggregate 3,600', is mainly by tunnel, but includes the 575' North Star and 125' Jessie shafts. The manager estimated in 1914 80,000 tons developed by this work, which is a liberal estimate. Ores average about 5.4% copper and 68% silica, the copper being partly in the form of chalcopryrite and bornite, mixed with chrysocolla, malachite and azurite, etc. Management claimed average value of 8.65% copper with varying gold and silver values up to \$12 per ton.

Equipment: includes two 40 h. p. gasoline hoists, an Ingersoll-Rand 4-drill air compressor and all necessary mine buildings.

Operations suspended end of 1915. Secretary writes, March, 1916, that company is quite satisfied with its property and the existing conditions, and requests no publicity in the Handbook. Investors take notice.

GERONIMO MINING CO.

ARIZONA

Address: Miami, Ariz.

Inc. in Arizona, 1916. **Cap.**, \$3,000,000; shares \$1 par; non-assessable.

Incorporators: N. C. Bandy, D. J. Shea and A. M. Cobb, of Miami. J. W. Sterling, cons. engr.; R. F. Fitzgeralds, gen. mgr.

Property: at Geronimo, Graham Co., Ariz. Churn-drilling for copper ore commenced in Oct., 1916, one hole cutting 4½% ore at 85'.

This is one of the many companies launched during the boom in 1916, the advertising covering full pages of the local papers, which is not of itself suspicious.

GOLD BUTTES MINING & MILLING CO.

ARIZONA

Jos. and Daniel Fraser, incorporators, Duncan, Ariz.

Inc. Dec., 1915, in Arizona, to operate the New Strike gold property, near Twin Peaks. Ore contains gold and is developed for 800'.

LONE STAR CONSOLIDATED COPPER CO.

ARIZONA

Officers: Hon. Wm. H. Powers, pres., 209 Washington St., Boston, Mass.; Henry H. Folsom, sec.; A. G. Smith, treas. Chas. B. Spaulding, supt.

Inc. Aug. 6, 1906, in Maine. **Cap.**, \$5,000,000; shares \$10 par, practically as successor of Maravilla Copper Co.

Company controls the Mineral Mountain Copper Co., through ownership of a two-thirds share interest, and controls, through majority stock ownership, the Chase Creek Copper Co.

Property: 32 claims, includes the Little Clara mine, developed by tunnel and shaft, and the Lone Star mine, in the Gila mountains, 10 miles N. of Solomonville, having a 900' shaft, said to show a 5' vein of sulphide

ore carrying 8 to 10% copper, with fair silver values and a little gold. The shaft also shows stringers of ore giving assays of 5 to 20% copper. Air compressor and drills installed 1915.

SALOME, see Wenden

SILVER BELL, PIMA COUNTY

ARIZONA BELMONT MINING CO.

ARIZONA

Office: Bullitt Bldg., Philadelphia, Pa. Mine: Silver Bell, Pima Co., Ariz. Meyer Schamberg, pres.; John Rice, treas., with J. S. Harwood, N. S. Keith, W. P. O'Meara, G. D. Woodside and E. E. Young, directors.

Inc. in 1911 in Arizona. Cap., \$1,000,000; shares \$1 par; issued 870,000.

Property: lands, 16 claims, adjoin the Imperial Copper Co at Silver Bell, on the east and northeast and are developed by 392' shaft. Operations suspended in 1913.

EL TIRO COPPER CO.

ARIZONA

Drexel Bldg., Philadelphia, Pa. El Tiro, Pinal Co., Ariz.

Officers: C. D. Bouton, v. p.; J. D. Goff, sec.; C. J. Schlaechter, treas.; W. H. Buehman, acting gen. mgr.; preceding, with G. W. Barnes, William Greif, L. O. Bailey, H. D. Moore, directors.

Inc. May 22, 1907, in Arizona, as successor of the Cleveland-Arizona Mining Co. Cap., \$4,500,000; shares \$10 par; fully issued. Funded debt outstanding July 1, 1916, \$1,291,000 (authorized \$1,500,000) first mortgage 6% 10-year \$500 and \$1,000 gold coupon bonds. Dividends 6% per year until all bonds are retired. Company controlled by American Finance & Securities Co., through ownership of majority of stock issue. Annual meeting third Thursday in April, at Tucson, Ariz.

Property: 14 claims, 255 acres, including a 5-acre mill site in the Silver Bell district, adjoining the Imperial mine, 70 miles west of Tucson. Claims show contact deposits between quartz porphyry and limestone, carrying cuprite, melaconite, chalcocite and chalcopyrite with a gangue of decomposed porphyry and limestone. Two orebodies under development are irregular in shape, of about 10 acres in combined area and proven to depth of 400'.

Development: by several shafts and tunnels, including the 283' three-compartment Kurtz shaft, and a 432' transportation, tunnel connecting the Kurtz shaft with the railroad. There is about 15,000' feet of development work disclosing large quantities of concentrating ore and several large bodies of high-grade ore. Mine is said to have considerable 3% ore on the dumps. Not operating March 1, 1916.

Equipment: includes a 600 h. p. steam plant, 150 k. w. electric plant and a 120 h. p. gasoline plant, with a 16x20" 250 h. p. double-drum hoist, good for 1,000'; 3 gasoline hoists, and Nordberg and Sullivan air compressors of 18 drills aggregate capacity. There are 18 buildings in all.

A 50-ton concentrator, built for experimental purposes, and increased later to 100 tons daily capacity, is equipped with a 7x10" Blake crusher, 30-ton Huntington mill, 2 rolls, a Vezin automatic sampler, 1 vanner, 5 Wilfley tables and 1 Richards pulsator and hydraulic sizer. Railroad crosses land.

IMPERIAL COPPER CO.

ARIZONA

G. W. Dietz, sec., Tucson, Ariz.

The Silver Bell mine is being operated by American Smelting & Refining Co.; Julius Kruttschnitt, Jr., mgr.; Edw. Thornton, supt.

In 1903 company bought the old Silver Bell mines and built the Arizona Southern Railway line from the Southern Pacific R. R. to the mine;

it erected a smelter at Sasco, through its subsidiary, the Southern Arizona Smelting Co., and built a concentrator and fine plant at the mine. Mining was stopped in 1913 by the loss of a 450' shaft by fire and the inability of the mine to furnish 700 or 800 tons of ore of high enough grade to pay with copper below 12½¢ a lb. Had the parent corporation, the Development Co. of America, been able to supply the funds, which it claims were promised by the Southern Pacific R. R., the Imperial could probably have tided over this period.

In 1911 trustee for bondholders of the company began foreclosure proceedings, resulting in the sale in 1915 of the property, including the stock control of the railroad and of the smelting company. Immediately thereafter the American S. & R. Co. secured a bond and churn-drilled the tract to check assay plans of former management, and in March, 1915, property was taken over and lease taken at \$2,000 per month on the Sasco smelter.

The Silver Bell mines cover 85 claims, 1,700 acres, in a small mountain range called the Silver Bell. The range has a monzonite porphyry core capped by Paleozoic limestone and quartzite, eroded and faulted, with orebodies in the baked and altered limestone as irregular lenses along shear planes in this contact zone. The porphyry is itself altered and impregnated with copper sulphides. Oxidation extends downward 100-150'. The underlying sulphide ore carries chalcopyrite and some bornite. This is the largest developed mine south of the Southern Pacific R. R., being but 35 miles south of Tucson.

For geology see Bull. 285, U. S. Geol. Survey, 1906, pp. 102-3. Also Min. Res. 1907, p. 175; 1908, pp. 204 and 305; 1909, pp. 167 and 251. Fully described in Vol. XI, Copper Handbook.

Shipments begun May, 1916, now average 10,000 tons per month.

OXIDE COPPER CO.

ARIZONA

Office: 85 Ames Bldg., Boston, Mass. Mine at Silver Bell, near Red Rock, Pinal Co., Ariz. Albert C. Burrage, pres.; Chas. D. Burrage, sec-treas.

Property: 31 claims, patented, known as the Copper Prince group, in the Silver Bell district, 7 miles south of the Imperial mine, shows contact metamorphic deposits carrying argentiferous copper sulphides in limestone gangue.

Development: by a 500' shaft and a 350' tunnel, with about one-half mile of workings.

Equipment: includes gasoline power and an air compressor. Churn drilling was done, 1910, to locate disseminated ores, but apparently results were not especially encouraging. Production was 49,676 lbs. copper and 103 oz. silver in 1908, and less than \$3,750 worth of ore in 1910; none reported since.

SASCO SMELTER

ARIZONA

Sasco, Ariz. Operated by A. S. & R. Co. under lease.

SOUTHERN ARIZONA SMELTING CO.

ARIZONA

Bankrupt. Property bought in by preferred creditors at public auction, March, 1915, and reported leased, 1916, to the American Sm. & Ref. Co. Sasco smelter fully described in Vol. XI, Copper Handbook.

WAYNE DEVELOPMENT CO.

ARIZONA

Idle.

Property: near Quijotoa, via Weldon, Pima Co., Ariz., includes 49 claims, partly patented, 980 acres and three mill sites, total 1,020 acres, in the Quijotoa district, 40 miles from the Red Rock-Silver Bell railroad. Claims show mineralized zones between granite and andesite carrying several orebodies, one of which is said to be 200' wide and characterized by

gold ores. The other orebodies show copper ores containing malachite near surface, succeeded by chalcopyrite, mixed with lead and zinc sulphides beneath the oxidized zone. The ore is reported to average 10 to 30% copper and 5 to 70% lead.

Development: by 1,800' crosscut tunnel, long abandoned, 7 shafts of 60 to 330' depth and about 10 tunnels, longest 430' with total workings of about 4,500'.

Equipment: includes steam and gasoline engines, aggregating 500 h. p. at the mine and mill, two 45 h. p. hoists, good for 700' depth, Fairbanks-Morse and Leyner air compressors, with 17 buildings. The 100-ton stamp mill and concentrator has 30 gravity stamps and a 250 h. p. engine, 4 Blake and Samson crushers, one 50-ton Elspass centrifugal crusher and 3 Standard tables. Long inactive and probably defunct.

SUPAI, COCONINO COUNTY

NORTHERN ARIZONA LEAD & ZINC MINING CO.

Address: Prescott, or Supai, Ariz.

Officers: W. I. Johnson, pres., with Geo. Brookshea, W. P. Burke, W. C. Miller and F. Blucher, directors.

Inc. 1916, in Arizona. **Cap.**, 1,000,000 shares of no par value; 520,000 issued.

Property: 5 claims, 100 acres, in Cataract Canyon district, Coconino Co., Ariz., said to show a chamber deposit in limestone. Ore contains both carbonate and sulphide of lead and zinc, with some silver.

Development: by tunnels, longest 285' with total workings of 600'.

Equipment: includes 20-ton mill, to be enlarged, giving concentrate assaying 65% lead and 25 oz. silver per ton.

Is a small mine, on which owners propose to erect a 300-ton mill.

SUPERIOR, PINAL COUNTY

ALTA MINING & SMELTING CO.

ARIZONA

Idle. Mail returned from former offices at Superior, and Florence, Pinal Co., Ariz.

Officers: L. H. Sherman, pres.; Col. G. W. Griffey, v. p. and agent; H. A. Austin, second v. p.; J. C. Ferrall, sec.-treas.; preceding officers and G. R. Charters, directors.

Inc. Sept. 8, 1905, in Arizona. **Cap.**, \$5,000,000; shares \$1 par. Annual meeting, first Tuesday in September.

Property: 25 claims, area 470 acres, and a 200-acre patented ranch, including a water right on the Gila river, in the Mineral Creek district, at Superior P. O., near the Lake Superior & Arizona mine. Lands have veins in schist and contact deposits between schist and porphyry, ranging 5 to 50' in width, opened by shafts of 96', 127' and 150', with upwards of 3,000' of workings, showing ore giving assays of 2 to 57% copper, with gold and silver values, also a lead vein giving assays of 2 to 57% lead, 4 to 15 oz. silver and 80c to \$14 gold per ton.

Equipment: at the Black Copper shaft includes boiler house and power house, with steam hoist good for 1,000', 4-drill Leyner air compressor and 14,000-gal. oil tanks. There are 9 mine buildings.

A suit against H. W. Augustine, H. F. Clough and I. A. Wood, promoters, for money claimed to be illegally appropriated for their own use, was decided in favor of the present management, compromised by the surrender of 1,190,000 shares of stock to the company.

Property reported sold, 1917.

BROWN WHITLOW GROUP**ARIZONA**

Mine Address: Superior, Pinal Co., Ariz. Owned by J. C. Brown and J. W. Whitlow.

Property: 5 claims, in Pioneer district, near Superior; adjoins the old Silver King mine, once the richest silver property of Arizona.

Development: by tunnel, which cuts a 7' contact vein of copper ore carrying low-grade and silver values.

CURRY MINING CO.**ARIZONA**

Wm. Curry, mgr., Superior, Ariz.; John T. Rurey, Phoenix, sec.; J. D. Cox, Hornell, N. Y. and Fred. H. Schulz, directors.

Inc. 1917 in Arizona. Cap., \$1,000,000; authorized to sell 200,000 shares.

Property: 7 claims, the Curry group, near Silver King, shows a ledge of silver lead ore.

Development: mostly by open cuts and pits, which show copper and lead ore. Plans sinking shaft 1917-18.

DOUGLAS COPPER CO.**ARIZONA**

Office and secretary: Fred L. Mason, P. O. Box 421, Globe, Ariz. T. C. Hendricks, pres.; H. M. Foster, v. p.; Chas. Davis, supt.

Inc. Aug., 1910, in Arizona. Cap., \$1,125,000.

Property: 35 claims, about 30 miles from Globe on the wagon road, and midway between the towns of Ray and Superior, Pinal Co., Ariz. Lands are traversed by several N. W.-S. E. fissure veins of limestone and quartzite, carrying gold, silver and copper in oxidized ores or as bornite and chalcopyrite.

Development: by 2 tunnels, a shallow shaft and a number of open cuts, all on one large vein. Management expects to sink shaft to 500' in depth. Property lies west of the limestone uplift in which the Newman group is located. From personal inspection, the claims are regarded as of highly speculative value, but the great amount of activity in this belt, all part of the Superior district, makes the tract far more valuable than it was a few years ago.

FORTUNA MINING CO.**ARIZONA**

Company probably dead but mine working.

Address: Edw. McFarley, mgr., Superior, Pinal Co., Ariz.

Inc. Jan. 27, 1908, in Ariz. Cap., \$1,000,000; shares \$10 par.

Property: a group of claims, 5 miles N. of Superior, under lease and bond to McFarley and Miller in 1917, shows copper ore with high gold and silver values.

Development: by 430' shaft on N. S. vein and the 450' Richardson tunnel on E. W. vein, carrying a 2-6" pay streak of ore said to assay 10% copper, up to several thousand ounces silver and \$25 gold per ton, but cut off by a cross fault in face. Tunnel to be extended and the mine equipped with compressor and air-drills in 1917.

In driving the tunnel to intersect vein at 750', Sept., 1917, a 2' streak of gray copper ore was cut at 440' and a cave at 450'. Shipments are to begin shortly.

GRAND PACIFIC COPPER CO.**ARIZONA**

Address: Superior, Ariz. J. C. Denton, mgr.

Officers: F. G. Jewett, pres.; M. A. Moody and L. M. Hart, v. p.'s.; H. C. Hamlin, sec.-treas.; above are directors.

Inc. April, 1916, in Arizona. Cap., \$1,500,000; shares \$1 par; 950,000 outstanding. Income in 1916 was \$5,000 and expenditures, \$10,000. The company has no debts; has spent \$70,000 to date, and has cash and money due in 1917, totaling \$50,000.

Property: 35 unpatented claims, 2 miles S. of the Magma mine, Pioneer

district, Superior, Ariz., shows 3 fault fissures crossing the uptilted limestone and quartzite beds at right angles. The lode under exploration follows a porphyry dike, and is similar in geological occurrence to the nearby Magma mine. The orebody already opened is about 50' long, and in places 5' wide, the ore being a residual mass in leached iron gossan.

Ore occurs as shoots with 30° dip and E. W. course. Oxide ore shipped averaged 17% copper, with some precious metals. A bedding plane lode and a silver lode also occur on the claims.

Development: by 3 tunnels; the lowest one 700' long, Oct., 1917, should cut the ore shoot at 800', and at depth of 420'. Workings total 1,000'. No reserves blocked out. Drifting, sinking and raising contemplated.

Equipment: includes Fairbanks-Morse hoist and Sullivan compressor.

Production: 150 tons of 17% ore in 1917.

LAKE SUPERIOR & ARIZONA MINING & SMELTING CO.

ARIZONA

All assets transferred to the Superior Arizona Copper Co., in 1916, and stockholders received share for share in the latter company, which see.

MAGMA CHIEF COPPER CO.

ARIZONA

Address: Superior, Ariz.

Officers: C. L. Knight, pres.; K. Pomeroy, v. p.; F. T. Pomeroy, sec.-treas., with D. D. Moffat and W. T. MacDonald, directors; C. A. Kumke, supt.

Inc. Oct. 4, 1913, in Arizona. **Cap.,** \$2,000,000; shares \$1 par; non-assessable; 1,259,916 issued.

Property: 17 unpatented claims in Pioneer district, Pinal Co., Ariz. Examined by W. H. Hollis, F. M. Gordon, C. A. Kumke and W. H. Weed.

Geology: claims cover the Superior series of tilted limestone, quartzite and shale beds, resting on diabase and cut by cross faults and the persistent L. S. & A. bedding fault vein, both faults being in the Magma Chief. Ore deposition in the district occurs with porphyry dikes in and along these fault-fissures, all the known mineralized faults showing black manganese and ironstained outcrops of silicious material. Comparing the outcrop of the adjoining Magma and L. S. & A. veins with that of other fractures, especially those on the Magma Chief no difference can be noted. The L. S. & A. vein was first worked for gold, and later exposed oxidized copper ore. The Watson vein of the Magma Chief has surficial characteristics of well-mineralized veins, has a width of 33' of manganese outcrop on the Palace claim, has shown a porphyry dike and should yield copper at depth.

Development: a tunnel started early in 1917 was in over 1,490' in October. This work is suspended pending diamond-drill results at the L. S. & A. contact. The rock was porphyry for 525'. The old Baltimore tunnel is being extended to open a manganese deposit. It is intended to sink an 800' shaft on the Watson vein. Crosscuts at 950', 1,050' and 1,150' showed 15 to 25' of porphyry assaying up to \$3.50 gold and 1 oz. silver per ton.

By Dec. 1., No. 1 hole was down 72' in quartzite, and progress was expected to be 20' daily. The vein should be cut between 500 and 600' depth.

Is considered a promising well-managed mining venture.

MAGMA COPPER CO.

ARIZONA

Office: 14 Wall St., New York. **Mine office:** Superior, Pinal Co., Ariz.

Officers: W. H. Aldridge, pres.; C. F. Ayer and H. F. J. Knobloch, v. p.'s; H. E. Dodge, sec.-treas.; preceding, with John F. Alvord and C. A. Corliss, directors; W. C. Browning, gen. mgr.; E. H. Lundquist, mine supt.

Inc. June, 1910, in Maine. Cap., \$1,500,000; shares \$5 par; issued \$1,200,000. Transfer agent, Guaranty Trust Co., New York. Registrar, Bankers Trust Co., New York.

Balance Sheet:

Assets—						
	Property & Plant	M. A. R. R. Stock	Cash & Copper	Other Current	Supplies	Total
1916.....	\$1,004,917	\$242,010	\$798,444	\$272,998	.....	\$2,318,369
1915.....	928,186	200,000	443,068	46,855	\$35,166	1,653,275
Liabilities—						
	Capital Stock	Current	Surplus			Total
1916.....	\$1,200,000	\$95,239	\$1,023,130			\$2,318,369
1915.....	1,200,000	47,478	405,797			1,653,275
Income Account:						
	Metal Sales	Total Income	Total Expenses	Oper. Profit	Deprec.	For'd
1916.....	\$2,555,936	\$2,556,732	\$1,376,968	\$1,179,764	\$82,431	\$1,097,333
1915.....	1,040,896	1,041,235	370,348	670,886	59,157	611,729

Earnings for first half 1917 were \$736,959.

Quarterly dividends of 50c per share began Sept. 30, 1915.

Property: in the Pioneer district, Pinal Co., Ariz., formerly known as the Silver Queen mine. Company owns a compact group of claims of about 531 acres, of which 153 acres are patented, also 108 acres of mill sites. Owns other interests and has options on adjoining property. Diamond-drilling revealed ore-shoots east of the main lode, which has been developed continuously from the 400' to 1,500' level.

Geology: The known orebodies of the mine occur in a strong fault fissure filled with porphyry and cutting diabase, quartzite and limestone. The ore is mainly chalcocite.

Development: mine has been partially prospected and developed to the 1,200' level by the old 800', shaft and a new 1,500' three-compartment shaft. Development work in 1916 totaled 8,653', of which 298' was shaft-sinking. Total underground workings Jan. 1, 1917, 26,236'. The vein has been developed on the 500', 650', 725', 800', 1,000', 1,200', 1,300', 1,400' and 1,500' levels. Openings on each of the three bottom levels have exposed the main ore shoot. At the bottom there is 34' of ore assaying 10.52% copper, 5.37 oz. silver, and \$1.26 gold per ton. Minerals are principally bornite and chalcopyrite. Total drifting at 1,500' was 235', all in ore containing 5% copper. West of the main body on the vein, or at 1,200' level was a shoot of ore 170' long and 5' wide, assaying 33 oz. silver, 0.4% copper, 80c gold, 2% lead, and 6.7% zinc. On the 1,000' level the main vein is 50' wide in places.

Ore reserves: estimated Jan. 1, 1917, as 125,000 tons copper sulphide ore assaying 6.25% copper, 6.5 oz. silver and .03 oz. gold per ton; 20,000 tons of lead-zinc ore, assaying 13.5% zinc, 2% lead and 12 oz. silver per ton; 7,500 tons of silver sulphide ore assaying 30 oz. silver, 0.4% copper, 2.2% lead, 6.1% zinc, 0.05 oz. gold.

Equipment: is electrical throughout, but includes a 160 h. p. steam hoist, now driven by compressed air, 2 air compressors, one of 1,500, the other of 900 cu. ft. capacity, driven by a 225 h. p. motor and 3 vertical Aldrich pumps, each driven by a 75 h. p. motor.

In Aug., 1914, the company completed a concentration and oil flotation mill, having a monthly capacity of 4,500 tons. Uses General Naval Stores oil. Mine and mill are connected by a 2,600' aerial tram. The Callow flota-

tion process is used in the mill and treats the tailing from the finishing tables. Recovery was 83.13%. Ore and concentrates are shipped to the plant of the A. S. & R. Co. at Hayden, Ariz. The 100-ton lead-zinc concentrator was enlarged 50%, but later the new section was changed to copper treatment.

The company owns substantially all the shares of the Magma Arizona Railroad Co., completed in 1915, a 30.4-mile narrow gauge road from Superior to Webster, a station on the Arizona Eastern R. R. This line was profitably operated in 1916.

A 15-mile electric power line with steel towers was built by the company from its property to the Inspiration mine, at Miami, where it connects with the power line from Roosevelt Dam. The company has a contract for several years with the U. S. Reclamation Service for electric power, at an approximate cost of \$49 per h. p. year.

Production: in 1916 was 8,473,580 lbs. of copper, \$375,885 gold and silver, \$24,492 lead and zinc; compared with 6,046,459 lbs., and \$208,658 gold and silver in 1915. The average selling price was 24.722c per lb., and cost 10.803c; leaving a profit of 13.919c per lb.

Crude ore shipped, 9,126 tons, assayed 16.756% copper, 18.802 oz. silver, and \$1.76 gold per ton. Mill ore, 74,617 tons, averaged 4.344% copper and 4.854 oz. silver. Tailing contained 0.7158% copper (of which 0.225% was oxide) and 0.84 oz. silver per ton. There was also shipped 3,450 tons of carbonate ore, assaying 7.936% copper, 5.611 oz. silver, and \$1.40 gold; 183 tons of lead and 429 tons of zinc concentrates.

Output for 1917 will be about 11,000,000 lbs. copper.

Although actual ore blocked out is not great in amount the future of the Magma appears bright, especially as the main orebody is strong at 1,500', and conditions for its continuation are favorable.

MAGMA EXTENSION COPPER MINING CO. ARIZONA

Address: 110 N. 1st Ave., Phoenix, Ariz. **Mine office:** Superior, Ariz.

Officers: John Cowan, pres.-treas.; J. J. Neary, sec. and gen. mgr., with G. A. Mauk, J. W. Spray and F. H. Poole, directors.

Inc. 1917 in Arizona. **Cap.**, \$1,500,000; shares \$1 par; non-assessable.

Property: 135 acres in Pioneer district, Pinal Co.; said to be adjacent to Magma Copper, Magma Chief and Silver King mines. Geological conditions are reported to be similar to those at these properties, but this is doubted.

MAGMA QUEEN COPPER CO. ARIZONA

J. C. Callaghan, C. R. Bone and G. A. MacDonald of Phoenix, incorporators.

Inc. Dec. 2, 1916, in Arizona. **Cap.**, \$1,500,000; shares \$1 par.

Property: 10 full and 2 fractional claims, 208 acres, known as the Black Diamond and Magma King groups, at the northern end of the Pioneer, or Superior mining district, Pinal Co., Arizona.

The Black Diamond ore deposit is a gently dipping bed of garnetized limestone, 12' to 20' thick, containing scattered grains and clusters of oxidized copper ore. This occurs at the contact between the limestone series of the region and the Silver King stock or body of monzonitic, i. e., granitic rock. The ore is flecked and spotted with stellate masses of micaceous hematite. Selected material for shipment shows 15% copper, 34.5% insoluble and 25% iron, but the average copper content of the deposit, so far as opened, is less than 2%. The Black Diamond orebody is 225' long.

Other claims show geological conditions which warrant prospecting work.

Development: work is limited to an incline, 48' long, and various open-

cuts. The 450' Black Diamond tunnel, 100' below the ore bed, had not reached ore at last accounts.

Regarded as worthy of limited prospecting, but not at points thus far attacked.

MAGMA RAY COPPER CO.

ARIZONA

Address: A. H. Woollacott, 261 I. W. Hellman Bldg., Los Angeles, Cal.

Property: 420 acres, known as the McSherry group, near Ray Junction, Pinal Co., Ariz.

MAGMA-SUPERIOR COPPER CO.

ARIZONA

Address: care of Samuel Newhouse, Salt Lake City, Utah.

Property: situated south and adjoining what was originally known as the Lake Superior & Arizona claims, now owned by Magma Copper at Superior, Pinal Co., Ariz. Geological conditions said to be favorable. Development proceeding at last accounts.

MAGMA SURPRISE MINING CO.

ARIZONA

Address: Superior, Ariz.

Officers: G. J. Stone, pres.; V. B. Andreas, v. p.; J. L. Boyce, sec.-treas., with R. Krakauer and P. Howle, directors.

Cap., \$1,000,000; shares \$1 par.

Property: 21 claims, 1½ miles S. W. of Superior, Pinal Co., Ariz. Developing at last accounts.

MAGMATIC COPPER CO.

ARIZONA

Address: Superior, Ariz.

Officers: J. C. Goodwin, pres.; T. J. Goodwin, v. p.; G. A. Goodman, sec.-treas.

Inc. 1917 in Arizona. **Cap.,** \$100,000; shares 10c par; non-assessable. Listed on New York curb.

Property: 20 claims, 1½ miles S. of the Magma Copper Co. mine, Superior, Pinal Co., Ariz.

Geological conditions are similar to the other parts of the district. Shaft down over 100' in Aug., 1917, and said to show high-grade manganese ore. Copper indications reported improving.

MAMMOTH COLLINS MINE

ARIZONA

Care of Young Bros., Shultz, Arizona. See Great Western Copper Co.

MANIFEST COPPER & SILVER CO.

ARIZONA

Address: Box 494, Globe, Ariz.

Officers: W. Kitzmiller, pres.; W. R. Henry, v. p.; W. W. Crawford, sec.-treas., with J. W. Morrell and (Mrs.) C. Kitzmiller, directors.

Inc. in Arizona. **Cap.,** \$3,000,000; shares \$1 par; non-assessable; 35,000 outstanding.

Property: 43 unpatented claims in Pioneer district, Pinal Co., Ariz., 20 miles from Globe and 12 miles from Hayden. Was a silver producer in the 80's. Under bond for 3 years to W. J. Porter and W. Kitzmiller.

Geology: sulphide ore occurs in a contact fissure in quartzite. It is reported to carry 10 to 30 oz. silver, \$1.50 gold, 10 to 35% lead, and 1½ to 6% copper.

Development: to 85' depth, totaling 2,000'. About \$7,000 spent during 1916.

POMEROY-PRUDENTIAL COPPER CO.

ARIZONA

Officers: Hornell, N. Y., and Superior, Ariz.

Officers: K. Pomeroy, pres.; J. T. Rurey, v. p.; E. Pomeroy, sec.; I. N. Brill, treas.

Inc. 1917 in Ariz. **Cap.,** \$1,500,000; 750,000 in treasury; 50,000 shares sold at 25c each; 50,000 more offered the public at 50c a share, March, 1917.

Property: 9 claims, Pioneer district, 3 miles W. of Silver King, and known as the Silver Bell and Sulphide group, in the Pioneer district, 3½ miles N. W. of the Magma mine.

Development: by 130' tunnel said to show some copper glance ore with silver values.

Is a prospect.

QUEEN COPPER MINING CO.

ARIZONA

Property sold to Magma Copper Co.

QUEEN CREEK COPPER CO.

ARIZONA

Address: Phoenix, Ariz.

Officers: A. Mackay, pres.; W. C. Foster, v. p.; Arthur J. Smith, sec-treas., with F. S. Stephen, F. J. Dourson, J. C. Devine, J. W. Crenshaw and C. M. Shannon, directors; W. A. Macdonald, supt., Superior Ariz.

Inc. May 3, 1916, in Arizona. **Cap.**, \$1,000,000; shares \$1 par; 564,965 shares outstanding. Listed on New York curb, April, 1917. Equitable Trust Co., New York, transfer agents; U. S. Corporation, registrars. Annual meeting first Monday in May.

Property: 17 claims on Queen creek, 1 mile from Superior, Pinal Co., said to have a contact fissure, carrying gold-silver-copper values.

Development: by 260' shaft, being sunk to 500' depth. Diamond drill exploratory work in 1917 was reported to have passed through 40' of vein matter at 300' depth, assaying 8% copper.

SILVER KING OF ARIZONA MINING CO.

ARIZONA

Office: 1 Broadway, New York. **Mine office:** Alex. B. Downe, mgr., Superior, Ariz.

Officers: A. W. Hillebrand, pres.; Alex. B. Downe, v. p.; W. F. Ainsworth, sec-treas., with W. C. Foster, E. J. Stern, R. E. Lewers and T. B. Higgins, directors.

Inc. May, 1916, in Arizona. **Cap.**, \$2,000,000; shares \$1 par; 1,500,000 issued; non-assessable. Security Transfer & Registrar Co., New York, transfer office. Annual meeting first Wednesday in January.

Property: the Silver King mine, 10 lode claims, nearly 170 acres, 3 miles from Superior, on the Stoneman grade, is an old silver mine, popularly credited with a production of \$10,000,000, and known to have paid \$1,950,000 in dividends up to July, 1887. Opened to a depth of 1,000', the mine was originally worked for gold and silver, copper ore in the form of tetrahedrite coming in at a depth of about 310' and continuing to depth of 510', below which very high-grade silver ores were again encountered. There are about 6 miles of old workings.

Geology: the conditions are described in Bull. 540, U. S. Geol. Survey. Though currently spoken of as a vein, the orebody is a stockwerk, in which the extraordinarily rich ores, carrying various silver arsenical and antimonial sulphides of silver, with argentite and stromeyerite, apparently gave out at the bottom levels. Below this level, lower grade but payable concentrating ore, amenable to flotation may be expected and lateral development is also expected to develop more ore. Believe property worthy of reopening but that more capital will be needed than present plan provides for. Old records show that copper ore was mined on the 800' level.

Development: in August, 1917, the mine was reopened, and by October the 980' shaft was unwatered to 250', and exploration commenced.

Equipment: includes Fairbanks-Morse gasoline hoist, Ingersoll-Rand compressor, Cameron pump, 5-ton auto-truck and 100-ton mill equipped with flotation apparatus. The mill will not be worked until the mine is thoroughly opened.

SUPERIOR ARIZONA COPPER CO.**ARIZONA****Office:** 14 Wall St., New York City. **Mine address:** Superior, Ariz.**Officers:** H. F. J. Knobloch, pres.; D. E. Thomas, v. p.; F. V. Munster, sec.-treas.; above, with F. W. Holmes and A. E. Peterman, directors; W. C. Browning, mgr.**Inc.** Mar. 22, 1916, in Maine. **Cap.**, \$250,000; shares \$1 par; non-assessable; 180,010 issued. Annual meeting, fourth Monday in May.

Company took over property and all assets of the Lake Superior & Arizona Mining & Smelting Co., together with some claims formerly owned by the Magma Copper Co., at Superior, Pinal Co., Ariz., adjoining the latter company's mines.

Property: the Gold Eagle mine, with 11 claims, 110 acres, freehold at Superior, in the Pioneer district, 3 miles S. of the Silver King mine, 30 miles W. of Globe and 28 miles E. of Florence. Claims show thickly bedded, steeply upturned limestone, resting on quartzite, underlaid by diabase. Ore occurs following slips, or brecciation along bedding planes which in general lie within 20' of the base of the limestone. In places the ore is 4' thick, and sometimes leached iron gossan is 15' thick. This brecciation is due to fracturing or bedding faulting, and does not follow exactly the same bed.

As the vein matter is a leached iron gossan with only occasional patches and segregations of oxidized ore or residual nuclei of sulphide, hope is felt that massive sulphides will be found in depth. Though a heavy flow of water is encountered, the sulphide zone has not yet been reached.

Development: the principal working is the Charlton tunnel, which for 2,000' follows the mineralized fracturing along the bedding plane between Devonian limestone and quartzite. This tunnel is 190' vertically below the Holt tunnel, is connected with the latter by a 165' winze on the dip of the vein and is 3,000' long, showing ore assaying up to 30% copper. At the northern end of this long tunnel, there is an incline shaft sunk along the bedding plane at 26° inclination for 1,800' with short levels at various intervals.**Equipment:** includes steam plant with 175 h. p. water-tube boiler, and 16-drill Rand 2-stage air compressor. Fuel is petroleum, and there are 5 storage tanks at the mine and 2 at Florence, each holding 2 carloads of oil.**Production:** was 99,120 lbs. copper, 1,040 oz. silver and 188 oz. gold in 1907; none since. Work was suspended 1907, resumed 1910 by the Magna Copper Co., and again suspended 1911. Property is considered promising.

Some dump ore shipped by new company, 1916, and development work in progress, 1917.

SUPERIOR-BONANZA MINING CO.**ARIZONA****Address:** J. T. Muller, Superior, Ariz.**Officers:** J. T. Muller, pres.; Chas. Brittonham, v. p.; H. D. McPhail, sec.-treas., with G. J. Camsler and Geo. Dogan, directors.**Inc.** in Arizona. **Cap.**, \$500,000; shares 50c par; non-assessable; 485,000 issued.**Property:** 6 claims, 110 acres, ½ mile N. of the Magma Copper Co., Pioneer district, Pinal Co., Ariz., said to show a fissure vein in diabase, dipping 72° N., with E. W. course. Ore contains gold, silver and lead. Shoot said to be 300' long.**Development:** by shaft to 52'. Only assessment work done in 1916. Shaft sinking to 700' proposed.

A prospect of no particular merit.

SUPERIOR RAY COPPER CO.**ARIZONA****Address:** A. L. Emberson Co., 112 N. Central Ave., Phoenix, Ariz.

Inc. in Arizona. **Cap.**, \$1,500,000; shares \$1 par; non-assessable; 700,000 issued.

Property: 11 claims in Pioneer district, 30 miles from Florence, and 1 mile from Superior, Ariz. Examined by John Armstrong, in Dec., 1916, who considers that the ground is well within the famous east and west faulting system upon which the great mines of this section have been opened.

Apparently no work of consequence has been done and claims are a pure gamble.

SUPERIOR SAFFORD COPPER CO.

ARIZONA

Address: Miami, Ariz. Mine near Superior, Ariz.

Inc. in Dec., 1916, by A. M. Bernstein, W. D. Wiley and B. W. Fauble, all of Miami. **Cap.**, \$2,000,000; shares \$1 par.

Property: in Pioneer district, Pinal Co., Ariz., near Magma Extension property. Shaft sinking said to have revealed 8 to 12% copper ore.

UNITED MAGMA MINES CO.

ARIZONA

Address: W. D. Steadman, Superior, Ariz.

Officers: J. H. Thompson, pres.; E. G. Schulze, v. p.; D. L. Hughes, sec.; Louis Lefkovits, treas., with W. D. Steadman, directors.

Inc. 1917, in Arizona. **Cap.**, \$2,500,000; shares \$1 par; non-assessable; 1,250,000 issued.

Property: 34 claims, 680 acres, in Superior district, Ariz.

Out of the mass of literature issued by Harry Lefkovits, 40 Exchange Place, New York, only the following can be extracted: "Property has been favorably reported upon by engineers of standing. It is believed to contain an extension of the Magma vein. In fact the property is said to bear about the same relation to the Magma Copper Co.'s property as the United Verde Extension bears to the United Verde, and that it has an excellent chance of repeating the development record of the United Verde Extension."

Nothing is available concerning development, etc. At last reports, Lefkovits had broken his pledge and bond to remain in New York until trial.

TOMBSTONE, COCHISE COUNTY

BUNKER HILL MINES CO.

ARIZONA

Owned by the Phelps Dodge Corporation, which see.

MIDDLEMARCH COPPER CO.

ARIZONA

Office: 319 Bullard Bldg., Los Angeles, Cal. **Mine office:** Middlemarch, Cochise Co., Ariz. Mine formerly owned by Gird Bros. and M. M. O'Gorman, of Los Angeles, Cal.

Inc. April 26, 1907, in California. **Cap.**, \$1,000,000, increased March 28, 1906, to \$3,000,000; shares \$100 par. Absorbed the Cobreloma Consolidated Copper Co., about 1907. Annual meeting, first Monday in April. Is under option for \$500,000 to B. M. Snyder, Los Angeles, Cal.

Property: 68 claims, 1,360 acres, in the Dragoon mountains, showing several contact deposits between limestone and granite-porphry, with a general N. W. strike, and dip of 42 to 54°. The 2 orebodies under development, said to be 30 to 80' wide, show oxidized ores succeeded by chalcopyrite, with some chalcocite.

Development: by 9 shafts, deepest 210', and 6 tunnels, total workings being about 2 miles, estimated by management to show 200,000 tons of ore, with 100,000 tons blocked out for stoping in the Missouri mine, with ore in other properties, though not extensively developed.

Equipment: includes a 300 h. p. steam plant, 50 h. p. hoist and 4-drill

Laidlaw air compressor. There are 12 buildings, including engine house, boiler house, machine shop and smithy.

Flotation plant being erected in July, 1917.

WAR HORSE COPPER MINING CO.

ARIZONA

Address: Bacher & Stelsel, 412 Mills Bldg., El Paso, Texas.

Cap., \$1,000,000; shares \$1 par.

Property: 15 claims in the Tombstone district, Ariz., 23 miles N. W. of Bisbee.

Development: 508' shaft and other openings. At 265' there was said to be 5½' of ore assaying 8% copper, 18 oz. silver, and \$1 gold per ton. At 400' the vein is 27' wide and is considered to run through 6 claims, a distance of 9,000' judging by the outcrop. This reported strike should make a profitable mine of the property if the ore is continuous for any considerable distance.

TUCSON, PIMA COUNTY

ACME MINING & REDUCTION CO.

ARIZONA

Idle. Mail returned from former address in Tucson, Ariz. See Vol. XI, Copper Handbook.

ALPHA COPPER MINING CO.

ARIZONA

Office: 34 S. Stone Ave., Tucson, Ariz.

Officers: E. A. Pike, pres.; R. J. Monahan, v. p. and mgr.; Geo. P. Myers, sec.; preceding, with F. S. Lockwood, J. L. Toohey, J. W. Bogan and John Nelson, directors.

Inc. Oct. 7, 1916, in Ariz. Cap., \$1,000,000; shares \$1 par; increased from \$500,000 March 16, 1917. 590,000 shares in treasury. Last offering of 100,000 shares at 50c made in May, 1917. Company still owed \$30,000 on property, Sept., 1917.

Property: 22 claims, 7 owned outright, balance part paid, comprises about 450 acres, including the Pima and Fries groups, situated midway between Mineral Hill and Twin Buttes camps, San Xavier district, Pima Co., Ariz.

The tract is underlain by granite capped on the hills by quartzite and traversed by two different sets of veins, both metalliferous. The fracturing is complex and the veins associated with porphyry dikes, andesite dikes and wide breccia zones.

Ore: carries silver and copper as chalcopyrite and gray copper (tennantite) with silicious gangue. The Pima mine, opened to 150' in depth, 1876, produced \$85,000 in silver.

Development: 215' shaft on the Pima vein with levels at 150' and 200' cutting 2 veins, 4' to 5' wide, with stopes above 150' level yielding ore that is said to average \$16.35 per ton with copper at 25c and silver at 65c.

Equipment: adequate for existing needs only, includes 2 gasoline engine hoists, pumps, etc.

Reported on by W. Tovote, May, 1917. Property appears to have merit.

ARIZONA COPPER MINING CO.

ARIZONA

Office: Tucson, Ariz.

Officers: John N. Mettler, pres.; Jos. Brunner, v. p.; V. Brunner, sec.-treas., with Leo J. Wachs, directors.

Inc. Aug. 1, 1901, in Arizona. Cap., \$1,000,000; shares \$1 par; 171,000 shares outstanding Jan., 1917.

Property: 25 claims, about 500 acres, 16 miles W. of Tucson, in Amole mining district, Pima Co., Ariz. Developed by 100' tunnel and 300' shaft,

said to show a vein carrying 2% copper. Ore occurs in porphyry and limestone and carries much iron.

Equipment: includes hoist, engine and several buildings. Company doing development work 1917 and plans installing air compressor with proceeds from stock sales.

ARIZONA MOLYBDENUM CO.

ARIZONA

F. J. Wharton, pres., Tucson, Ariz.

Inc. 1917, in Ariz. Cap., \$300,000.

Property: 10 claims, about 200 acres, in the Baboquivari mountains, Pima Co., about 35 miles from Twin Buttes, slightly developed by several shallow shafts.

Ore: occurs as pegmatite carrying molybdenite, chalcopyrite and galena, in veins of quartz-feldspar, 4-10' wide, with S. E. strike, traversing coarse-grained granite. Samples reported to assay 2.2 oz. silver, 1.8 oz. gold and 3.9% copper. A 50-ton flotation plant constructed in 1917, is reported to be producing 1,500 lbs. of concentrate daily running 18% molybdenum.

ARIZONA-TONOPAH MINING & MILLING CO.

ARIZONA

Office: 303 Delta Bldg., Los Angeles, Cal. **Mine office:** 44 W. Congress St., Tucson, Ariz.

Officers: Jos. Dixon, pres.; R. D. Dunn, v. p.; Geo. Ankers, sec.-treas., with Countess Minafori, W. L. Shaffer and John L. Prime, directors.

Inc. Jan., 1916, in Arizona. Cap., \$1,000,000; shares \$1 par; 500,000 outstanding. Annual meeting, first Monday in November.

Property: 27 claims, 547 acres, in Amole mining district, Pima Co., 9 miles S. W. of Tucson, shows granite, andesite and rhyolite, cut by a sulphide deposit, proven for 100' and said to assay from 1-5½% in metal content. Values are gold, silver and copper.

Development: by 130' tunnel and 90' shaft. Idle, 1917; but management plans further development and installation of additional equipment in 1918. Management made optimistic statements concerning mine conditions and then suddenly shut down. Not favorably regarded.

BLANCHE ROSE MINING CO.

ARIZONA

Practically dead. At Twin Butte. Company relocated land of the bankrupt Chesterfield Copper Co., described in Vol. XI, Copper Handbook. See Esperanza Mine.

BOSTON & ARIZONA MINES CO.

ARIZONA

General office: Tucson, Ariz.

Officers: Geo. P. Gregory, pres.; Henry C. Young, Jr., v. p. and gen. mgr.; Gerald S. Howland, treas.

Inc. 1915. Cap., \$100,000; shares \$1 par. Stock listed on Boston curb. Federal Trust Co., Boston, transfer agents; Exchange Trust Co., registrars.

Property: 5 claims, in the Old Hat mining district, 25 miles north of Tucson, Pinal Co., Ariz., said to show an orebody 25' wide and 100' long, with copper-silver-gold values. Ore occurs between grano-diorite foot and quartz lime hanging-wall. Developed by 247' tunnel. A prospect.

Is not favorably regarded.

BUSH-BAXTER MINING CO.

ARIZONA

Address: care of E. N. Bush, Twin Buttes, Ariz. Company is a close corporation owned by four people.

Property: the Glance mine and 4 claims, formerly worked under lease by Bush & Baxter, at Twin Buttes, Pima Co., Ariz. Work started May, 1913, from a 10' assessment hole and lessees disclosed ore a few feet below surface, starting shipments almost immediately. Shaft has been sunk 582 feet.

Ore: said to average 5% copper, 2 oz. silver, 33% iron, 3% lime, 25% silica and 15% sulphur.

Production: in 1916 said to have averaged 120 tons of 4% copper ore per day.

Bonded late 1915 to the Amer. Sm. & Ref. Co. for \$450,000, but bond relinquished 1916 after payment of \$100,000 and \$54,000 royalty. Net smelter proceeds for 1916, \$132,000 from the one mine.

CABABI MINING CO.

ARIZONA

Secretary and address: Wm. H. Kershner, 1021 Hume-Mansur Bldg., Indianapolis, Ind. **Mine P. O.:** Camp Cababi, via Tucson, Pima Co., Ariz.

Officers: Chas. N. Wilson, pres.; Allen W. Conduitt, v. p.; preceding, with H. A. Walker, E. B. Peck, E. J. Scoonover, Albert Off, W. H. Kershner and R. A. Wilcox, directors; H. F. Scheerer, gen. mgr., P. O. Box 1116, Tucson, Ariz.; C. J. Price, mg. engr.; Harry Orndorff, purch. agt.

Inc. 1908, in Arizona. **Cap.**, \$1,500,000; shares \$1 par; non-assessable; issued \$1,250,000. Annual meeting, third Monday in June.

Property: 50 claims, about 1,000 acres, 35 claims patented, also 2 mill sites of 5 acres. situated in the Cababi mountains, 69 miles S. W. of Tucson.

Development: by numerous shallow shafts, and main shaft 450' sunk on the Picacho claim, includes an antigua, reopened about 1860, by Francisco Padrea, and which, years ago, was a small producer of silver-bearing copper and lead ores.

Equipment: includes a steam hoist good for 500', an adobe store building and several frame structures and tents utilized as dwellings.

A full report on the property made, Oct., 1912, by C. J. Price, mg. engr., shows 2,240 tons of ore, valued at \$28,485, on dumps. Manager reports 10,000 tons high-grade ore blocked out April 25, 1913. Mine now idle, but company claims it will be reopened when rail transportation is afforded.

CORNCOB MNG. & DEV. CO.

ARIZONA

See Korncob M. & Dev. Co.

DAILY-ARIZONA CONSOLIDATED COPPER CO.

ARIZONA

Address: G. S. Hancock & Co., fiscal agents, Tucson, Ariz.

Officers: W. H. Daily, pres.; J. W. Daily, mgr.

Cap., \$2,000,000; shares \$1 par; 1,000,000 shares issued in payment for property; 750,000 shares reserved for treasury.

Property: 22 claims, about 400 acres in the Old Hat mining district, near Oracle, Pima Co., developed by nearly vertical adit to depth of 500'. Ore as shipped will average 6% copper and \$2.00 in gold and silver.

Equipment: includes 100 h. p. boiler, compressor, several buildings and a ½-ton truck. About 15 men employed in 1917. Management claims to have expended \$30,000 on development work and equipment during 1916-17.

W. H. Weed in 1917, reported that the ore is a garnet rock carrying chalcopyrite; it is an inclined bed of limestone altered and mineralized by contact metamorphism. Though of low average grade, there are local masses of richer shipping ore. The deposit is quite similar to that of the adjacent mine owned by Phelps, Dodge Corp. The deposits are large, and if a sufficient tonnage is proven by development, can be mined and milled by flotation methods at a profit, provided cheap transportation is possible, since the mine is on a high mountain top and far from a railway.

DOS CABEZOS GOLD RIDGE MINING CO.

ARIZONA

Office: P. O. Box 987, Tucson, Ariz. **Mine address:** A. J. Welty, supt., Dos Cabezos, Ariz.

Officers: J. H. Huntsman, pres.; H. C. Kimball, v. p. and gen. mgr.; H. H. Hotchkiss, sec.-treas.

Inc. in Ariz. Cap., \$1,000,000; shares \$1 par; 200,000 issued. Annual meeting, Jan. 1st.

Property: 7 claims, patented, 140 acres, in the Dos Cabezas mining district, said to show a schistose fissure vein in granite and limestone carrying gold, silver and copper values as sulphides. Oreshoot reported as 4 to 34' in width with assays from \$12 to \$1,912.

Development: by new 450' tunnel, a 200' incline shaft and old 1,700' tunnel to be connected by winze with new tunnel 125' below. Equipped with 30 h. p. hoist. Said to have 75,000 tons of ore partially developed. Employs 20 men.

ELEPHANT HEAD MINING & MILLING CO. ARIZONA

Address: Ben Daniels, pres., Nogales, Ariz. Copper-lead property near Mt. Hopkins, Santa Cruz Co., Ariz.

Lands: about 40 miles from Tucson, and 6 miles from the Calabasas railroad, near Elephant Head Butte, in the Santa Rita mountains. A vein, said to have a 40' outcrop, carries a complex of argentiferous lead, copper and zinc sulphides, of low average grade, and there also is a 20' vein of quartzite, said to give surface assays of \$10 gold per ton.

No recent returns. Probably closed down.

EMERY-WHITCOMB TUNGSTEN CO. ARIZONA

Acquired by International Tungsten Corp., which see.

ESPERANZA MINE ARIZONA

Near Twin Buttes, Pima Co., Arizona. Under operation, 1917, by Messrs. E. A. Pike, J. C. Shell and Edw. Thornton.

Mine was owned in 1913 by the Chesterfield Copper Co. which went into bankruptcy. Company was reorganized in 1914 as the Blanche Rose Mining Co., but has not operated since 1914 and is practically dead. Present leasers have shipped several carloads of ore.

GLANCE MINING CO. ARIZONA

Address: Twin Buttes, Ariz.

Officers: E. G. Bush, pres., treas. and gen. mgr.; E. A. Pike, asst. mgr.; S. J. Gunn, supt.; G. H. Langworthy, sec. Is a close corporation.

Inc. in Ariz., in 1916.

Property: 3 claims, patented, held under option for old Twin Buttes Mining & Smelting Co., and a 2-year lease on the Twin Buttes railroad. The ore occurs in shoots at intersection of cross fractures with a main fissure in altered limestone near and roughly parallel to a granite contact. The ores contain copper glance, chalcopyrite and iron pyrite, with rather low gold-silver contents, and run 7% to 9% by smelter return. The last oreshoot developed is 15' wide and averages 12% copper. The Glance mine has a 450' shaft, being deepened to 650'.

Production: about 3,500,000 lbs. copper per year.

HELVETIA COPPER CO. ARIZONA

Idle. Office: 907 Metropolitan Life Bldg., Minneapolis, Minn. **Mine and works office:** Helvetia, Pima Co., Ariz.

Officers: C. C. Prindle, pres.; Chas. W. Sexton, v. p. and sec.; preceding, with William A. Paine, Jas. H. Seager, John S. Pillsbury, Russel M. Bennett and John R. Van Derlip, directors; Robt. H. Gross treas.

Inc. March 3, 1899, in New Jersey, and reorganized Oct. 4, 1905, in Arizona. **Cap.,** \$5,000,000; shares \$25 par, in \$250,000 full-paid and \$4,750,000 assessable stock; fully issued. Levied 50c assessments, payable July 20, 1908; April, 1909; February, 1910, and Feb. 15, 1911, the latter assessment rendering the stock \$15 paid. State Street Trust Co., Boston, registrar;

Boston Safe Deposit & Trust Co., transfer agent. Annual meeting, first Monday after first Tuesday in October.

Financial statement of Dec. 31, 1916, is as follows: Capital stock, \$3,100,000; expenditures to date for mining property, \$2,181,786; for development, \$806,429; for equipment, \$40,250; treasurer's account, \$69,887; unpaid assessments, \$35,363; interest, \$12,141; ore account, \$46,461; general expense, \$34,428; taxes, \$1,327.

The company's holdings are at Helvetia, at the west foot of the Santa Rita mountains, 18 miles south of Vail, on the Southern Pacific, and El Paso & Southwestern railroad.

Property: 38 patented claims, also 8 patented mill sites and 960 acres of scrip land, giving total holdings of 1,673 acres, 30 miles S. E. of Tucson. The formations, resembling those of Bisbee, include Carboniferous and older limestones lying north of a great granite mass with porphyritic intrusions. The limestone has many iron outcrops underlain by orebodies occurring as replacements. These have an average strike of N. 35° W., with average dip of 45°, carrying ore of 2 to 4% copper.

For full description of properties and development, see Vol. XI, Copper Handbook.

INTERNATIONAL TUNGSTEN CORPORATION ARIZONA

Office: 42 Broadway, New York.

Officers: Hiram Whitcomb, pres.; Richard Lounsbury, treas.; C. E. Greenough, sec.; A. A. Westerhouse, asst. sec.

Inc. June 16, 1916, in Virginia. **Cap.**, \$10,000,000; shares \$10 par. Company acquired entire capital stock of the Emery-Whitcomb Tungsten Co. and the National Tungsten Co., both incorporated in Arizona.

Property: 8 patented claims, 143 acres, and 18 unpatented claims, 350 acres, all contiguous, in the Arivaca mining district, Pima Co., 65 miles S. W. of Tucson and 23 miles from Amada on the So. Pac. R. R. Claims are said to cover an area of granite, rhyolite and diorite, the latter with quartz-filled fissures containing tungsten ore. Two of the veins are said to traverse the property for over 10,000' with widths ranging from 2½' to 12'; one ore-shoot claimed to be 12' wide, 175' long and containing 1% tungstic oxide, WO₃.

Development: mainly by tunnels, longest 500', with several shafts, deepest 156', which is said to be sunk on a 30' vein that traverses the property for a mile; 15' of this vein is said to contain rich tungsten ore; the balance, 2½% copper sulphide ore, "which taken together constitute a mammoth mine." Ore reserves are undoubtedly greatly over-estimated.

Equipment: includes a hoist, compressor and a 7½-ton auto truck for delivering ore to the mill. The 10-stamp mill has three 50 h. p. gas engines. Blake crusher, gyratory crusher, 8 Wilfley tables, Johnson vanner and 2 small air compressors. After a shut-down of several months, work was resumed, May 1, 1917. Mill is treating 100 tons daily, yielding 1 ton of 65% tungsten concentrate. At prices in Aug., 1917, this is worth about \$1,300.

KORNCOB MINING & DEVELOPMENT CO. ARIZONA

Care E. W. Walker, v. p. of Arizona Consol. National Bank, Tucson, Ariz.

Is a dormant corporation, owning group of claims on eastern base of Catalina mountains, 75 miles by road from Tucson.

Claims show garnet containing copper pyrite, as a contact metamorphic product, along a granite limestone contact. Property was promoted by Col. Davis.

Geological report on property made by Prof. A. F. Tolman, Jr., of Leland Stanford, May 24, 1912.

MAGNATE COPPER CO.**ARIZONA****Address:** M. Brooks, sec.-treas., Liberty Bldg., Philadelphia, Pa.**Officers:** C. Z. Jones, pres.; Carl M. Kneass, v. p.; W. H. Weed, cons. engr.; A. C. Simpkins, gen. mgr.; Allan H. Burris, mgr.**Inc.** Nov. 19, 1916, in Del. **Cap.**, \$5,000,000; shares \$1 par; 2,710,000 in treasury.**Property:** 29 claims, in Twin Buttes district, Pima Co., Ariz., 32 miles from Tucson and 4½ miles from railway at Twin Buttes.**Geology:** surface shows characteristics of producing porphyry-copper areas. Basal rock is a grano-diorite of varying grain. Most of the area is covered by a dense fine grained rock very greatly altered, but probably monzonite. Mineralization proceeded along dominant N. E.-S. W. fractures, which were filled with quartz, pyrite and chalcopyrite. Erosion with oxidation of the pyrite, forming acid water, further changed the altered rock and formed a deposit of disseminated ore whose extent is not yet determined.**Development:** shaft sunk 150' opened at 50' and 150' on a vein 5-10' wide with bunches of 2 to 14% copper ore, and some lead ore, from which shipments have been made to the smelter.

Diamond drilling is in progress. No. 1 hole passed through 60' of 2% ore, more than confirming favorable predictions based on surface examination. No. 3 hole, 200' distant, is reported to show over 100' of 2¼% ore. A tunnel at the north margin of the group carries high grade ore.

Is an attractive prospect, with possibilities of development into a big "porphyry" copper.

MAJESTIC COPPER CO.**ARIZONA****Idle. Office:** First National Bank Bldg., Kansas City, Mo. **Mine office:** Oracle, Pinal Co., Ariz.**Officers:** E. A. Hosier, pres.; W. A. Neiswanger, v. p.; E. T. Wilder, sec.-treas.**Inc.** as Inspiration Mining Co., but sold its property, in the Globe district, to the Inspiration Copper Co., and changed its name, March, 1909, to present title, to avoid misunderstanding. **Cap.**, \$3,000,000; shares \$1 par; \$2,707,000 outstanding; bonds authorized, \$25,000; \$14,350 outstanding.**Former property:** 6 claims near Oracle, on which assessment work was done for several years, has been abandoned and company is now inactive. Company received from the sale of the Inspiration mine about \$1,500,000.**MICHIGAN & ARIZONA DEVELOPMENT CO.****ARIZONA****Office:** 905 Metropolitan Life Bldg., Minneapolis, Minn. **Mine near** Helvetia, Pima Co., Ariz.**Officers:** C. C. Prindle, pres.; R. M. Bennet, v. p.; Chas. W. Sexton, sec.-treas. This company reorganized the Helvetia Copper Co., under a plan explained Vol. V. Formerly owned a considerable share interest in the Helvetia.**MILE WIDE COPPER CO.****ARIZONA****Main office:** Tucson, Ariz.**Officers:** C. P. Reiniger, pres. and mgr.; L. E. Jettinghoff, sec.; Prescott Lyon, treas. The president with C. W. Freeman, E. C. Carter, W. H. Singer and F. C. Douds, directors. Annual meeting, July 7th.**Inc.** May, 1916, in Arizona. **Cap.**, \$1,000,000; shares \$5 par.**Property:** about 55 unpatented mining claims and 2 mill sites, about 1,400 acres; on the south side of Amole Peak, 18 miles from Tucson. Claims are divided into groups: the Copper King, Orient, Copper Mountain and Esperanza, with the Oro Fina placer claims and Copper King and Copper Crown mill sites.

Geology: a number of intrusions of quartz-porphry, granite-porphry and some andesite between beds of limestone, have caused considerable alteration and metamorphism. A striking feature of the topography is the dike-like amphibole and garnet outcrops. The general strike of the contact is N. E.-S. W. with 45°-65° dip to the south-east. The change of dip is very noticeable, becoming flatter the greater the distance from Amole Peak. This system has been cut at right angles by system of vertical slips and faults. At some of the intersections of these two systems a circulation of mineral solutions depositing pyrite and chalcopyrite resulted in the replacement of the limestone. These replacements are the orebodies, having a width of 5' to 8' and a length of 15' to 20' and probably the same in height. In places there are bunches of high-grade chalcopyrite.

On the opposite side of the mountain and much nearer the railroad several of the claims held by the company show several apparently isolated contact metamorphic deposits consisting largely of garnet containing chalcopyrite, and averaging in the exposures seen, about 2½% copper. The limited development does not disclose the limits of any of the orebodies, but their surface exposures are not great.

Development: main development on the Copper King group is by 300' incline shaft with stations at 100', 200' and 300'. Drifting is progressing on the 200' level, with about 700' to date and 150' of raising used for ventilation.

Production: for 1916 was about 100 tons of 8% ore, from 3 of the ore "pockets." This was shipped in Oct., 1917, according to report.

Equipment: 25 h. p. gas. hoist; 500 cu. ft. compressor, 100 h. p. F. M. gas. engine, store and camp buildings.

The properties of this company do not come up to the very rosily painted descriptions given out by the Pittsburgh brokers who hold an option for 51% of the stock, the balance being owned by the company's manager.

MINERAL HILL CONSOLIDATED COPPER CO. ARIZONA

Idle. Office: 331 Fourth Ave., Pittsburgh, Pa. **Mine office:** Tucson, Pima Co., Ariz.

Officers: M. S. Isherwood, pres.; Boon Ingells, v. p.; E. B. Reeser, sec.-treas. and gen. mgr.

Inc. March, 1904, in Arizona, as successor of Azurite Copper & Gold Mining Co. Cap., \$3,000,000; shares \$1 par.

Property: the Azurite mine with 26 claims, 12 patented, 520 acres, in the San Xavier district, 18 miles S. W. of Tucson, said to have produced \$550,000 worth of ore under former ownership. Company's lands also include the American group of 8 claims and the Mineral Hill group of 5 claims. The mine is claimed to have a large body of sulphide ore averaging about 3.5% copper.

Development: by 74 pits and open cuts, 8 tunnels, longest 250' and 48 shafts, deepest 345', mine having a total of about 1 mile of workings. Company operated in 1912, but closed down in Sept., 1913, and apparently still idle, 1916.

MOLYBDENUM PRODUCTS CO. ARIZONA

Address: Arthur Geeson, Box R, Tucson, Ariz.

Officers: F. H. Hereford, pres.; Harold Steinfeld, v. p.; Alan Kissock, sec.-treas. and mgr., with Hiram Corbett, R. K. Shelton, K. G. Smith and Maxwell Miltors, directors.

Inc. June, 1916, in Arizona. Cap., \$100,000; shares \$1 par; non-assessable; 30,000 issued.

Company owns no mines yet, but operates an electric smelter, buying

wulfenite ores, mainly from Arizona Rare Metals Co. Is one of the largest producers of molybdenum in the United States.

NARRAGANSETT COPPER CO.**ARIZONA**

Address: care W. R. Ramsdell, Tucson, Ariz.

Officers: W. R. Ramsdell, pres.; James S. Kelso, sec.-treas.

Inc. in Arizona. Cap., \$3,000,000; shares \$1 par.

Property: 21 claims, at Rosemont, Helvetia district, Santa Rita mountains, Pima Co., Ariz. Mine is 20 miles from the S. P. R. R.

Gross earnings in 1916 were \$279,145.

Geology: the ore occurs in a replacement deposit between limestone and quartzite, which dips 30° E., and has a N.-E. pitch. Shoot has been opened for 1,000' along the strike. Both oxide and sulphide ores occur, and contain both copper and silver, the average for 1916 being 8.8% copper.

Development: by tunnel; workings total 2,000' to depth of 370', said to have exposed 300,000 tons containing from 2½ to 35% copper, including 19,000 tons of 4% ore in dumps.

Production: in 1916 was 1,274,876 lbs. copper and 10,347 oz. silver. Cost is given as 15½c per lb. Over 20 carloads monthly being shipped, 1917. Owner plans to erect a leaching plant for low-grade ores.

NATIONAL CONSOLIDATED MINING CO.**ARIZONA**

Presumably idle. Described in Vol. XI, Copper Handbook.

NATIONAL TUNGSTEN CO.**ARIZONA**

Acquired by International Tungsten Corp., which see.

OLD PUEBLO MINING & MILLING CO.**ARIZONA**

See Tucson Consolidated Copper Co.

OLD YUMA MINE**ARIZONA**

Col. Epes Randolph, owner, Tucson, Ariz. Mine closed, Aug., 1916.

Property: 40 unpatented claims, about 14 miles W. of Tucson, Pima Co., Ariz., shows a fissure vein, 40' wide in andesite, carrying gold, molybdenite and specularite. Ore occurs in 4 shoots, each about 300' long, and is said to average \$3 gold and 1¼% molybdenum. Developed by vertical shaft to depth of 320'.

Equipment: includes 15 h. p. hoist, pump, 400' tramway and 400-ton concentrating mill. Concentrates said to average 21% MoO₃.

OWL HEAD COPPER CO.**ARIZONA**

Office: Cameron Michel Co., 299 Madison Ave., New York. Mine near Red Rock, Pinal Co., Ariz.

Officers: Wm. P. Michel, pres.; Jas. P. Harvey, v. p.; E. I. Chapman, treas.; J. B. Wright, sec., with Ralph Cameron, directors.

Inc. 1910, in Arizona. Cap., \$10,000,000; shares \$10 par; 3,160,000 issued. Registrar & Transfer Co., transfer agent.

Property: 24 claims, the Apache Princess group, in the Tortillita mountains, Owl Head mining district, 16 miles N. E. of Red Rock. Lands show a zone, 150' wide, of reddened schist with eruptive dikes, the conditions being said to resemble those of the "porphyry" or disseminated deposits at Miami and Ray. The workings show copper impregnations in the schist and to some extent in the adjoining granite, said to give assays of 0.5% to 3% copper and 1 to 3 oz. silver per ton.

Development: by shaft, 150' deep in May, 1916, to be sunk 200'. Cross-cutting and churn drilling is planned. A 2/3 interest in the Owl Head Co. is controlled by the Cameron Michel Co., which is financing the development work.

PIONEER MINING & SMELTING CO.**ARIZONA**

Offices: 1178 Broadway, N. Y., and Tucson, Ariz.

Officers: Garret B. Kip, pres., Tarrytown, N. Y.; W. C. Moore, sec.-treas., with G. H. Corwin and Edw. Benedict, directors.

Inc. Aug. 19, 1913, in Arizona, as a reorganization of the Pioneer Smelting Co., which went into bankruptcy in 1913. **Cap.**, \$1,000,000; shares \$1 par; \$690,647 issued; non-assessable.

Property: formerly held by the Pioneer Smelting Co., 14 unpatented claims, 260 acres, included the Plumed Knight mine, sold to Mr. Barnsdall of Pittsburgh, in 1917, and, the Gould mine, also sold, 1917. Mines fully described in Vol. XII.

Company owns a 150-ton custom smelter, 1½ miles west of Sahuarita, and 20 miles south of Tucson, on the Twin Buttes railroad. The plant has a 106x42" blast furnace, built by the Colorado Iron Works Co. The smelter was in blast for a short time in 1912, but has since been idle, as property could not pay expenses.

PLUMED KNIGHT MINE

ARIZONA

Sold, 1917, to Mr. Barnsdall of Pittsburgh, Pa.

Mine, formerly owned by Pioneer Mng. & Smelting Co., is 18 miles from Tucson, Pima Co., Ariz., in the San Xavier district.

Development: by shafts to about 350' depth shows ore rich in iron, lime and silica at and above 100' level, succeeded by bornite at depth. Ore said to average 4% copper with small gold-silver values.

ROSEMONT COPPER CO.

ARIZONA

Office: 11 Broadway, New York. Is controlled by Adolph Lewisohn and Lewisohn Bros.

Property: at Rosemont, Pima Co., Ariz.

In 1916 property was under lease to the Rosemont Development Co., which has a number of sub-lessees. Shipments to the El Paso and Sascu smelters.

Geology: numerous orebodies in limestone, occurring under geological conditions surficially similar to those at Bisbee. Company also owns claims at Helvetia, and others adjoining the Tiptop mine, near Helvetia, but the bulk of its holdings are on the east side of the Santa Rita mountains, west of the Rosemont post office. Company has a small smelter, long idle. Property regarded as promising.

SANTA RITA COPPER MINING & SMELTING CO.

ARIZONA

Office: care C. F. Elliott, P. O. Box 592, El Paso, Tex. **Mine office:** Arivaca, Pima Co., Ariz.

Inc. June, 1901, in Arizona. **Cap.**, \$3,000,000; shares \$1 par; issued, \$2,750,000.

Property: 12 claims, unpatented, 220 acres, in the Tyndall district of the Santa Rita mountains, 13 miles from Arivaca, shows granite, porphyry and diorite, carrying several veins of sulphide ore, usually at the contact of the diorite and granite. Veins range from 4 to 12' in width.

Development: 2 shafts and several tunnels, with a total of about 2,000' of workings, mostly in low-grade ore. A new tunnel, planned to give a back of 110', was 200' long, at last accounts. The mine is without power equipment. Company is a promotion of A. A. Post.

SESAME COPPER CO.

ARIZONA

Address: Box 907, Tucson, Ariz.

Officers: C. M. Taylor, pres.; J. E. White, v. p.; S. A. Elrod, sec.-treas.; Gerald Jones, counsel.

Inc. in Arizona. **Cap.**, \$1,000,000; shares \$1 par. On April 16, 1917, Arizona Corporation Commission allowed sale of 75,000 shares at 10c each.

Property: in Empire district, Pima Co., Ariz., 11 miles S. E. of Vail on the S. P., and El Paso and S. W. lines.

Development: several hundred feet by shafts, opening copper ore in 12 places. Prospectus said that "A number of theoretical and practical

mining men.....expressed the opinion that a large body of paying ore should be encountered at a probable depth of 200'; which is interesting, if true.

STRATTON COPPER CO.**ARIZONA**

Address: P. O. Box 1116, Tucson, Ariz.

Officers: Chas. N. Wilson, pres. and mgr.; A. W. Conduit, v. p., with H. A. Walker, W. F. Milholland and C. P. Lesh, directors; W. H. Kershner, sec.-treas.; W. H. Scheerer, supt.

Inc. June, 1915, in Arizona. Cap., \$2,500,000; shares \$1 par; outstanding, \$2,000,000. Annual meeting in January.

Property: 13 claims and 3 mill sites, 175 acres, in the Catalina mountains, Pima Co., said to show a contact deposit of copper ore in limestone, assaying 7% copper and 10 oz. silver.

Development: 10 test shafts showing sulphide ore. Operating 2 incline shafts, one 200' deep, in ore assaying 4 to 20% copper. Forty men employed.

Equipment: three 500' hoists, two 75 h. p. boilers. Sullivan 550 cu. ft. compressor, lighting plant, buildings, 800' ore tram and ¼ mile cable tram for wood, etc.

Ore shipments started July, 1917.

SWASTIKA COPPER & SILVER MINING CO.**ARIZONA**

Office: John Heidel, Heidel Hotel, Tucson, Pima Co., Ariz. **Mine address:** Twin Buttes, Pima Co., Ariz. W. K. Royce, pres. and gen. mgr. D. H. Cochran, v. p.; J. S. Hopley, sec.; J. M. Ormsby, treas., at last report.

Cap., \$1,500,000; shares \$1 par.

Lands: unpatented, include the Alice and the Pioneer mines, in the Swastika group of 14 claims and the Calendar group of 10 claims, about 3 miles S. of Olive or Twin Buttes Camp. The Swastika group carries silver-lead ores, and the Calendar group has silver-copper ores in contact metamorphic deposits between limestone and granite. The property has 360' of workings. Equipment includes a small steam plant.

The northern part of the company's holdings were bonded Nov., 1917, for \$125,000, negotiations pending for the remaining four claims.

TIP TOP COPPER CO.**ARIZONA**

Idle. Office: Commonwealth Bldg., Philadelphia, Pa. **Mine office:** Helvetia, Pima Co., Ariz.

Officers: Geo. A. Aman, pres.; S. Charles Pratt, v. p. and gen. mgr., at last accounts.

Inc. 1902, in Arizona. Cap., \$1,150,000; shares \$1 par.

Property: 24 claims, 400 acres, also known as the Little Helvetia mine, including the Tip Top and Copper Duke claims, also a 100-acre mill site, about 2 miles from Helvetia, shows 3 veins, averaging 14' width. These veins have extensive bodies of soft black sulphide ore in altered clayey limestone and porphyry, reported to give average assays of 5% copper and 1 oz. silver per ton, with a trace of gold.

Development: mainly by tunnel with about 4,000' of workings; also the usual prospect shafts and tunnels.

Equipment: includes gasoline power. Was bonded 1907, to Guggenheim interests, for \$250,000, with cash payment of \$75,000, but both parties to bargain were dissatisfied, and property reverted to owners.

TORTILLITA COPPER CO.**ARIZONA**

Office: room 1003, 299 Madison Ave., New York. **Western office:** care Hon. J. B. Wright, 32 No. Stone Ave., Tucson, Ariz.

Officers: Wm. P. Michel, chairman; Robinson V. Thompson, pres.;

Thos. Rowland, v. p.; Leon N. Salmon, sec.; J. W. Edward Michel, treas., with Biana Le Manna, directors.

Inc. March, 1912, in Arizona. Cap., \$1,000,000; shares \$1 par; 600,000 issued. Stock is not listed. Annual meeting in January at the Tucson office.

Company claims to have sufficient funds on hand for continuation of systematic development work. Management is said to be in hands of the Eastern Stockholders Committee, a group of 10 stockholders, business men, who, according to their own statements, form "A Committee of Progress and Development—not Grievance." Is controlled by Cameron Michel Co. of New York.

Property: 34 claims, 700 acres, about 16 miles N. E. of Redrock, Pinal Co., Ariz., includes the Cloudburst and Yankee Girl mines, purchased under foreclosure in May, 1912. Property is an old-time silver producer.

Development: the "Yankee Girl" double-compartment vertical shaft, 12' wide and 500' deep, said to show some quartz carrying copper glance and native copper at the bottom; also a large flow of water. A large hoist and compressor have been installed. A N. crosscut was cut 600' from No. 5 station, with the main ore channel not far distant, where "large volumes of heavily enriched ore" should be encountered.

Equipment: includes an oil-driven air compressor, drills and a gasoline hoist.

Whether the property has a large ore deposit or not has not yet been proven, but reports by various engineers are favorable.

TUCSON ARIZONA COPPER CO.

ARIZONA

Office: 331 Ness Bldg., Salt Lake City, Utah. **Mine office:** J. A. Cowan, Supt., Tucson, Ariz.

Officers: John F. Cowan, pres.; E. A. Culbertson, v. p.; B. G. Hite, sec.-treas., with S. H. Douglas, W. H. King and L. A. Cummings, directors.

Inc. Nov. 28, 1916, in Arizona. Cap., \$1,000,000; shares \$1 par; non-assessable; 724,498 issued.

Property: 23 claims, 6 miles from Tucson, Ariz., show contacts and fissures in limestone and andesite. Orebody is said to be from 4 to 30' wide, dips 45 to 75°, and has an E.-W. course. Shoot is 400' long, 6 to 10' thick, and reported to contain 6% copper, 3 oz. silver and \$1 gold per ton.

Development: started in Dec., 1916, by 100' shaft and 500' of workings.

Equipment: 25 h. p. gasoline hoist and 250 cu. ft. compressor. Mine is a prospect and in good hands.

TUCSON CONSOLIDATED COPPER CO.

ARIZONA

Letters returned unanswered in May, 1917, from 511 Chamber of Commerce, Milwaukee, Wis. **Mine office:** Tucson, Pima Co., Ariz.

Officers: J. H. Wussow, pres.; Dr. M. A. Brandt, v. p.; F. J. Rodee, sec., Tucson; C. W. Schneider, treas.; Hon. Fred W. Fickett, gen. mgr.; preceding officers, J. G. Albright, C. F. Freeman, P. P. Donohue, A. Ballantine, R. L. Bennett and S. W. Purcell, directors.

Inc. April 15, 1907, in Arizona. Cap., \$3,000,000; shares \$1 par; non-assessable; in one-half full paid and one-half common stock; issued, \$1,500,000. Annual meeting, third Monday in March.

Property: 81 claims, unpatented, in 4 groups, 1,620 acres, in the Papago district. The property of the Old Pueblo Mining & Milling Co., 9 claims, is held by this company under an option calling for 51% of stock on completion of \$50,000 worth of work. Presumably includes Purcell Grand Cons. Mng. Co. property.

The 4 groups are 8 miles W. of Twin Buttes and 35 miles W. of Tucson. Claims show granite-porphry and limestone, with fissure veins and

contact deposits, 5 being under development. The largest deposit is described as a chimney in limestone, about 55x150' in size. The groups as a whole have 3,800' of workings, mostly tunnels, longest 800', but including 10 shafts, deepest 525'. Ore is said to give assays of 6 to 30% copper, 12 to 80% lead, 3 to 125 oz. silver and 80c to \$30 gold per ton, from azurite, chalcocite, chalcopyrite and galena. The reserves were estimated at 500,000 tons ore blocked out for stoping, which estimate is regarded as excessive.

The **Purcell** group of 16 claims, 3 fractional, 275 acres, shows 3 approximately parallel mineral zones, developed by a 96' shaft and a 200' tunnel, estimated by the company to give assays of 15% copper, 20 oz. silver and \$1.50 gold per ton.

The **Bolello** group of 9 claims, 180 acres, 2 miles S. of the Purtell, has basic granite, with frequent quartz-porphry intrusions, showing 3 copper veins, slightly developed, carrying ore that has given assays up to 24% copper, with gold and silver values.

The **Black Dyke** group of 48 claims, 960 acres, is W. of and about 3 miles N. from the Purcell group, constituting a parallelogram 3,600' wide and 12,000' long, showing strong iron outcrops, with favorable indications, having a number of shallow shafts, showing copper ore of 4 to 25% copper tenor, and silver-lead ore assaying up to 69% lead and 139 oz. silver per ton. This group has little development, but appears promising.

Equipment: includes a 250 h. p. steam plant, burning petroleum, with 2 hoists, and there are 6 buildings, including 2 general stores.

The **Old Pueblo Mining & Milling Co.**'s property consists of 9 claims, 5 miles W. of Tucson, developed by the 517' Quien Sabe shaft and a tunnel. A 70' shaft cut, at depth of 30', a 15-ton pocket of chalcocite, assaying 33% copper, 16 oz. silver and \$2.50 gold per ton.

The reports by Wishon, 1908, and Attix, 1903, issued by the company are so old, one wonders why this "sure thing" mine has been so long idle, and what work, if any, has been done in the past 8 years.

TWIN BUTTES MINING & SMELTING CO.

ARIZONA

Office: 77 Michigan St., Milwaukee, Wis. **Mine office:** Twin Buttes, Pima Co., Ariz.

Officers: W. A. Barber, pres.; Julius Frank or J. H. Tweedy, v. p.; P. C. Branner, sec.; Stephen Hoff, treas., with Ralph M. Friend, G. P. Mayer, Fred Williams and Henry Minnemacher, directors.

Inc. Sept. 8, 1903, in Arizona. **Cap.**, \$2,000,000; increased, 1905, from \$1,000,000 to \$1,250,000, and again increased, Jan., 1910, to \$3,000,000; shares \$1 par. Bonds outstanding were \$2,000,000 at last accounts. Controls the Twin Buttes Railroad Co. Wisconsin Trust Co., transfer agent and registrar. Annual meeting, third Tuesday in January.

Property: the King and Glance mines, being operated under lease and bond by the Glance Mining Co., on royalty basis. The Morgan mine is idle but under separate option. The Twin Butte Co. also owns many other claims, partly patented in the Twin Buttes district, in the foothills of the Sierrita mountains, 27 miles south of Tucson. Lands carry fissure veins in limestone and contact deposits having a limestone foot and granite-porphry hanging wall.

The Twin Buttes Railway, 10 miles in length, running from Twin Buttes to the S. P. (Nogales line), has 1 locomotive and 3 flat cars. Is under 2-year lease to E. G. Bush, 1917.

Production: 258,672 lbs. copper and 3,446 oz. silver in 1910. Shipped about 100 tons daily in 1912, to the Pioneer smelter.

See Glance Mining Co.

VERDE QUEEN MINING CO.

ARIZONA

Address: Pantano, Pima Co., Ariz. P. M. Hilton, supt.

Property: in central part of Empire mining district, about 12 miles from Pantano, and 15 miles W. of Benson. Shows silver-lead and copper ores, developed, by a 280' two-compartment shaft, from which a little lead ore was shipped to the El Paso smelter.

Equipment: includes gasoline hoist. Idle for several years.

VULCAN CONSOLIDATED MINING CO. ARIZONA

Address: W. R. Ramsdell, 40 S. Stone Ave., Tucson, Ariz.

Officers: W. R. Ramsdell, pres.; C. E. Walker, v. p.; J. S. Kelso, sec.-treas.

Inc. March 16, 1916, in Arizona. **Cap.**, \$100,000; shares \$1 par; non-assessable.

Gross earnings from ore sales in 1916 were \$128,753, and operating expenses \$78,078. Earnings were equal to 50c per share.

Property: 9 claims, 4 patented, 20 miles S. of Tucson, Pima Co., Ariz. Examined by F. R. Weeks.

Development: by 560' incline shaft in which sulphide ore carrying from 8½ to 12% copper has been opened.

Equipment: 15 and 25 h. p. Fairbanks-Morse hoists, and 50 h. p. Chicago Pneumatic compressor.

Production: 685,903 lbs. copper and 6,311 oz. silver in 1916.

WHITCOMB MINING & MILLING CO. ARIZONA

Office: 154 W. Randolph St., Chicago, Ill. **Mine office:** Tucson, Ariz.

Officers: W. Sanson, pres.; J. C. Freeman, v. p.; T. A. Snow, treas.; A. McCallum, sec.; H. Whitcomb, gen. mgr.

Inc. March, 1914, in Arizona. **Cap.**, \$100,000; recently increased to \$200,000; shares \$1 par; non-assessable; all issued. No bonded indebtedness.

Property: 3 unpatented claims in the Pima district, 20 miles from Tucson. The increase of capitalization was for the purpose of acquiring 6 additional claims known as the Prosperity group.

Development: by inclined shaft about 500' deep and stopes on 3 levels. Ore is a silver-lead-bearing quartz of milling grade.

Equipment: includes a concentrating mill, shut down in 1915 for lack of water, but again operated in 1916. Company claims \$500,000 worth of ore developed on the two properties.

WHITE-VICTOR COPPER MINING CO. ARIZONA

Address: J. H. White, mgr., Twin Buttes, Pima Co., Ariz.

Inc. Nov., 1916, in Arizona. **Cap.**, \$500,000; shares \$1 par.

Property: 6 claims, near the San Xavier mine, Mineral Hill district, Ariz. In March, 1917, 2-10% copper ore was said to have been opened near the surface and shaft sinking was started.

Prospectus says little about the property, but describes the wonderful returns of other mining companies.

YUMA MINE ARIZONA

Property: 14 miles N. W. of Tucson, is controlled by Col. Epes Randolph, Tucson, Ariz., and associates. Reported, May, 1916, to be shipping to Tucson ore containing chiefly molybdenum, with about \$3 gold per ton. About \$100,000 is reported to have been spent in equipment and preliminary work. Employed 100 men at last accounts.

Mine is described in Bull. 111, U. S. Bureau of Mines, 1916. The molybdenum occurs as wulfenite in an acid eruptive rock so highly altered that it is difficult to classify. The wulfenite is associated with cerussite, or well-crystallized vanadinite, or both. The average mine ore would be about 2 or 3% wulfenite. Ore concentrates well.

VEKOL, PINAL COUNTY

SILVER REEF MINE**ARIZONA**

Owned by Frank M. Leonard and associates, 3543 Third St., San Diego, Calif. Former company, the Silver Reef Mining & Smelting Co., dead.

Property: 12 claims, surveyed for patent, including the Silver Reef mines, at Vekol, 12 miles S. of Casa Grande, in Pinal Co., Ariz., originally worked for silver ore. Vein 35' wide, between granite and rhyolite carries 12 to 20 oz. silver ore, also some lead and copper.

Development: by a 375' shaft and 425' tunnel.

Equipment: includes a gasoline hoist, air compressor and 20-stamp all-slime cyanide plant.

WENDEN, SALOME, ALAMO; YUMA COUNTY

ALVIN DEVELOPMENT CO.**ARIZONA**

Office: Houghton, Mich. Controlled by Tank Pass Consolidated Mining Co., Salome, Yuma Co., Ariz. Temporarily idle except for annual assessment work. Described Vol. X.

ARIZOTA MINING CO.**ARIZONA**

Had a large group of claims 11 miles north of Wenden, Ariz., in 1912.

BLACK REEF COPPER CO.**ARIZONA**

Mine address: Wenden, Ariz. **Office:** 17 W. Adams St., Phoenix, Ariz.

Officers: H. E. Willhalm, pres.-mgr.; F. H. Larsen, v. p.; T. M. Burroughs, sec.-treas.

Cap., \$250,000; 25c par; non-assessable; 650,000 shares in treasury.

Property: 8 claims, 160 acres, on the south side of Cunningham Pass, Harcuvar mountains, 8 miles north of Wenden. Claims adjoin property of the Desert M. & D. Co.

Development: the working shaft is 400' deep. The 170' level runs 45' west and 180' east on the vein, which, though leached, shows some shipping ore. The vein is practically vertical and the shaft sunk is bottomed in ore. Mine yields 1,000 gals. of water per day.

Ore: carries chalcopryite and bornite associated with limonite and siderite, and it is said to show \$3-\$40 gold, 3-35% copper and high iron values. Vein is 2'-3' wide with swell to 6' at 100' in depth.

Equipment: includes 25 h. p. steam hoist, 50 h. p. Fairbanks gasoline engine and compressor. Employs 15 men. In 1917 company offered the public 100,000 shares at 25c for a development fund. Reported fully financed Sept., 1917.

COBRITA VERDE COPPER CO.**ARIZONA**

Chas. Reedall, supt., Salome, Ariz.

Property adjoins that of Cobrita, but shaft collar is 100' lower, and good ore is reached in drift from shaft.

COBRIZA MINES DEVELOPMENT CORPORATION**ARIZONA**

Controlled by Goodrich-Lockhart Co. Halstead Lindsley, gen. mgr., room 1508, No. 60 Broadway, New York.

Officers: David M. Goodrich, pres.; H. M. Jasper, sec.-treas.; Robert Morrison, supt.

Property of 35 claims with equipment of 200 h. p. oil-fired boiler, 12-drill I.-R. compressor, hoist and electric plant. Has 800' inclined shaft and reported to ship 150 tons of 4% copper ore daily. Employs about 100 men. Operates under lease, property of the Arizona United Mining Co., which see.

CRITIC MINE**ARIZONA**

Geo. Easton and E. A. Stent, lessees, Wenden, Ariz. Geo. B. Layton, N. Y., owner.

Produced 100 to 150 tons a month of ore, carrying \$20 gold and 20% copper, from fissure vein in gneiss.

DESERT MINING & DEVELOPMENT CO.**ARIZONA**

Robt. W. Hollis, mgr.-cons. engr. Cap., 500,000 shares; \$1 par.

Property: 16 claims in Cunningham Pass, 9 miles N. of Wenden, and 27 claims at Wenden, total 540 acres.

Development: by 2 shafts, 200' and 325' deep on the Copper Hill claim, said to show a large body of disseminated ore.

GLORY HOLE BONANZA MINES CO.**ARIZONA**

Address: Salome, Yuma Co., Ariz.

Officers: Dick Wick Hall, pres. and mgr.; E. S. Jones, v. p.; E. G. Jesson, sec.; H. W. White, treas.; preceding, excepting E. G. Jesson, directors.

Inc. Feb. 5, 1916, in Arizona. Cap., \$150,000; shares 10c par; 1,250,000 outstanding.

Property: 12 claims, seven 8 miles N. W. and five 10 miles N. of Salome.

Geology: quartz vein, with 60° dip, N. W.-S. W. strike, in andesite and schist, shows small high-grade and large low-grade shoots of gold ore and some copper.

Development: by 4 tunnels aggregating 825' in length. Workings to 175' depth total 1,200'. Work commenced in 1916. No ore is being mined, only exploration being done since high-grade streaks were extracted. Promising developments reported in June, 1917.

Equipment: Fairbanks-Morse engine, 4-drill Ingersoll compressor, machine drills.

Is an aftermath of the spectacular discovery of specimen gold ore made a few years ago. Advertising is decidedly lurid in local Arizona papers.

HARQUA HALA RIDGE M. & M. CO.**ARIZONA**

Offices: 27 School St., Boston, Mass., and 74 Broadway, New York City. Mine office: Wenden, Ariz.

Officers: Angus McEachren, pres.; Chas. S. Hill, v. p.; M. A. Blood, sec.-treas., with Percy James and D. L. Aspinwall, directors. W. T. Gnash, mgr.

Inc. Feb. 28, 1917, in Arizona. Cap., \$3,000,000; shares \$1 par; non-assessable; 1,800,000 outstanding. Annual meeting 1st Wednesday in February.

Property: 37 claims, about 740 acres, in the Harqua Hala mountains, Ellsworth mining district, Yuma county, about 5 miles S. of Wenden, said to show a contact deposit between quartzite and porphyry, 100' wide and traceable for 1,200' in length, containing copper, gold, silver values.

Development: by tunnels and shafts, with a total of 1,200' of workings. A 1,500' crosscut tunnel is to be driven to cut the main orebody at 1,200' depth.

The company offers to prospective investors "to crush and pan gold ore, taken from the property, before your eyes," at their Boston office.

JEROME-WENDEN COPPER CO.**ARIZONA**

Address: A. J. Humbert, Wenden, Yuma Co., Ariz.

Is a reorganization of the Nuevo Mundo Mining Co., and although it has Jerome tacked on to its name, the company is doing its mining work far from there.

LA BELLE MINING CO.**ARIZONA**

Vicksburg, Yuma Co., Ariz.

Officers: A. W. Hompre, pres.; E. B. Moore, v. p.; L. S. Judd, sec. and gen. mgr.; James Bayne, treas.

Inc. Aug. 3, 1909, in Arizona. **Cap.**, \$100,000; shares \$10 par; issued, \$82,600. Company is a close corporation, entire stock issue being owned by officers. Annual meeting, June 30.

Property has been abandoned as development proved it of no value. All machinery and improvements sold, but corporation still alive, 1917.

MONTANA-ARIZONA COPPER CO. ARIZONA

Idle. W. D. Greenough, mgr. (Greenough Bros.), Spokane, Wash.

Property: 26 claims, 520 acres, 30 miles north of Wenden, Yuma Co., Ariz., is said to show 5 veins of 3 to 100' width, traceable 7,000', one vein carrying gold values.

Development: 300' two-compartment shaft and a considerable number of trenches.

Equipment: includes 60 h. p. gasoline hoist.

NAVAJO MINES CORPORATION OF ARIZONA ARIZONA

Office: Vicksburg, Yuma Co., Ariz.

Officers: E. P. Heald, pres.; William Vincent, 1st v. p.; O. B. Lefurgey, v. p.; C. Y. DeLay, sec.-treas. and gen. mgr., with H. M. Anthony, O. P. Posey and Eugene Schutz, directors.

Inc. in Arizona. **Cap.**, \$3,000,000; shares \$1 par; fully paid and non-assessable; 1,800,000 issued. National Security Co., New York, transfer agents.

Property: the Desert mines, comprising the Golden Mound, and Gold Eagle quartz claims, and Safe Deposit placer, all patented, 51½ acres, 2½ miles from Vicksburg on the railroad.

Geology: rocks are pre-Cambrian schists, with overlying quartzite, cut by diorite dikes. There are reported to be 3 quartz veins 1 to 10' wide, also a mound 400' across, 140' high at center. Ore contains gold, with small lead and copper contents and average assay is given as \$8 per ton. Quartz in small hill is said to carry 4.3% copper and \$17.15 gold and silver per ton.

Development: veins traced 800' by pits, tunnels, open cuts and a 275' tunnel with 2 crosscuts, 90' and 40' long. Ore reserves estimated by G. R. Boggs at 100,000 tons. W. Forstner estimates orebody 400' long by 140' high to contain 13,500 tons of \$20 ore and 1,500 tons of \$50 ore.

Equipment: includes concrete reservoir, buildings for 50 men, etc. Prospectus truly says: "This is not a sock for everyone." Development is, in our opinion too meagre to warrant the estimates given of either quantity or quality and mining and milling cost of \$2 per ton will be hard to attain on a small scale. In June, 1917, there were 5 car-loads of ore ready for shipment.

NEBRASKA & ARIZONA COPPER CO. ARIZONA

Idle, and probably dead. **Address:** Paradise, Cochise Co., Ariz. W. K. Morrow, supt. at last report.

Inc. Jan., 1910, and merged June 25, 1910 with the California & Paradise Mng. Co., in the California & Paradise Cons. Mng. Co.

Property: 13 claims, known as the Morrow & Chamberlain group, developed by a shaft on the Malachite claim.

The old 200' Malachite shaft was deepened to 600' in 1913, and cross-cutting done on the bottom level without satisfactory result.

ORO COBRA MINING CO. ARIZONA

Address: Thos. Wilkinson, pres. and gen. mgr., 715 High St., Burlington, Iowa. Mine near Wenden, Yuma Co., Ariz.

Inc. Oct., 1901, in Arizona. **Cap.**, \$1,500,000; shares \$1 par; non-assessable; fully issued. Annual meeting, second Tuesday in February.

Property: 14 claims, 280 acres, in the Tank Pass section of the Harcuvar mountains, Ellsworth district, 12 miles west of Wenden. The claims show diorite, schist, granite and porphyry, with several fissure veins, from a few inches to 20' in estimated average width, carrying oxidized ores near surface, said to assay 12 to 15% copper, and \$1.50 to \$80 per ton in combined silver and gold values, with chalcopyrite, at shallow depth. Mine is opened by shafts of 250', 150' and 40', and a tunnel of 110' with 700' of workings. Only assessment work done in 1915.

No later returns.

RANIER DEVELOPMENT CO.

ARIZONA

Office: 27 School St., Boston, Mass.

Officers and directors: S. J. Gnash, pres.; W. W. Gnash, v. p.; W. A. Dean, sec.-treas.; S. J. Gnash, mgr.; W. T. Gnash, supt., Wenden, Arizona.

Inc. July 1, 1914, in Arizona. **Cap.**, \$3,000,000; shares \$1 par; 1,878,496 shares outstanding, of which 1,777,238 shares are pooled. Metropolitan Trust Co., Boston, transfer agent. Annual meeting, February 15th.

Property: 44 claims, about 860 acres, in Ellsworth mining district, 12 miles N. of Wenden, Yuma Co. Ore occurs in fissure veins carrying gold-silver-copper-iron. The main vein is reported exposed at surface for 80-250' in width. Country rock is granite schist, shale, porphyry and limestone. Two small shipments averaged \$59 per ton.

Development: totals 800' of underground workings, including several shafts, deepest 226' vertical and a 130' tunnel.

Equipment: includes 20 h. p. gas. hoist, pump, tramway and several houses. Mine is connected by wagon road with Wenden.

Management plans drilling to greater depth in 1917. About \$5,000 was expended in development work during 1916.

TANK PASS CONSOLIDATED MINING CO.

ARIZONA

Address: A. Tennyson Pryor, pres. and gen. mgr., 933 Dime Bank Bldg., Detroit, Mich. Ward Smith, v. p.; Wm. D. Calverley, sec.-treas.

Inc. Nov., 1909. **Cap.**, \$3,000,000; shares \$10 par. Company controls the Alvin Development Co. through stock ownership, and took over the property of the Cobralla Copper Co., March, 1910.

Property: known as the Ultimatum or Cobralla group, adjoins the Alvin, near Tank Pass in the Harcuvar mountains, Ellsworth mining district, about 10 miles from Wenden. The mine carries about 4,500' of the strike of various fractures in a contact zone following granite intrusive in quartzite, amphibolite and limestone, the ores carrying bornite and chalcopyrite, and estimated to average 3 to 5% copper, 5 to 6' oz. silver and \$1 to \$8 gold per ton, with occasional paystreaks and masses of high-grade ore.

Development: by the 150' Carbonate Hill shaft and a 200' tunnel.

Equipment: includes gasoline hoist. Is a prospect of merit.

VICTOR & BELLE CROWN MINING CO.

ARIZONA

Wenden, Yuma Co., Arizona.

Officers: J. E. Matteson, pres. and gen. mgr.; F. C. Piper, v. p.; J. H. Matteson, sec.-treas.; B. J. Quinn, cons. engr., at last accounts.

Property: 10 claims, 180 acres, in the Harcuvar mountains, 8 miles N. of Salome, the nearest rail point. Claims are said to have a vein of 5 to 7' width, a 30 to 36" paystreak, giving assays of 15 to 20% copper and \$15 to \$20 gold per ton.

Development: includes shafts of 80', 35' and 450', and tunnels of 755', 165' and 230', aggregating about 1,200' of workings. In April, 1917, a tunnel was to be driven to open the mine at 900' depth.

WENDEN COPPER CO.**ARIZONA****Address:** I. H. Barkdoll, pres., Phoenix, Ariz.**Property:** 3 miles N. of Cunningham Pass, Yuma Co., Ariz. Sinking and opening 30" of gold-copper ore, at last accounts.**WENDENDALE GOLD MINING CO.****ARIZONA****Property** near Wenden, Yuma Co., Ariz., in the Cunningham Pass district, is developed by a shaft, showing ore that gave returns to 13% copper and \$12 gold per ton, from a test smelter shipment. Shipping ore being mined by lessees in 1916.**YUMA WARRIOR MINING CO.****ARIZONA****Office:** 41 Bank of Arizona Bldg., Prescott, Ariz.**Officers:** H. W. Stevens, pres.; E. J. F. Horne, v. p.; C. T. Joslin, sec-treas., with W. A. Drake, R. W. Hunt, W. O. Johnson and H. K. Chapin, directors. H. W. Stevens, supt.**Inc.** in Arizona. **Cap.**, \$3,500,000; shares \$1 par; non-assessable. On Nov. 1, 1917, J. Frank Lilly & Co., 62 Broadway, New York, was offering 1,000,000 shares of treasury stock at 50c each. Shares are to be listed on New York Curb.**Property:** 365 acres in the Ellsworth district, 6½ miles from Salome, Yuma county, Ariz., known as the Harqua Hala-Bonanza and Golden Eagle groups. Originally located in 1888, the mine is reported to have yielded gold worth \$4,000,000 above the 200' level. Mines operated by present owners for 3 years. Examined by L. W. Getchell.**Geology:** ore shoots occur in shear zones in schists with intercalated limestone, extending down into the basal granite. Basic dikes are found and many veinlets of quartz and calcite occur. Geology is described in U. S. G. S. Bull. 451, 1911, p. 106.**Development:** by incline shaft to 365' vertical depth. On 5 levels free milling ore is said to have been opened; on No. 7 south, sulphide ore assaying \$44 gold, 7.4 oz. silver, and 5.28% copper; and in a winze below No. 8, \$16.54 gold, 7.85 oz. silver, and 6.15% copper ore, all above water level. At 350' or 400' lower, estimated water level, a considerable body of copper sulphide is expected. A new 3-compartment shaft may be sunk.**Equipment:** complete mining plant, ¾ mile aerial tram from Golden Eagle mine to Bonanza, 40-stamp mill, shops and buildings. To treat the sulphide ore it is proposed to add tube mills, concentrators and flotation plant, with capacity of 200 tons daily.**Production:** is irregular, and since Feb., 1917, the mill yielded gold worth \$25,000. Work is now concentrated on development.

Reported new orebodies may be valuable, but company should not bank on past production, which was gold from free milling ore.

WICKENBURG, MARICOPA COUNTY**ABE LINCOLN COPPER CO.****ARIZONA****W. W. Wantland**, pres. and mgr.; Col. Ed. W. Getten, sec-treas., Omaha, Neb.**Property:** in Hassayampa district, near Wickenburg said to show 7' of sulphide ore, averaging 17%.

A prospect—under development in 1917.

ARIZONA COPPER BELT MINING CO.**ARIZONA****Office:** 25 Broad St., New York, N. Y. **Mine office:** Constellation, Yavapai Co., Ariz.**Officers:** Wm. J. Dilthey, pres.; H. F. E. Gamm, v. p.; J. C. Maugans, treas.; R. A. Camp, sec.; Samuel Bloom, directors; Charles F. Dilthey, supt. at the mines.

Inc. Feb., 1906, in Arizona. Cap., \$1,000,000; shares \$1 par; non-assessable; issued, \$685,692. No bonds.

Property: 17 claims, exclusive of water right and millsite, in two groups, known as the Texas Group and the Wren Group. The Wren Group consists of 4 patented claims. The property is in Central Arizona, in the Black Rock district of Yavapai Co., about 15 miles N. E. of Wickenburg, the nearest railroad station on the Santa Fé Railroad.

The two groups are 2 miles apart and work is mainly on the Texas group, adjoining the Monte Cristo silver mines, some 2 miles nearer the railroad. The working shaft is about 320' deep, with cross-cutting and drifting at that depth. The ore carries copper, with gold and silver values, said to assay from \$28-\$40 per ton. The company has a well-established camp on grounds, 15 h. p. gasoline engine, machine shop and camp buildings.

ARIZONA LEAD & COPPER CO.

ARIZONA

Wickenburg, Ariz.

Officers: Edw. E. Northrup, pres. and mgr., El Paso, Texas; Fred. R. King, v. p., Whittier, Calif.; Jesse A. Spradling, sec., Redlands, Calif.; F. G. Hutchison, treas., Chloride, Ariz.

Property: 20 claims in the Big Horn mountains, reported to be partly developed with some ore blocked out for shipment, April, 1917.

ARIZONA SAMPLING & REDUCTION CO.

ARIZONA

Geo. M. White, mgr.; L. N. Butler, sec.-treas. Operates a reduction plant at Wickenburg, handling mainly custom ores, also developing the Copper Hill mine in Copper Basin and the James Jackson mine near Kingman.

BEE HIVE GOLD CO.

ARIZONA

Office: Hotel Zeiger, El Paso, Texas. Chas Zeiger, pres.

Cap., \$100,000; shares 25c par.

Property: 9 patented claims, adjoins the Octave mine, near Congress Junction, Weaver mining district, Yavapai Co., Ariz. **Ore:** quartz carrying gold values in quartz vein on contact between granite and schist.

Management claims to have spent \$60,000 in development work, driving tunnels, 1,000' and 2,000' long respectively, and to have 10,000 tons of \$8 ore on the dump besides 500,000 tons in sight and blocked out above tunnels and between two winzes sunk below the tunnel level.

Equipment: engine, compressor and drills.

BIG BLUE MINING CO.

ARIZONA

Address: Constellation, Ariz.

Inc. 1911, in Arizona. Cap., \$1,000,000; shares \$1 par. Col. E. F. Brown, owner; J. A. Caskey, supt.

Property: the Big Blue and Copper Prince mines on the Hassayampa river, 14 miles from Wickenburg, Yavapai Co., Ariz., showing fissure veins in schist, that yield high-grade silver-gold-copper ore.

Development: by 2 shafts, connected on 200' level, drifts, crosscut and tunnels. An ore shoot developed on 100' and 200' level is now being stoped.

Equipment: includes crusher, pump, gasoline engine, hoisting plant and a concentration mill. Shipped regularly to Douglas in 1914. Ten men employed.

Reported under lease, 1917, to Thos. Nolan and A. W. Schoof.

DRAGON MINING & DEVELOPMENT CO.

ARIZONA

Address: Wickenburg, Ariz.

Officers: J. G. Scarborough, pres.; F. L. LaForce, v. p.; E. P. Truitt, sec.; H. Hertz, treas.

Property: in Wickenburg district, Ariz. In July, 1917, a shaft was being sunk to 200'. At 157' some gold-silver ore was opened.

EMPRESS COPPER MINING CO.**ARIZONA**

C. K. Hartley, supt., Wickenburg, Ariz. Company formed, 1917, to reopen and work the old Swallow mine, 12 miles east of Wickenburg. Shipment of 42 tons of copper-gold ore made in April, 1917.

GOLD BAR MINES CO.**ARIZONA**

Address: T. H. Jenks, Wickenburg, Ariz. J. A. Twitchell, pres., Phoenix, Ariz.

Property: of the Interior Mining & Trust Co., 15 miles N. E. of Wickenburg, developed by 330' shaft, said to show gold quartz at bottom. New shaft being sunk to 625', shows copper sulphides at 480 to 500'.

Equipment: includes 12 Nissen stamps of 100-ton daily capacity.

GRIJALVA NUEVA MINING CO.**ARIZONA**

Wickenburg, Yavapai Co., Ariz.

Officers and directors: J. H. Mulholland, pres. and gen. mgr.; J. J. Heard, v. p.; T. B. Inglis, sec.-treas. A. R. Schloesser, supt.

Inc. May 15, 1915, in Ariz. **Cap.**, \$500,000; shares \$1 par; all outstanding. Annual meeting, first Monday in April.

Property: 13 claims, 2 patented, 220 acres, 10 miles N. W. of Wickenburg, includes the old Grijalva mine.

Company started operations in Dec., 1915, and went out of business, 1917.

HALE MINING & MILLING CO.**ARIZONA**

Constellation, Yavapai Co., Ariz. Felix X. O'Brien, supt. Has gold and copper ores in veins. Equipped with gasoline power. Inactive save for yearly representation work.

JUANITA MINING & MILLING CO.**ARIZONA**

Company defunct.

Former officers: M. Dwight Jennings, pres.; W. S. Heflin, v. p.; D. A. Seaman, sec. and gen. mgr.; E. J. Bennett, treas.; preceding, with B. F. Peters, Otto Kring and E. Payne Palmer, directors.

Inc. April, 1905, in Arizona. **Cap.**, \$1,500,000; shares \$1 par; non-assessable; issued \$1,200,000. Annual meeting, first Tuesday after second Monday of April.

Property: 16 claims, unpatented, 300 acres, and a 5-acre mill site about 4 miles from the Senator mine in the Hassayampa district, about 17 miles S. of Prescott. Property said to carry 11 fissure veins in porphyry and schist with 4 under development of 1 to 60' width, traceable 1,000 to 3,000' carrying copper sulphides assaying 2 to 10% copper, to 100 oz. silver and \$1 to \$1,700 gold per ton. Apparently the main vein is of 8' average width.

Development: by 210' shaft and several tunnels from 45 to 450' long, with 3,500' of workings estimated, 1913, to have blocked out 5,000 tons of ore with 25,000 tons in sight.

Equipment: includes 25 h. p. hoist, 2-stamp mill, 7 tons capacity.

Work resumed in June, 1917, by D. M. Jennings and others of St. Louis, who received a deed on the property from the Sheriff.

LA EXPOSICION MINING CO.**ARIZONA**

Letter returned from New York address, 1917.

Officers: Fred A. Swan, pres.; Forrester A. Linn, v. p.; Appollos Fuller, sec.-treas., with Chas. Putnam, directors.

Inc. May 20, 1910, in Ariz. **Cap.**, common; \$500,000; all issued; preferred, \$1,500,000; outstanding, \$750,000; all shares \$1 par. Security Transfer & Registrar Co., New York, transfer agent and registrar. Listed on New York Curb as a prospect.

Balance sheet on May, 1916, shows assets \$2,623,550, which includes "ore

in sight on Hurlbut lease" \$2,500,000, and "ore in sight on Zesiger lease" \$50,000. Neither tonnage, grade nor kind of ore are reported. The company had a lease and bond on property of the Leadville Mining Co. at Courtland, Ariz., but failed to make payments due and title reverted to the latter company.

Property: La Expositcion claim, 42 acres, at Cumpas, Sonora, and 2 claims, 74 acres, near Nacozari, Mex. In Arizona company has a bond on 7 claims near Wickenburg, adjoining the Monte Cristo on south, said to show copper sulphide ore.

Development: 2 incline shafts. A 100' incline shaft is said to show 20' of sulphide ore; the other shaft, ore 16' to 18' in width. Claim 30,000 tons of 8% copper ore in sight.

Company also has bond on a gold property, 5 claims, near Greaterville, Pima Co., Ariz., said to show a vein 200' wide and 1,000' long on surface, capable of being mined by steam shovel, and entire vein will mill better than \$8 per ton. **Development:** 2 tunnels, 250' and 300' long, and 90' incline shaft "all in ore." Management claims 500,000 tons free milling ore, capable of being handled for \$1.50 per ton, netting company \$8 per ton; all of which is preposterous; further comment is superfluous.

Equipment: includes a hoist and 2-drill air compressor.

A 3½' Huntington mill being erected, which is expected to treat 50 tons daily.

LINDEN GROUP

ARIZONA

Wm. Linden, Groom Creek, Yavapai Co., Ariz., owner and mgr.

Property: the Cottonwood and Vera groups, 7 claims, 140 acres at Groom Creek, in the Hassayampa district, shows gold-silver-copper-molybdenum ore in quartz contact vein traversing diorite-schist formation.

Development: by 50' vertical shaft and several tunnels, deepest 300'.

Shipments: in 1916, totaled 100 tons from the Cottonwood claim and averaged 17% copper with some silver and gold. Owner planned installing 50-ton Marathon mill and cyanide unit and driving a 400' tunnel in 1916.

Letter ret'd, 1917. Probably closed down.

MARICOPA MINES CO.

ARIZONA

Office: B. of L. E. Bldg., Cleveland, Ohio. Earl G. Hill, agt., Austin, Nev. **Mine offices:** Morristown, Maricopa Co., Ariz., and Austin, Lander Co., Nev. In process of reorganization, March, 1916.

Property: 33 claims, 611 acres, along the north contact of the Austin mineral belt. Principal property, 17 claims, at Austin, Nevada, shows four fissure veins in quartzite, ranging from 3' to 20' in width, traceable 1,400', and said to carry average values of about 4% copper, 50 oz. silver and \$2.80 gold per ton.

Development: by 4 shafts, deepest 800', and 5 tunnels, 2 longest being 2,000' and 830', with total underground openings of about 12,000'.

The Prosperity group, 16 claims, in the Wickenburg district, Arizona, shows granite and limestone, the ore occurring in fissure veins in porphyry. There are 6 known veins of 8 to 30' average width, developed by numerous shafts, with about 1,800' of workings. Ore is mainly chalcocite, claimed by the management to carry average values of 9% copper, 11 oz. silver and \$11 gold.

Equipment: includes 2 small steam hoists and an air compressor at the Arizona property and a 75 h. p. gasoline hoist, 2 air compressors, machine shop, and necessary mine buildings on the Nevada property.

The 100-ton concentrator, in New York canyon, near Austin, has a Blake crusher, 2 rolls, 9 Card tables, 6 slime tables and a small cyanide plant.

Extensive work planned for 1916, but no recent information is at hand.

MARS CONSOLIDATED CO.**ARIZONA**

Probably dead. Address: care F. J. Webber, Colorado Springs, Colo. Company is the successor of the Heckley Gold & Copper Mining Co.

Property: 13 claims, in 3 groups, on Copper Hill, in the Black Rock district, 6 miles N. E. of Wickenburg, Maricopa Co., Arizona, shows 3 veins of 6', 10' and 25' claimed average width, developed by a 268' tunnel, said to carry ore assaying up to 28% copper. Letters unanswered.

MILDRED GOLD MINING CO.**ARIZONA**

Address: D. B. Genung, supt., Stanton, Ariz.; H. M. Canover, pres. Company has no debts.

Property: 14 unpatented claims near Congress Junction, Yavapai Co., Ariz.

Development: 4,000' of shafts, drifts, etc. Tunnel 1,150' long has been driven from mill level to connect with main vein and incline shaft at depth of 520'.

Equipment: 2 hoists, 10-stamp mill and water supply 1¼ miles long.

MONARCH MINING & SMELTING CO.**ARIZONA**

Wickenburg, Ariz.

Officers: W. O. Donovan, Vidalia, Ga., chairman; J. H. Mulholland, pres. and gen. mgr.; Jas. R. Vaughan, v. p.; J. B. Everidge, v. p.; J. H. Mulkey, sec.-treas.; officers are directors. A. D. Akin, cons. engr.

Inc. Aug., 1904, in Ariz. Cap., \$1,000,000; increased to \$1,500,000 in 1913 and to \$3,000,000 in 1914.

Bonds: \$100,000 1st mtge., issued 1913; \$57,400 outstanding. Assets of company given as \$62,523 over liabilities, Jan., 1915.

Property: 6 claims, patented, 100 acres, known as the Ryland or Three, Black Buttes group, in the Black Rock or White Pitacho district, 9 miles S. E. of Wickenburg, shows diorite and schist carrying oxidized ores changing at shallow depth to chalcopryrite and occasional bornite, said to assay 2 to 20% copper and estimated by management to average 1 to 3 oz. silver and \$3 to \$15 gold per ton.

Development: several shallow shafts and tunnels of 600 and 360', with about 1,500' of underground workings and several thousand feet of surface trenching.

Equipment: includes a 50 h. p. distillate engine, 5x8" Rumsey triplex pump, and a 4-drill Sullivan compressor. There are about 26 buildings, all owned by the company. Water is taken from the Hassayampa river through 7 miles of 4" pipe.

Development has proved surface ores to be badly broken, not continuous and occurring in pockets. Former management counted on raising funds for deep development by milling surface ores, but with wet concentration process used in 100-ton mill, major part of oxides and carbonates was lost in the tailing. Mill was therefore closed down after trial run. Shaft sunk deeper in 1916, but work was suspended in winter and resumed May, 1917.

MONTE CRISTO MINING & MILLING CO.**ARIZONA**

Chief owner, Ezra W. Thayer, pres., Phoenix, Ariz.; A. G. Pickett, sec.; Chas. B. Brann, supt., Wickenburg, Ariz.

Inc. Nov. 23, 1903. Cap., \$2,000,000; shares \$1 par.

Property: Monte Cristo silver mine, adjoining the Arizona Copper Belt mine near Constellation, in Black Rock district, Yavapai Co., Ariz. The Monte Cristo mine shows very remarkable high-grade native silver ore which in the bottom of the mine is changing to copper ore.

Development: by 950' shaft with over 6,000' of workings. Company is developing on 1,000' level and has a large deposit opened up.

OCTAVE MINES CO.**ARIZONA**

Office: 882 Drexel Bldg., Philadelphia, Pa.

Officers: H. C. Gibbs, pres.; H. S. Hopper, v. p.; D. S. Leas, sec.-treas.; J. Nelson Nevius, mgr., Octave, Ariz.

Property: the Octave gold mine, an old mine with a record of \$2,000,000 produced. Shows same geologic features as the Congress mine, 10 miles to east. The rocks are granitic, intruded by acidic and basic dikes, including some of post mineral age.

Development: to depth of 2,000' and for 1,400' along the vein; 500' of new work done in 1914-15, mainly E. of a fault that cut off the ore on the 8th level, has shown an orebody 270' long, 2.2' thick, averaging \$10 per ton, separated by 25' of lean vein from 90' of \$13.44 ore that is 4' wide. Property examined by J. Nelson Nevius, 1916.

Camp reopened after 7 years idleness and development work under-way, Aug., 1917.

ORO GRANDE MINES CO.**ARIZONA**

Office: Clinton, Ia. Mine near Wickenburg, Maricopa Co., Ariz.

Officers: at last accounts, G. E. Lamb, pres. and treas.; Geo. B. Upton, v. p. and gen. mgr.; F. W. Ellis, sec., and T. G. Norris, directors.

Inc. 1901 in Arizona. Cap., \$3,000,000; shares \$10 par; non-assessable; issued \$2,500,000. Is a close corporation, controlled by 6 shareholders. Annual meeting, second Tuesday in January.

Property: 9 claims, patented, 161 acres, in the Black Rock district of Yavapai Co., shows contact deposits, between diorite and hornblende schist. The ore under development with strike of N. 27° E. and vertical dip, is estimated by management as 170' wide, traceable 4,400', and carries oxidized ores, bornite and chalcocite, with gold values.

Development: by shafts of 320', 100' and 100', with about 8,000' of workings, reported to have blocked out 980,000 tons of ore.

Equipment: includes a 55 h. p. gasoline plant at the mine, with a 15 h. p. hoist and 5-drill Sullivan air compressor.

The 50-ton mill has ten 1,050-lb. stamps with a 40 h. p. gasoline engine; water is pumped, for milling, from Box canyon on the Hassayampa river.

The manager reports a saving by straight amalgamation of 99% of assay values and having made 60-day mill-runs with a total cost of \$1.87 per ton, for mining, milling, pumping and all expenses, which is interesting, if true. Idle since 1907.

TOMBOY MINES**ARIZONA**

Address: Bruce Hobbs, sec., 29 Otis St., Boston, Mass.

Property: 7 claims, 150 acres, in the Castle Creek district of the Bradshaw mountains, about 13 miles from Wickenburg, formerly owned by the Arizona Mines Co., shows an orebody up to 50' in width, traced by trenching for nearly 1 mile.

Development: includes several short tunnels, and a 250' shaft, showing a vein carrying about 3' of disseminated malachite, ore being exclusively oxidized to depth opened. Mine as a whole has about a quarter-mile of workings.

Equipment: includes an 18 h. p. hoist, good for 600' depth, and necessary mine buildings.

A full report on the property was made Oct., 1910, by Mark Bradley, mg. engr. Presumably idle.

VULTURE MINES CO.**ARIZONA**

Address: Wickenburg, Ariz.

Officers: Robt. Mackay, pres.; F. W. Rockwell, v. p.; R. T. Sewall, sec., Boston; A. McLean, treas.; the foregoing and A. R. Mackay, F. M. Kimbark, E. I. Marvell, J. B. Sullivan, Jr., directors; Spencer Hutchinson, cons. engr.

Cap., 600,000 shares; par \$5; all issued. No bonded indebtedness. 35 Congress St., Boston, Mass., transfer office. R. T. Sewall, registrar. Annual meeting, June 1.

Property: 31 claims, 11 patented, 618.2 acres, 15 miles S. W. of Wickenburg.

Geology: quartz vein in schist contains gold, with some galena and pyrite, dips 37° and strikes N. 85° E. Pay ore occurs in shoots, the main orebody being 35' by 300'.

Development: mine is worked by back stoping and waste filling through two inclined shafts 765' and 595' deep. Greatest depth of workings, 1,239'; linear extent, 25,000'.

Equipment: includes Ottumwa hoist; gas and steam engine; Sullivan compressor; Cameron pump; 700' tramway; 125-ton stamp mill with concentrating machinery.

Ore: treated, 1912, 19,689 tons; 1913, 33,174; 1914, 36,348; 1915, 29,968 tons. No recent financial statement has been made. For ten months, 1913, ore averaged \$20.54 per ton; recovery, \$17.40 per ton; total value, \$429,416.

WICKENBURG COPPER M. & R. CO. ARIZONA

Address: Chas. Born, Prescott, Ariz.

Officers: B. B. Bloom, pres.; Chas. Born, sec.-treas., with R. N. Vyne, directors.

Inc. 1916 in Arizona. **Cap.,** \$5,000,000; shares \$1 par; non-assessable.

Property: 22 claims, in the Black Rock district, Yavapai Co., Ariz. Mine was idle for 15 years. Examined by A. E. Boyce.

Development: in August, 1917, company was driving a tunnel 300' on a silver vein.

WINKELMAN, See Hayden

YUCCA, See Kingman

YUMA, Yuma County

FORTUNA MINES CORPORATION

ARIZONA

Presumably idle: does not reply to letters.

Mines at Fortuna, Yuma Co., Ariz. **Office:** 31 State St., Boston, Mass., and care F. G. Hobbs, sec.-treas., Sharon Bldg., San Francisco, Calif.

Officers: F. E. Boland, pres.; Frank G. Hobbs, Thos. Pascoe, J. E. Manders, directors; T. C. Woodworth, cons. engr.; W. H. Enderton, supt; F. B. Keever, mgr.

Inc. 1913 in Calif. **Cap.,** \$500,000; shares \$1 par. Listed on Boston Curb. Federal Trust Co., Boston, depository.

Property: the Fortuna mine, 7 patented, 11 unpatented claims, 358.7 acres, 15 miles S. of Blaisdell station on the S. P. R. R. and 22 miles S. E. of Yuma, Ariz. Claims are at base of W. slope of the Gila range. The Fortuna mine is said to have been worked by Chas. D. Lane of San Francisco, 1896-1904, with a gross production of \$2,887,075 gold and to have paid \$1,180,000 in dividends. The oreshoot was lost in 1901, a fault from 800' to 1,200' level cutting off the ore, and \$500,000 was spent in vain to recover ore beyond the fault. Present company started work May, 1913, and is reported to have spent \$100,000 and to have recovered the vein on the 800' level.

The Fortuna is a quartz vein in schist, near gneiss and granite masses. It runs E. W., dips 50° S. and has an average thickness of 4", said to widen out to 30' in lenses. The outcrop shows iron and copper oxides, but the ore is free milling.

Development: by an old 1,500' working shaft whose levels have been utilized by present company. Crosscutting is reported to have found the oreshoot, 5' wide, on the 800' level. A new shaft, 400' E. of old workings, is said to show a 2' vein of \$40 ore. Company claims 1,000,000 tons of probable ore, which is regarded as too optimistic.

Mill has 20 1,400-lb. stamps and receives water from a 4-mile pipe line.

Mine has a good record and company has several eminent stockholders, but promotion record has been disappointing.

ARKANSAS

AMERICAN STAR ANTIMONY CORPORATION ARKANSAS

Office and Mine: Gilham, Ark.

Officers: J. G. Battele, pres.; Gordon Battele, v. p.; C. M. Fenton, sec-treas., with Harry S. Miller and G. B. Fenton, directors.

Inc. Dec. 10, 1916, in Missouri. **Cap.**, \$24,000; shares \$100 par; all issued. Conqueror Trust Co., Joplin, Mo., registrar and transfer agents. Annual meeting 2nd Monday in December.

Property: 3 groups, 440 acres, near Gilham, Sevier Co., and a smelter in the town of Sevier. **Ore:** stibnite, occurs in fissure veins, 6" by 8' wide and said to give average assays of 30% antimony, 33% sulphur, 6% silica, 3% iron, 4% quartz and 24% alumina.

Development: by 3 shafts, deepest 175'.

Equipment: includes 3 compressors, hoist and steam power. Management reports ore reserves of 2,000 tons, June, 1917. Developing.

ARKANSAS ZINC & SMELTING CORPORATION ARKANSAS

Address: F. W. Bocking, gen. mgr. Van Buren, Ark. N. Y. address: 42 Broadway.

Smelter: one mile east of Van Buren, between St. L., I. M., & S. R. R. and St. L. and San F. R. R. Plant includes ore storage bins of 4,000 tons capacity, weighing apparatus, 2 Ropp type kilns of 20 to 25 ton daily capacity, crusher and mixing house, sampler, 3 blocks of 800 retorts each with similar number proposed, pottery, electric power plant, and necessary buildings.

The ore and concentrate supply for this plant comes from northern Arkansas mines and probably some from Oklahoma.

CHARLEY BOY MINING CO. ARKANSAS

Address: Chas. Gilstrop, Tulsa, Okla.

Officers: A. K. Richards, pres.; W. T. Hines, v. p.; Chas. Gilstrop, sec.-treas.

Has a lease on land in the Zinc district, Boone Co., Ark. Deep drilling is to be started.

DENVER MINING & MILLING CO. ... ARKANSAS

Address: Yellville, Ark.

Property: a zinc-lead mine in northern Arkansas, said to contain up to \$300,000 worth of ore in sight. A new mill was started in August.

DIXIE GIRL MINE ARKANSAS

Address: J. L. McCarty, Rush, Ark.

Property: in the N. Arkansas zinc region, developed by 100' and 225' tunnels and opencut. Rich carbonate ore is said to be exposed.

McCURRY MINING & MILLING CO. ARKANSAS

Address: W. A. McCurry, Zinc, Ark.

Property: the Coker Hollow, Rhodes-Manchester and Haulk at Zinc and the Keys Gap and Canton near Ponca City. The former contains zinc

silicate, the latter blende and galena. At Zinc the company has a 100-ton custom mill.

ONWATTA MINE**ARKANSAS**

W. C. Settles, supt. Mine in Dodd City district, Marion Co., Ark., shows lead ore with calamite, smithsonite and cadmium ore, occurring in fissures or fault breccias, the zinc ore averaging better than 60% metallic contents. The formation is limestone. An intermittent producer.

YELLOW ROSE MINING CO.**ARKANSAS**

Address: Rush, Ark.

Cap., \$3,000,000.

Property: the Yellow Rose, White Eagle and Big Find zinc mines in the Rush district, Marion Co., Ark. Said to be one of the best properties in northern Arkansas.

Development: by shaft and tunnel. A 200-ton mill is operating.

CALIFORNIA

As the mining districts of the State are widely scattered along the Sierra front, the geographical arrangement is by counties instead of towns.

ALPINE COUNTY**CURTZ CONSOLIDATED MINES CO.****CALIFORNIA**

Probably dead; no response to letter. See Vol XII. Mine near Markleeville, Alpine Co., Cal.

MORNING STAR MINE**CALIFORNIA**

Owned by Curtz Consolidated Mines Co.

AMADOR COUNTY**ARGONAUT CONS. MINING CO.****CALIFORNIA**

Office: 43 Cedar St., New York City. Controls Argonaut Mining Co., and is itself controlled by the White Knob Copper & Development Co., owning a majority of its capital stock.

Officers: John T. Smith, pres.; H. H. Carlisle, v. p.; E. H. Kelly, treas.; Arthur Kennedy, sec., New York.

Inc. Jan. 5, 1907, in Maine. Cap., \$2,000,000, par \$5; \$1,855,000 issued; \$1,200,000 owned by White Knob Copper & Development Co. Dividends: 30c in 1914; 40c in 1915; 40c in 1916; 10c to June, 1917. Annual meeting, 1st Tuesday after June 1. Security Registrar & Transfer Co., tran. agt. and registrar.

ARGONAUT MINING CO.**CALIFORNIA**

Address: 404 Humbolt Bank Bldg., San Francisco. Mine office; Jackson, Amador Co., Cal.

Officers: Jesse W. Lilienthal, S. F., pres.; N. S. Kelsey, mgr.; E. Phillips, mine foreman; Geo. W. Green, mill foreman.

Inc. in 1893. Cap., \$1,000,000, shares \$5 par; all issued. Is the operating company of the Argonaut Cons. Mng. Co., control of which is held by the White Knob Copper & Dev. Co., Ltd.

Property: one mile north of Jackson, on the Mother Lode; adjoins that of the Kennedy Extension Mng. Co. on the south.

Ore: soft shattered white gold quartz in a very regular and continuous vein 8' to 12' wide, with strike N. 10° W. Vein outcrops in a metadiabase; above the 290' level it passes into the Mariposa slates, where, apparently, the fissure was originally opened by a thrust fault with a throw of 120'. One wall is a soft black slate, the other is slate or a greenstone schist. Two ore shoots have been developed; the north shoot 325' long, with average width of 10'; the south shoot 600' long, with average width of 10'. On the 1,240' level there is a split in the vein, a branch running off

into the schist hanging wall. Ore yields in the mill about \$5.50 in free gold and \$1.50 in concentrates.

Development: shaft 4,650' deep, sunk at an angle of 60°, with levels at 150' intervals. At 290' level shaft cuts the vein in diabase, from the 1,460' level to present depth it is in the slate hanging-wall. Present work is being done on the four lower levels. Ground is very heavy and the square-set mining method is used. Nearly half the force employed underground are timbermen. Ore is hoisted, in 4-ton skips, by a 500-h. p. double-drum electric hoist, automatically dumped into storage bins, then fed to a 10 by 16" Knight crusher and trammed in 2½-ton cars to the mill.

Mill: forty 1,000-lb. stamps, dropping 96 times per minute, with 7" drop, and crushing 5 tons per stamp through 20-mesh wire screen, with capacity of 300 tons daily. From the amalgamating plates pulp flows to 36 Frue vanners, tailing goes to hydraulic classifiers, overflow being concentrated on 20' Darrow rotary concentrators. A 90% extraction is made by amalgamation and concentration. Company employs 225 men.

BUNKER HILL CONS. MINING CO. CALIFORNIA

Office: Humbolt Bldg., San Francisco. **Mine office:** Amador City, Amador Co., Cal. W. F. Detert, pres.; C. E. Bunker, supt.

Inc. 1907. Cap., \$200,000, shares \$1 par. The mine has paid dividends for several years; in first half of 1915 six monthly dividends were paid, totaling \$30,000. Owing to heavy construction and new equipment expense the dividend rate was reduced from 5 to 2½ cts. per share.

Property: 3 claims, the Bunker Hill, Mayflower and Nevada, 1½ miles north of Amador City, 2,587' on the lode.

Geology: the ore is gold, occurring in the Bunker Hill vein, strike N. 25° W., dip 58° E., with average width of 6'. From surface to 200' level the vein occurs on the contact between Mariposa slate on the west and metadiabase on the east; from the 200' to the 1,400' level, the vein is in slate; from the 1,500' to the 2,400' level the vein has a greenstone footwall and slate hanging-wall. On the 1,400' level an orebody has been opened 40' west of the Bunker Hill vein, and running parallel with it. This orebody is 860' long, average width 30', and at a point 860' north of the shaft joins the Bunker Hill vein; at points it forms the footwall of the Bunker Hill vein. Ore occurs in the form of lenses, the schist being cut by numerous stringers of quartz; the rock is highly impregnated with pyrite, as high as 4 to 5%. The gray orebody has been developed on the 1,400', 1,500', 1,750' and 1,950' levels. Three ore-shoots have been developed on the property; the north and south shoots on the Bunker Hill vein have an average length of 500', average width of 6', while the gray orebody is 600' long, average width of 15'.

Development: by shafts: main shaft is double-compartment, 2,587' deep, and sunk on an incline of 58°. From the 1,950' to 2,400' level it is sunk in metadiabase. On the 2,400' level the distance from the shaft to the Bunker Hill vein is 280'.

Equipment: includes a double-drum hoist, driven by a 300-h. p. motor, Ingersoll-Rand compressor, driven by 100-h. p. motor, pumps, a 40-stamp mill and a cyanide plant. Ore is hoisted in 2½-ton skips, and is crushed by a Knight crusher, before being trammed 550' to the mill. Stamps, weighing 1,150 lbs. each, drop 6½", 96 drops per min., crush 5 tons per stamp daily through No. 4 punched screen. Pulp flows over double-compartment amalgamating plates to 24 6' Frue vanners; tailings from the vanners go to the cyanide plant, where sands are treated in eight 100-ton leaching vats, treatment taking 8 days. Concentrates are first agitated with lime in Pachuca tanks, 50 lbs. lime for 11 tons ore, then agitated 8 hours with strong KCN solution; treatment lasting 3 to 4 days.

Mill tailing runs 99c per ton; a 45% extraction is made. Tailing is treated on a royalty basis. W. E. Darrow, V. R. Fitzsimmons et al., Sutter Creek, owners. The Bunker Hill Company employs 155 men. See U. S. G. S. Folio 63; and M. & M. Res. of Amador Co., p. 20, Cal. State Mng. Bureau.

In Sept., 1917, company built a flume to carry tailing from the mill to the concrete dam on Rancheria creek.

In the first six months of 1915, 42,087 tons of ore was mined and milled, producing \$151,591, an average value of \$3.60 per ton; aggregate total expenses, \$109,792.

CENTRAL EUREKA MINING CO.**CALIFORNIA**

Successor to the King William Mining Co.

Office: 254 Russ Bldg., San Francisco and Sutter creek, Amador Co., Cal.

Officers: V. S. Walsh, pres.; I. N. Rosekrans, v. p.; J. B. Toplitz, J. R. Tregloan, W. P. Henry, directors; Wm. A. Van Bokkelen, sec.-treas.; F. Jost, supt.

Inc. in California. Cap., 1,500,000 shares; 1c par; changed from \$400,000. \$1 par; of this 1,000,000 shares were for exchange with old stockholders share for share on payment of $\frac{1}{2}$ c per share. Annual meeting 4th Thursday in April. Results of operations were a disappointment for many years, but a dividend of 2c per share was paid in Feb., 1915.

Receipts and expenditures up to April, 1917, include total receipts, \$146,132, which included \$43,789 for assessment Nos. 38, 39 and 40; and \$5,199. Cash on hand and accounts receivable are: \$14,822 with bills payable of \$12,394.

Property: adjoining the South Eureka on the north, $\frac{1}{2}$ mile south of Sutter Creek, shows 3 parallel veins which have been developed. The veins are in the form of stringers, with strike N. 20° W., dip 55° to 70° E., and an average width of 6'. The east vein is 20' from the west vein, while the hanging-wall vein is 200' east of the west vein. East and west veins have slate walls; hanging-wall vein has a slate footwall and greenstone hanging-wall. Two series of ore shoots have been developed, the north shoots being 60', the south shoots 200' long.

Development: 3-compartment shaft 3,430' deep, sunk on 57° incline. Shaft cuts the hanging-wall vein on the 500' level and is sunk on the hanging-wall to the 1,900' level, at which point it is deflected to the west and passes into a slate formation. Three crosscuts have been made to the west. A new fissure has been developed at the 3,425' level. On the 2,100', 2,850', 3,000' and 3,300' levels, favorable orebodies have been opened up. New development was 196' of shaft sinking and 1,605' of other work.

Equipment: includes an Ingersoll compressor driven by 150-h. p. motor and two 60-h. p. oil-fired boilers. Ore is hoisted in 2-ton skips and run through a Blake crusher before being trammed to the mill.

Mill: 40 stamps of 1,150 lbs. each, making 100 drops per minute and crushing $4\frac{1}{4}$ tons per stamp through a 24-mesh screen. Mill ran continuously during the year except for the months of Sept. and Oct., on an average ore of \$3.50 per ton and gave tailings of 30c to 40c per ton. Mill is driven by a 75-h. p. motor.

Ore of mine was thought to be exhausted but Mr. C. E. Julihn who was employed to report on the property recommended further development which is being done.

CONSOLIDATED AMADOR MINING CO.**CALIFORNIA**

See Old Eureka Mining Co.

DEFENDER MINE**CALIFORNIA**

F. B. Joyce, owner, 1023 Mills Bldg., San Francisco, Cal. Mine office: Defender, via Volcano, Amador Co., Cal.

Property: 3 claims, unpatented, 5 miles S. E. of Volcano, Cal.

Ore: free milling by fine grinding, carries gold and some silver (parting value) in an ore with chalcopryite, galena and sphalerite, in a vein in granodiorite. The lode has strike of N. 15° W., dip 85° W., and an average width of 3' 6".

Development: 360' vertical shaft, with 1,500' underground workings. At 130' south shaft on 200' level the vein is cut by a diorite dike 22' thick;

other smaller diorite dikes cut the main shoot and seem to be associated with the ore occurrence.

Equipment: includes steam hoist, compressor and a 10-stamp mill. Eight men are employed.

Production: to date said to be 12,000 tons, yielding \$140,000. Work in 1915 and 1916 consisted of development work only.

FREMONT CONSOLIDATED MINING CO. CALIFORNIA

Offices: 24 Market St., San Francisco, and Dry Town, Amador Co., Cal. Arthur Goodall, gen. mgr.; A. L. Palmer, supt.

Property: 4 claims, 4,200' on the lode, 1½ miles north of Amador City, shows gold ore occurring on contact of black slate on the west, and metadiabase on the east. Vein strikes N. 25° W., dip 50° E., and has an average width of 6'. West of the main vein ore has been developed in schist. Orebodies occur as lenses, the ore being in the form of quartz stringers, cutting the schist. The rock is highly mineralized with pyrite.

Development: by the Fremont shaft, 2,750' deep, sunk on a 51° incline, and a 1,500' incline shaft north of the Fremont shaft. There are several miles of underground workings.

Equipment: includes a steam hoist at each shaft and a 40-stamp mill. Oil is used as fuel.

HARDENBERG MINING SYNDICATE CALIFORNIA

Office: 1018 Crocker Bldg., San Francisco, Cal. W. J. Loring, mgr.; James F. Parks, supt.

Operates the Hardenberg gold mine at Jackson, Amador Co., Cal. Developed by 1,500' shaft and equipped with 20 stamp amalgamation-concentration mill. Has compressor and electric power. Employs 26 men.

Syndicate suspended operations in October, 1917, owing to unsatisfactory results.

KENNEDY MINING & MILLING CO. CALIFORNIA

Office: 409 Montgomery St., San Francisco, Cal. Webb Smith, supt. Cap., \$100,000; shares \$100 par.

Property: 9 claims, covering 3,100' on the Mother Lode, includes the Kennedy mine adjoining the Argonaut, 1 mile north of Jackson, Amador Co., Cal. The Kennedy vein, one of three veins in the Lode, outcrops in andesite passing downward into Mariposa slate, following roughly the contact between the two rocks. The vein dips 57° E. and the payshoots rake to the north. The best ore occurs near the footwall over a black gouge 1 to 2' thick.

Development: by 3 shafts; the vertical south shaft, 2,300' deep, north shaft, 2,500' deep and the 3-compartment east shaft sunk to vertical depth of 4,030' with crosscuts and drifts, run N. and S. on the veins. Shaft being sunk with the object of reaching junction of two orebodies. Ore in the lower levels is generally of better grade than above.

Equipment: includes air-drills, 15"x30" Murry compressor, 25"x30" Fulton compressor, nine 80-h. p. boilers, oil fired steam power, 800-h. p. double-drum hoist and 100-stamp mill, making an extraction of 83%. Monthly capacity is 15,000 tons. Concentrates assay \$100 per ton and tailings run about 60c per ton. Concentrates are treated at the mine in a 10-ton chlorination plant with 2 roasting furnaces. Employs 300 men. Company purchased the Zeila mine and 40-stamp mill at Jackson, about 1½ miles S. of the Kennedy, in 1915, for \$35,000. The Zeila is worked out down to the 450' level, but new orebodies averaging \$4 per ton are said to have been disclosed below the old workings.

Property has a hopeful future, but management is unduly conservative, rarely giving information, in marked contrast to the frank, open policy of the Plymouth Consolidated in the same district.

KEYSTONE MINING CO. CALIFORNIA

Carlton R. Downs, Amador City, Cal., mgr.

Property: the Keystone mine at Amador City, Amador Co., covering 4,000' along the Mother Lode.

The Keystone is a quartz vein, 12-200' wide, occurring on the contact between black clay slate footwall and meta-andesite hanging-wall. Two other veins, the Spring Hill and east veins, have been developed; the latter is now furnishing the ore. The contact vein was mined above the 900' level. See M. & M. Res. of Amador Co., State Mineralogist's Report, p. 34-36.

Development: by 3-compartment Patton shaft, 2,680' deep and 1,118' south shaft on 60° incline, with crosscuts and drifts E. and N. on the 100', 900', 1,000', 1,200' and 1,400' levels. Development work now being done on the 1,800'. Most of the 1916 output come from the 900', 1,000', 1,200' and 1,400' levels.

Equipment: includes 40-stamp amalgamation and concentration mill, making an extraction of 90%; electric hoist, 300-h. p. motor, air compressor and drills. Concentrates run \$50 per ton; the tailings 30c per ton. About 80 men employed.

Production: for year ended Jan. 1, 1917, was 61,348 tons of \$2.52 gold ore, a total of \$151,134.

LINCOLN CONSOLIDATED

CALIFORNIA

Address: Sutter Creek.

Reported sold its property Oct. 1917, to Jas. Hoatson, et al., of Houghton, Michigan, and 10% dividends paid shareholders from proceeds.

OLD EUREKA MINING CO.

CALIFORNIA

Office: 42 Broadway, New York City. Mine at Sutter Creek, Amador Co., Cal.

Officers: Wm. D. Thornton, New York, pres.; G. E. Tener, Pittsburgh, v. p.; C. D. Fraser, treas.; J. D. Clarke, sec.; T. Walter Beam, gen. mgr. Inc. 1916, in Delaware. Cap., \$3,000,000; shares \$10 par.; 100,000 issued.

Property: originally owned by Hetty Green, was purchased in 1916 from the Amador Cons. Mng. Co. Is credited with past production of \$20,000,000. Main shaft has a depth of 2,063'. In Feb., 1916, large trees were growing out of the shaft, and water was flowing from the collar.

For history of the property see Mining and Scientific Press, Vol. 112, No. 26. The vein runs N. W., dips 71° E. and has a 700' ore shoot.

Property was unwatered in 1917, after a shut-down of over 40 years. By Nov. 22, 1917, the shaft had been unwatered and repaired to 2,063'. Four drifts are being cleaned out, where considerable pay ore is exposed.

Equipment: modern sinking pumps, 300-h. p. electric hoist, Ingersoll compressor, and necessary buildings.

This is a genuine and expensive project to reopen an old gold producer, the owners betting on the continuity of the Mother Lode ore channels, and the economical conditions afforded by power, water and climate in handling them. The old Plymouth proved highly profitable, so probably will the Old Eureka.

ORIGINAL AMADOR CONSOLIDATED MINES CO. CALIFORNIA

Office: 1225 Broadway, Oakland, Cal. T. S. O'Brien, supt., Amador City, Amador Co., Cal.

Property: 6 claims, covering 4,400' on the lode at Amador City, is said to carry a system of parallel quartz veins, from 12' by 50' wide, with diabase hanging and Mariposa slate footwall.

Development: by incline shaft to depth of 780'. The ore is mined by the shrinkage stope method.

Equipment: includes Ingersoll-Rand ocmpressor driven by 100-h. p. motor, double-drum hoist, drills and 20-stamp mill for amalgamation and concentration of the ore, making an extraction of 90%.

The concentrates average \$80 per ton. The mill was remodeled in 1915 and is equipped with 4 trommels, 2 Dorr classifiers, two 8 by 3' Hardinge conical mills, 2 hydraulic classifiers with 3 spigots each, Deister double-decked sand and slime tables and a cyanide plant. Capacity has been increased from 90 tons daily in 1914 to about 300 tons in 1916. Operating costs reported at \$2.56 per ton. Employs 32 men.

Mine was closed down early in 1917 owing to farmers protesting that their lands were damaged by overflow of tailings. Reopened June, 1917.

PLYMOUTH CONS. GOLD MINES LTD. CALIFORNIA

Offices: 20 Cophall Ave., London, E. C., Eng. **Mine office:** Plymouth, Amador Co., Cal. **Gen. mgrs.:** Bewick, Moreing & Co., 62 London Wall, London, E. C., Eng. **San Francisco office:** Crocker Bldg.

Officers: C. Wanklyn, chairman; C. A. Moreing, W. J. Loring, John Barry, J. P. and David Richards, directors. T. E. Smith, sec.; J. F. Parks, supt.

Inc. Jan. 15, 1914, in England. Cap., £240,000; shares £1 par; all issued. **Gross earnings for 1916** were \$681,150; **operating expenses** \$462,290 and **net earnings, after writing off depreciation,** \$218,860; **dividends absorbed** \$174,600, **leaving balance of** \$53,331.

Dividends: in 1915, were 3s. per share, of \$173,000, in 1916, 3s. per share.

Property: the Plymouth Consolidated group of 13 patented claims and a tract of agricultural land, about 500 acres, at Plymouth, Amador Co., Cal. The holdings cover 4,800' along the Mother Lode, showing 3 fissure veins in Mariposa slate. The veins run N. S., with dip 60° E. Ore is partly sulphide, occurring in shoots 6' to 30' wide and 150' by 300' long, said to average 0.30 oz. gold and 0.14 oz. silver, per ton.

Development: by several incline and one vertical shaft to depth of 2,600'. Workings total about 4 miles. The main or Pacific shaft is a vertical 3-compartment shaft to 1,600' level where it turns into a 55° incline, sunk in the footwall of the Empire-Pacific veins to the 2,600' level. Work in 1916 amounted to 5,009', mainly drifts and raises.

Equipment: includes 500-h. p. electric hoist, 1,800 cu. ft. compressor, a 30-stamp 360-ton mill for amalgamation and concentration of ores which makes a 90.32% extraction. The mill is equipped with No. 5 Gates gyratory crusher, Hardinge mills, Richard classifier, tables and vanners. The concentrates average \$115 per ton, and the tailings run about 50 to 80c per ton. Total cost per ton was \$3.20. Management estimated ore reserves at 170,220 tons of \$6.64 ore, Jan., 1917.

Production: 44,775 tons of ore in 1914, yielding 11,132 oz. gold; 129,500 tons in 1915, yielding 31,193 oz. gold and 8,652 oz. silver, gross value \$846,491; 125,000 tons in 1916, yielding 32,693 oz. gold and 8,016 oz. silver, gross value, \$681,150.

The property is an old mine, for a long time dormant, but made into a successful producer through the able judgment and operating ability shown by Bewick, Moreing & Co.

SOUTH EUREKA MINING & MILLING CO. CALIFORNIA

Office: First National Bank Bldg., San Francisco, Cal. **Edward Fox,** sec.-treas.; W. H. Schmal, supt.

Earnings in 1915 reported, \$582,762; with operating expense, \$448,013; **construction and equipment,** \$8,825; **supplies** \$570; **dividends** 38c per share, or \$125,354. Stock is listed in San Francisco.

Property: South Eureka mine and the Oneida, lying between South Eureka on the north, and the Kennedy mine on the south, one mile south of Sutter Creek, Amador Co.

Ore: is gold bearing quartz occurring in the Mother Lode, and is on a northern extension of the Kennedy and Argonaut lead. The enclosing rocks are Mariposa slate and greenstone schists. At the South Eureka mine three distinct veins have been developed; the hanging-wall, footwall and middle veins, with the two latter joining below the 2,000' level; most of the pay ore developed on lower levels is in this vein.

Development: by shafts. The north shaft, 2 compartments, on the South Eureka, is down 2,785' on a 67° incline; it cut the hanging-wall vein at 1,700' level, remained in the vein to the 2,000' level and is in the footwall below this. The south shaft, 880' S. E. of the main shaft, has a vertical depth of 600'. The Oneida has a 2,280' vertical shaft sunk in the hanging-wall; it cut the vein on the 1,900' level. Workings of Oneida are connected

with South Eureka on the 1,800' level. The lower level of the Oneida were flooded, but early in 1916 the mine was drained and work resumed.

Equipment: at South Eureka includes 2-ton skips, double-drum hoist driven by two 400-h. p. motors with 24-rope transmission drive and 2 Ingersoll-Rand compressors, each driven by 100-h. p. motor.

Mill: 80 stamps, weighing 1,150 lbs., dropping $6\frac{1}{2}$ ", 100 drops per minute, crush 5 tons through 24-mesh screen. Each battery of 20 stamps is driven by a 50-h. p. motor. Pulp from amalgamating plates is treated on Frue vanners. Company employs 250 men.

Production: in 1915 totaled 145,124 tons of \$4.34 ore, with a recovered value of \$3.96 per ton, extraction 91%. Cost per ton of ore milled, \$3.09; average value of concentrate, \$68.99 per ton.

See Cal. State Mineralogist's Report Mines and Min. Res. of Amador Co., pp. 39, 45.

SOUTH KEYSTONE CONS. MINING CO. CALIFORNIA

Address: C. H. Colper, mgr., Amador City, Cal.

Officers: W. Virges, pres.; C. H. Colper, v. p.; F. F. Wood, sec.-treas., with J. A. McIntire and C. Huth, directors.

Cap., \$1,000,000; shares \$1 par.

Property: several well known gold claims between Amador City and Sutter Creek, Cal.

Development: ground was unwatered in March, 1917 and exploration is under way at 600' and 1,000' depth in North Star claim. A 10' vein was cut at 600' in August.

This is another of the old California mines being reopened under modern conditions.

SUTTER CREEK MINING CO. CALIFORNIA

Letters sent to Alex. Rennie, supt., Sutter Creek, Amador Co., Cal., returned in May, 1917. **Cap.,** \$300,000.

Property: the East Eureka mine, also called the Rose, or Poundstone, a mile east of Sutter Creek. Shaft was reopened 1916 and 10-stamp mill repaired.

TREASURE MINING CO. CALIFORNIA

Office: 576 Mills Bldg., San Francisco. Mine office, Amador City, Cal.

Officers: W. Rothchild, pres.; E. J. McCutcheon, v. p.; E. S. McCurdy, sec.-treas., with H. G. Stevenson, G. W. McEnerney, directors. J. H. Bell, supt.

Property: one claim, near Amador City, Amador Co., said to show a gold quartz vein in schist with dip 45° to 55° and N. W. strike.

Development: winze 700' deep; 50° incline shaft, with levels at 1,800', 2,000', 2,160' and 2,300'.

Mill containing ball and Hardinge mills at work, 1917.

WESTERN MINES CORPORATION CALIFORNIA

Office: Gwin Mine, via Jackson, Amador Co., Cal.

Officers: Major H. S. Howland, pres.; John Landers, v. p.; San Francisco, Cal.; D. C. Demarest, v. p.; A. F. Hughes, chief engineer, with A. J. Harwood, directors. W. D. Wright, treas.; Jos. D. Fackenthal, sec.

Cap., \$2,000,000; shares \$5 par. **Bonds:** authorized, \$800,000, debentures 6%, convertible into stock on basis of \$200 in stock for every \$100 in bonds. Issued in denominations of \$100 and \$1,000 dated Aug. 1, 1916, due Aug. 1, 1926. Semi-annual interest, payable Feb. 1 and Aug. 1. Empire Trust Co., New York, trustee.

Property: the company was formed in 1916 to operate the Gwin mine on the Mother Lode, in Calaveras Co., Cal., 7 miles S. of Jackson, Amador Co.; also the Sierra Mines, under option, $4\frac{1}{2}$ miles from Downieville, Sierra Co., and the Inyo County mine. The Gwin mine, acquired in 1867 by Wm. N. Gwin, and said to have produced \$2,000,000 to the 1,500' level, has been idle since 1908.

Geology: the Gwin vein occurs in Mariposa slate, with strike N. 12° W., dip 68° E. The ore shoots vary in width from a few inches to 20'. For geology see U. S. G. S. Folio 63.

Development: by shaft; main shaft sunk 2,400' vertical, cuts the vein at 1,200' level. A winze on the 2,400' level and 450' south of main shaft is 450' deep.

Ore reserves: management claims 240,000 tons averaging \$4.25 gold per ton, between the 1,400' and 2,400' levels and 800,000 tons of milling ore above the 1,400' level; also that "it is an exorable law applicable to Mother Lode mines that enrichment takes place with depth."

Equipment: includes two compressors, 118' steel head-frame, double drum hoist, three 80-h. p. boilers, two 10' Pelton wheels. Waste water from hoist and mill is stored in 75,000 gal. tank, before passing to compressor plant on the river, giving a 400' head.

Mill: with 100 stamps, weight 950 lbs.; includes 2 Blake crushers and Frue vanners.

Sierra mines: 11 claims, 200 acres, with 2,150' of tunnel workings, claimed to have 216,000 tons ore in sight, assaying \$3 to \$8 per ton. Further development work planned.

Inyo County mine: 3 claims, 60 acres, is a prospect said to cover 4,500' of a quartz vein 100' in width. Development merely by a 200' tunnel. Further development planned for 1917.

Management estimates gross earnings of \$4 per ton, with net returns of \$280,000 per year and "when the Sierra mines have been equipped with a new plant, the earnings should be (\$894,000 gross, \$415,000 net) in excess of 20% on the capital stock."

No information available as to whether or not this estimate has been confirmed by 1916-1917 operations.

WHITE KNOB COPPER & DEVEL. CO., LTD. CALIFORNIA

Address: E. H. Kelly, treas., 43 Cedar St., New York. Mining property was the White Knob mine, at Mackay, Custer Co., Idaho, now owned by the Empire Copper Co. For further details of this company and its predecessors, see Vols. IX and X, Copper Handbook.

Cap., \$6,000,000; \$4,000,000 common and \$2,000,000 7% cumulative preferred stock. Company is a holding company controlling through ownership of \$1,200,000 of the capital stock, the Argonaut Consolidated Mining Co., a dividend payer, which controls the Argonaut Mining Co., at Jackson, Amador Co., Cal., which see.

Dividends: were resumed in 1914, with payments of 25c per share on preferred stock, Nov., 1914; 10c in Feb., May, Aug., and Nov., 1915; 10c Feb., May, Aug. and Nov., 1916, and 10c Feb., 1917.

BUTTE COUNTY

AMERICAN DREDGING CO. CALIFORNIA

Address: C. G. Leeson, mgr., Oroville, Cal.

Inc. 1916, in California, to take over the dredging interests of the Oro Water, Light & Power Co., whose power plants were acquired by the Pacific Gas & Electric Co.

Property: placer claims along the Feather river in Butte county and along the Mokelumne river in Calaveras Co., Cal. On the former are three dredges and on the latter two, with from 5 to 9 cu. ft. buckets. Annual gold production is over \$500,000. The newer boats on the Mokelumne dig up to 225,000 yards per month each. Gravel carries about 10c gold per yard.

OROVILLE DREDGING, LTD. CALIFORNIA

Controlled by Oroville Dredging Co., Ltd., of England.

Office: Alaska Commercial Bldg., San Francisco, Calif.

Inc. June 19, 1905, in Maine. **Cap.,** \$3,500,000; shares \$5 par; 686,531 issued.

Dividends: 2½% in 1905, 10% in 1906, 7½% in 1907, 10% in 1908, 7½% in 1909, none from 1910 to 1913, on account of expenditure on English company's property in Colombia, 5% in 1913-14, 7½% in 1914-15, 10% in 1915-16, and 2½% in 1916-17.

Property: 2,500 acres of placer ground along the Feather river, near Oroville, Butte county, Cal.

Equipment: at present includes 2 dredges. Company maintains repair shops at Oroville.

Production: during year ended July 31, 1915, 2,569,643 cu. yd. yielded 8.89c per yard, at cost of 4.45 cents.

Like the other dredging companies at Oroville this one is nearing its end.

STEIFER MINING CO., P. B. CALIFORNIA

Coutolenc, Butte Co., Cal. P. B. Steifer, pres.

Inc. Dec. 6, 1901, in Cal. Is a gold mine. Company was sued by Henry T. James and W. C. Pershbaker, alleging illegal issuance of stock, issuance of notes, and that company is a stock selling proposition.

CALAVERAS COUNTY

ALLISON MINING CO. CALIFORNIA

Address: Melones, Cal.

Inc. 1917, by A. W. Capps and John T. Murphy, at San Francisco, and Frank B. Pattee of Oakdale.

Property: quartz claims on Carson Creek, adjoins the Jones, on both sides and ends; west of the Melones mine; vein shown on bodies of \$5 quartz and some high grade.

Two 5' Huntington mills to be installed in 1918.

BLAZING STAR MINE CALIFORNIA

Owned by Union Development Co., 713 Iowa Loan & Trust Bldg., Des Moines, Iowa. Mine, 1½ miles east of West Point, Calaveras Co., Cal., has a 2' quartz vein, strike N. 30° W., dip 80° W.; developed by 400' shaft. Was being reopened at last accounts.

CALAVERAS CONSOLIDATED SYNDICATE CALIFORNIA

Address: W. J. Loring, gen. mgr., 1018 Crocker Bldg., San Francisco.

Mine address: A. D. Stewart, supt., Melones, Calaveras Co., Cal.

Is a close corporation.

Owens and operates the Calaveras, Morgan and other mines. The Calaveras has a 1,200' tunnel and 275' winze, 600' below surface.

Ore: gold quartz said to average \$5 per ton, for width of 18' and length of 500'. The Morgan shaft is 250' deep below tunnel.

Has a stamp mill, with concentrators. Uses electric power, has 3 motors, 3 drill Sullivan air compressors and employs 25 men.

CALAVERAS COPPER CO. CALIFORNIA

Office: Ames Bldg., Boston, Mass. **Mine office:** Copperopolis, Calaveras Co., Cal.

Officers: Chas. M. Hayden, pres.; Herbert Goff, sec.-treas.; preceding with Oliver Ames, F. Lothrop Ames, Samuel Carr, Gilmer Clapp, Wm. J. Maloney, John S. Ames, Ross F. Robertson, directors. S. M. Levy, mgr.

Inc. Aug. 31, 1909, in Del. **Cap.**, \$5,000,000; shares \$5 par; reduced Aug. 24, 1910 to \$2,500,000, common shares \$5 par; issued \$1,868,750; \$300,000 preferred, shares \$5 par, none issued. Bonds (first mortgage, 6%) principal amount \$450,000; interest accrued to Dec. 31, 1915, \$147,510; under refinancing plan adopted by stockholders in January, 1916, the principal of said bonds and said accrued interest to Dec. 31, 1915, were extended so as to fall due in nine equal annual installments, beginning Jan. 1, 1920, viz., \$50,000 of principal and \$16,390 of said accrued interest each year; each of said payments bearing interest at 6% from Jan. 1, 1916. Under the same plan \$99,000 face value of debenture notes were issued, payable at the rate of \$5,000 per month, beginning April 1, 1917. Of these notes \$50,000 have already been paid. \$75,000 of two year 6% convertible notes which were due March 1, 1917, were either converted before, or paid on that date. All the bonds are held by the Ames Estate of Boston, which formerly owned the property. State Street Trust Co., Boston, registrar;

Federal Trust Co., transfer agent. Stock is listed on the Boston Curb. Annual meeting, 2nd Monday in February.

Property: 2,833 acres, including the Union, Keystone and Empire mines, and also including ranch and water power lands, bought Aug. 31, 1909, of Union Copper Mining Co., 16 miles from Milton, the nearest rail point on the Southern Pacific. Mines opened 1861, were considerable producers and were worked intermittently until 1907.

Experts employed by the Calaveras company report substantially as follows:

Geology: the country rock is a basic igneous rock schistose in character. The general strike of the schistosity is N. 30° W. The dip is 65° North-easterly. This formation is traversed by a shear zone about 125' wide, the strike and dip of which conform with the strike and dip of the general schistosity. The holdings of the Calaveras Copper Co. cover approximately 19,000' along the strike of this shear zone. For the most part, the shear zone in which the orebodies occur is a distributive fault, in which the ore occurs as lenticular bodies within the crushed material (half fissile schist) resulting from movements parallel with the schistosity.

In several new places a cross break cuts across that portion of the shear zone containing one of these lenticular orebodies. From this cross fault the ore makes out on either side for 20 or 30', but within the fissile material of the shear zone. Thus, there is a lenticular orebody parallel with the schistosity and another orebody which really runs across the schistosity. The ore averages about 3% copper.

Development: the strike of the vein is proven for about 8,000'. The principal development is at the Union and Keystone mines.

Equipment: includes a 1,000-h. p. steam plant at the Union mine, with 3 hoists, 15-drill Nordberg and 5-drill Leyner air compressors; company also reports 500 electric h. p. at the mill and same at the smelter.

The company owns about 60 buildings, including office building, boarding houses, bunk houses, 3 warehouses, machine shop, smithy, 3 barns, and about 40 dwellings. The 600-ton mill equipped with three ball mills is operating with oil flotation, and is connected with the mines by a 4,000' electric tram. A dam, impounding water for the mill has 90,000 gals. storage capacity.

At the southerly end of the property a dam has been built. This arrangement to impound the tailings and a pump installed gives an additional water for the concentrator.

The 300-ton smelter, now inoperative, has 2 McDougall calciners, a 150-blast furnace and a 150-ton reverberatory furnace. The converter has 2 Allis-Chalmers stands. Smelter fuel was petroleum and coke.

While the property was closed it was investigated by several engineers on behalf of various persons, contemplating the purchase of the property or its operation under a lease. As a result it was determined, October, 1914, to operate the property, with Mr. S. M. Levy, as manager. Under Mr. Frank W. Royer, as consulting engineer, the mine has since been operated and careful experiments were made for the purpose of treating the ore by the oil flotation process. It has been determined that the average grade of the ore is approximately 3% and that under oil flotation a concentrate of at least 16% can be made, the recovery averaging approximately 92%. Ore now in sight ready to mine amounts to 300,000 tons.

In March, 1916, new milling machinery was installed capable of treating about 250 tons of ore a day by oil flotation process; subsequently another milling unit was installed and the mill is now treating about 500 tons a day. A still further unit was installed, 1917, making total milling capacity 700 tons a day. From March 1, 1916 to March 31, 1917, the mill treated over 90,000 tons of ore. The concentrates are being shipped to Tacoma for treatment.

CAMPO SECO MINES

Owned by Penn Mining Co., at Campo Seco, Calaveras Co., Cal.

CALIFORNIA

COLUMBIA MINES CO.**CALIFORNIA**

Mine at Angels Camp, Calaveras Co., Cal.

Officers: J. S. Rear, pres.; N. N. Merriman, v. p.; A. Caminetti, treas.; preceding with W. C. Tupper, W. P. Smith, F. M. Woods and J. G. Ferraris, directors

Inc. Jan., 1915, in California. Cap., 750,000 shares, \$1 par value, all issued; no bonds.

Property: 2 claims of low-grade gold ore. Shaft reported to be down 250' with some drifting. Has 100 ton stamp mill. Stock listed on New York Curb.

GOLD BAR MINING CO.**CALIFORNIA**

Office: 255 California St., San Francisco, Cal.

Officers: J. J. McIntire, pres. and gen. mgr.; W. N. Lamb, v. p.; H. Eason, sec.; J. W. Marshall, asst.-sec.; with Wm. Osborn, directors.

Inc. Aug., 1915, in California. Cap., 75,000 shares, \$1 par; authorized to sell 35,000 shares for development purposes August, 1917.

Property: 30 miles from Valley Springs, Calaveras Co., Cal. Proposed to develop a lava-capped drift-gravel channel, and wash gravel by improved method, the drop system. A sketch in prospectus indicates great optimism.

LIGHTNER GOLD MINING CO.**CALIFORNIA**

Office: 301 N. Eldorado St., Stockton, Cal.

Officers: C. M. Jackson, pres.; Alex. Chalmers, v. p.-mgr.; B. F. Williams, Jr., sec.-treas., with A. D. Schindler and L. J. Wagner, directors.

Inc. Oct. 26, 1896, in California. Cap., \$125,000; shares \$1 par; assessable; 62,287 shares outstanding. Dividends paid to date, \$550,000. Gross earnings in 1914 were \$46,012 and operating expenses totaled \$38,245. Mine was not operated during 1915. Assets, Feb., 1916, amounted to \$224,281 and liabilities to \$85,186. Annual meeting last Thursday in Oct.

Property: 1 patented claim, $4\frac{1}{2}$ acres, in Angels Camp, Calaveras Co., between the Utica and Angels quartz mines, shows a quartz fissure vein said to be 80' wide, running N. W.-S. E., with dip of 70° and assaying \$5 per ton. The mine is credited with a total production to date of \$2,000,000. Property was closed down in 1910, owing to caving of the old shaft sunk on the orebody.

Development: the mine was worked out from the 600' to the 350' level through this shaft, a 30' bed of talc cutting off the orebody between the 500' and 600' levels. Work was continued through 1911-1912 and a new 2-compartment shaft sunk. In 1914 work was again resumed and a winze sunk to the 900' level, where a crosscut run N. is said to have found the orebody in place under the talc, 30' wide and with the same dip as on the 300' level. This vein was drifted on for 120' and appears to be the top of a new orebody of same age and character as was found above the talc. Production ceased after 9 months' operations in 1914 and the shaft was being sunk to below the 1,000' level.

Equipment: includes hoist, drills, electric power, compressor and 60-stamp amalgamation and concentration mill, making an extraction of 90%. Employs about 70 men and maintains an average daily output of 150 tons when working. Management estimated ore reserves at 200,000 tons above the 300' level, Feb., 1916.

After several years of idleness, mine was examined with view of reopening, 1917. In May, there was nothing being done. The mill, built on hanging wall of lode, is considerably out of alignment due to collapse of workings.

MELONES MINING CO.**CALIFORNIA**

Office: 131 State St., Boston, Mass. Mine office: John A. Fulton, act. mgr., Melones, Cal.

Officers: W. E. C. Eustis, pres., Boston; A. H. Eustis, sec.-treas.; C. Minat Weld, James Parker, Frank Lyman, W. B. Devereux, T. H. Watkins and W. C. Ralston, directors.

Inc. in West Virginia. **Cap.**, \$400,000; shares \$1 par; nonassessable; 275,000 issued. Bonds authorized \$500,000, \$400,000 outstanding. State St. Trust Co., Boston, Mass., transfer agent. Annual meeting, 3rd Wednesday in March.

Property: 16 claims, 152 acres, on Carson Hill, has been steadily operated since 1898.

Ore: gold, occurs in a quartz vein in schist with N. W.-S. E. strike and a dip of 70° N. E.

Development: by tunnel 5,000' long on 1,100' level. At this point a 3-compartment shaft has been sunk in the footwall to 2,550' level. Ore above 1,100' has mostly been extracted. Shrinkage stoping is in vogue where the vein is not too flat. Ore is trammed from mine to mill in 8-ton cars hauled by a d. c. 500-volt locomotive.

Equipment: includes double-drum electric hoist, driven by 250-h. p., 2,000-volt induction motor, hoisting at 1,000' per minute; 600-cu. ft. Imperial compressor driven by 100-h. p. motor; 1,200-cu. ft. Laidlaw-Dunn-Gordon compressor; and a 100-h. p. trolley generator in power-house at river. Two Knight water-wheels partly drive these helped by a 250-h. p. G. E. 2,000-volt motor. Mill and other plant driven by water-power, 1,200 h. p. being available. Flume and ditch line is 4 miles long.

Mill: 100 stamps, weight 1,050 lbs. each, dropping 7", 102 drops per minute, crushing 5 tons ore per stamp through 20-mesh screen; outside amalgamation is used; battery pulp concentrated on Wilfley tables; middlings elevated, reclassified and reconcentrated; concentrates to cyanide plant, capacity 600 to 700 tons per month. Concentrates assay \$30 to \$50 per ton. All tailings on tables are treated by cyanide. Classification takes place on the tables. Sand is treated by percolation (cyanide), and slime in a Dorr counter-current (C. C. D.) plant. Total recovery averages 85%. Costs have risen so lately that they cannot be given without confusion but probably range from \$2 to \$2.50 per ton for mining, milling, and cyaniding.

See Mines & Mining Resources of Calaveras Co., Cal. State Mineralogist's Report, 1915, pp. 93-96.

NASSAU COPPER CO.

CALIFORNIA

Office: 339 Bush St., San Francisco.

Property: 2 patented claims, 40 acres, and 1,560 acres of agricultural lands, 4 miles north of Copperopolis, Calaveras Co., Cal., covering a length of 15,840' on the lode. Ore occurs in lenses and streaks as copper sulphides, pyrite, gold, silver and zinc in a 10' vein running N. 35° W. and dipping 65° N. E.

Development: by 280' shaft with 1,000' of drifting N. and S. on the 95' level and 1,100' of drifting N. and S. on the 200' level. Ore was shipped to the Selby smelter from Angels, 9 miles distant. Shipments averaged 17.90% zinc, 5.22% copper, 4.60 oz. silver, 0.20 oz. gold, 11.90% iron, 39% silica.

The complex character of the ore and consequent low returns, coupled with litigation have led to a shut-down, and the mine is closed, save for keeping water down. The mine-water is run through troughs containing scrap iron to recover copper-content. Property is reported to have good possibilities.

PENN MINING CO.

CALIFORNIA

Office: 727 Foster Bldg., Denver, Colo. Mine office: Campo Seco, Calaveras Co., Cal.

Officers: Chas. Loughridge, pres.; Wm. D. McIlvaine, sec.-treas.; Alfred P. Busey, Jr., gen. mgr.; D. C. Smith, metallurgist.

Inc. June 1, 1910, in Wyoming, as successor of Penn Chemical Works. **Cap.**, \$250,000; shares \$1 par. Is operated as a close corporation.

Property: the Campo Seco, Hecla, Little Satellite and Satellite, patented claims, near Campo Seco, in the Foothill copper belt, 80 acres, with a 20-acre smelter-site and 2,305 acres of timber and miscellaneous lands, giving total holdings of 2,405 acres.

Ore: the ore deposit, having a maximum width of 30' at depth of 400', lies between amphibolite schist and talcose shale, and north of the Campo Seco shaft splits into veins known as the East and West, which continue parallel. Ore is mainly chalcopryrite, associated with sphalerite, sometimes occurring in considerable quantities, and pyrite, and also includes occasional chalcocite and bornite. The average assay of ore smelted in 1916 was 5.15% copper, 2.39 oz. silver, 7.9% zinc, 0.073 oz. gold. The gangue ranges from talcose schist, through clay, to quartz. Faulting considerably displaced the vein below 700' depth.

Development: includes the 2,900' working shaft, No. 3, and a tunnel, also 4 other shafts, 2 on the East vein at the Campo Seco and Hecla mines and 2 on the West vein at the Satellite mine. No. 1 shaft, 300' deep, is useful only for ventilation; No. 2 shaft, 750' deep, at the Satellite mine, is the main working shaft on the West vein, with a compressed air hoist; No. 3 shaft, at the Campo Seco mine, about 1,300' from No. 2, is 2,900' deep, with levels at 150' intervals, and has a steam hoist; No. 4 shaft, at the Campo Seco mine, 200' deep, is used as an air shaft and manway; No. 5 shaft, at the Hecla mine, 400' deep, is used as an air shaft.

Ore reserves: estimated sufficient for two years.

Equipment: includes 2 Wellman-Seaver-Morgan electric hoists with 1,500' and 2,500' capacity drums. The smelter has a 400-h. p. steam and electric plant, ice plant, pumping plant and a Nordberg air compressor, capacity 1,400 cu. ft., to supply the mine and smelter. Fuel is crude petroleum, which also is burned in the locomotives. The Southern Pacific Railway is 5 miles distant, at Valley Springs, and transportation between that point and the mine is by wagons, making one round trip daily. A short private railway connects the mines and works.

Smelter: the 300-ton smelter, a quarter of a mile from the mine, has an Allis-Chalmers converter, one Herreshoff roaster, two 150-ton reverberatory furnaces, and eight 16-ton McDougall calciners. The smelter railway, for charging and slags, has electric locomotives. Some cement copper is produced from mine water.

Blister copper is shipped to the American Metal Co. for refining.

The company has experimented on the Thiogen process for elimination of sulphur, mainly on account of fume litigation. The smelter has been in continuous operation for over 16 years.

	Production:	Tons Ore Treated	Lbs. Refined Copper
1916	43,210	3,973,111
1915	42,365	3,152,071
1914	42,928	4,007,149
1913	50,427	4,467,982
1912	51,163	5,175,875

PIONEER CHIEF GOLD MINING CO. CALIFORNIA

Office: 923 Monadnock Bldg., San Francisco, Cal. Mine office: San Andreas, Cal.

Officers: N. J. Martin, pres.-mgr.; B. F. Marshall, v. p.; Judge W. F. Crist, sec.-treas.; with M. V. Van Fleet and G. G. Damon, directors; J. E. King, supt.

Inc. Aug. 26, 1915, in California. Cap., \$300,000; shares \$10 par; assessable; 23,603 shares outstanding. Transfer office: 923 Monadnock Bldg., San Francisco, Cal.

Property: 15 patented claims, 200 acres, on the footwall belt of the Mother Lode, near San Andreas, Calaveras Co., said to show gold ore occurring in veins with slate hanging and diabase footwall. Veins have N. 30° W. strike and dip 65° E. Management reports pay ore in shoots 7' wide and 200' long, containing quartz, sulphides, chalcopryrite, pyrite and galena, with average assay of \$9 in gold.

Development: by 2-compartment, 500' shaft.

Equipment: includes electric power, 40-h. p. single-drum hoist and 600-cu. ft. compressor. Management plans erecting 100-ton mill.

ROYAL GOLD MINES CO.**CALIFORNIA**

Acquired by Stockholders' Mining Co., which see.

STANDARD AMALGAMATED EXPLOR'N CORP. **CALIFORNIA**

Office: Gahm Bldg., Boston, Mass. Mine near Esmeralda, Calaveras Co., Calif.

Officers: Frank E. Bramhall, pres.; W. F. Dwyer, v. p.; A. F. Riedel, sec.; H. H. Brown, treas.; with Alfred Grover, E. Koessler, E. F. Curtis, Geo. Clark and J. L. Whitten, directors. Louis Robin, mgr.; Chas. Cuneo, supt., Esmeralda, Cal.

Inc. Jan. 2, 1909, in Nevada. **Cap.**, \$1,500,000; shares, \$1 par; non-assessable; outstanding April 23, 1916, 1,264,223 shares.

Bonds: authorized and outstanding, \$40,000. Company is successor of the Standard Amal. Exploration Corp. **Cap.**, \$2,500,000.

Property: the Economic mine, 2 patented claims, 36 acres, near Esmeralda, is said to have a steeply dipping 6' quartz vein in slate.

Development: by a 700' tunnel, with total workings of 5,000'. Management claims ore blocked out sufficient to run the mill 4 years; assay \$18 to \$46, while "actual mill returns on try-outs to Selby smelter show better than \$60.20 per ton."

Equipment: includes a 20-stamp mill, 100-h. p. compressor and electric power. Company has completed its own power line and operates its own lighting plant. Will add 20 stamps to the mill and build a cyanide plant.

STOCKHOLDERS MINING CO.**CALIFORNIA**

Main office: 77 Franklin St., Boston, Mass. Mine office: Hodson, Calaveras Co., Cal.

Officers: H. P. Brett, pres.; J. M. Whitcomb, treas.; E. F. Baxter, sec.; with W. A. Perry, T. L. Wiles, E. S. Hilton, and W. A. Mosman, directors. W. B. Farmer, business mgr.; Haines Gridley, mine mgr.

Inc. Jan. 10, 1917, in Maine, successor to the Royal Gold Mines Co., and the adjacent Mountain King Co. **Cap.**, \$2,000,000; shares \$1 par, \$1,500,000 issued for property and financing. Transfer agent: Commonwealth Trust Co., Boston. Annual meeting 1st Monday in May.

Property: 17 claims, 14 patented, 180 acres on the Mother Lode, Calaveras Co., Cal., containing low-grade gold ore. The ore-zone is said to be 5,000' long and 500' wide.

Geology: quartz veins in slates, which are traversed by dikes of diabase or greenstone, that often form one of the vein walls.

Development: 3 shafts, one 1,000' deep, and 5,000' of workings. Proposed work should give the mills 600 tons daily. Original company has been shipping since June, 1915.

Equipment: hoist, crusher, tramway, 2 mills with 130 stamps, cottages, school, and hotel.

Property examined by W. E. Farish, W. P. Miller, J. H. Finlay, William Forstner, E. P. Jennings, and William Foster, who all reported favorably.

UNION DEVELOPMENT CO.**CALIFORNIA**

Owens Blazing Star mine (which see), Calaveras Co., Cal.

UTICA GOLD MINING CO.**CALIFORNIA**

Office: care of Hobart & Lane Estates, Merchants Ex. Bldg., San Francisco, Cal. Fred J. Martin, supt., Angels Camp, Calaveras Co., Cal.

Property: 9 claims, covering Dead Horse lead, a N. W.-S. E. vein dipping 70° N. E. Vein has ore 60' thick, averaging \$3.60 per ton. Also Gold Cliff mine on westerly split of the main Mother Lode.

Geology: the Gold Cliff and Utica veins are about 3,000' apart on the surface, converging somewhat in their southern trend, and also in depth. Development tends to show that within a short distance from the bottom of the present workings, these two veins will unite as one large one. On the 2,750' level the pitch of the Utica vein, at or near the surface, is 60° to

the east, while at the 2,400' level it has a pitch of 70°. The Gold Cliff, on the other hand, at or near the surface, has a pitch of 55° to the east, and at the 1,900' level has changed to 40°. The present lower workings of the Utica show the vein at that point to be about vertical.

Development: on the Utica vein to depth of 2,400' by vertical shafts; the 1,470' cross shaft being main working with 700' winze below 1,400' level and a 1,600' connection on 1,500' level, to 2,400' level of Gold Cliff shaft.

Equipment: includes the Utica 60-stamp mill, 20 stamps operating on Utica ore proper, with 85% extraction and the 40-stamp Gold Crown mill making a 90% extraction. Total costs, \$2.15 per ton.

A new strike on the 1,600' level made in June, 1916, disclosed 18" to 20" of bonanza, or specimen ore, showing coarse free gold, the vein averaging \$1,200 per ton. New work on the 1,800' level is expected to disclose the downward extension.

See Cal. State Mining Bureau report 1913-14, M. & M. Res. of Calaveras Co., pp. 81 and 110.

No recent information available.

VICTOR LAND & MINERAL CO.

CALIFORNIA

Address: Angels Camp, Calaveras Co., Cal.

Property: the Reiner mine, bought for 50,000 shares stock, issued at 32c by permit of California State Corporation Commission, Oct., 1917.

COLUSA COUNTY

CERISE GOLD MINING CO.

CALIFORNIA

Offices: Willows, Glenn Co., Cal. Incorporators: Z. E. Simpson, F. Freeman, sec., H. E. Simpson, C. L. Austin and J. Schribner.

Property: in Sulphur Creek, Colusa Co., Cal. Company organized to carry on a general mining and milling business.

RUBY KING COPPER CO.

CALIFORNIA

Mine near Ladoga; Colusa Co., Cal. Although generally known as a copper mine, no copper ore has as yet been discovered and property is operated as a mineral paint mine, by the Ruby King Mineral Paint Co., 1027 Eighth St., Sacramento, Cal.

Property: 6 patented claims, developed by 1,200' shaft and 1,000' tunnel. Ore is iron oxide containing a small percentage of cinnabar.

Production: 500 tons in 1914. No recent returns.

CONTRA COSTA COUNTY

SELBY SMELTING & LEAD CO.

CALIFORNIA

Office: Merchants Exchange Bldg., San Francisco, Cal. Works office: Selby, Contra costa Co., Cal.

Officers: H. B. Underhill, Jr., pres.; Eugene B. Braden, v. p.; Chas. J. Durbrow, sec.

Inc. 1875, in Nevada and controlled, through stock ownership, by American Smelters Securities Co., a subsidiary corporation of the American Smelting & Refining Co. The works represent an investment of about \$4,000,000.

The smelter at Vallejo Junction, near Carquinez Strait, receives ore by rail and water, from all of the Pacific states, but principally from Nevada. The works include a 400-ton smelter having lead stacks, a 200-ton lead reverberatory, a refinery for parting gold and silver, and a plant for the manufacture of bluestone.

Equipment: includes steam, electric and air power. The plant includes a bag house, and also a special chamber having the Cottrell process for precipitating solids from fumes, before passing to the main stacks.

The Selby is perhaps the largest smelter producer of gold in the United States, or possibly in the world. The plant and improvements were described in 1916 by T. A. Rickard in the Mining and Scientific Press.

DEL NORTE COUNTY

SALT LAKE-CALIFORNIA COPPER CO. CALIFORNIA

Office: 302 Hooper Blk., Salt Lake City, Utah. Mine office: Smith River, Del Norte Co., Cal.

Officers: W. Mont Ferry, pres.; Isaac Sparey, v. p.; J. H. Turner, sec.-treas. and gen. mgr.; preceding with C. W. Hoover, Jas. Ivers and L. A. Mehse, directors.

Inc. Nov. 29, 1907, in Utah. Cap., \$1,000,000; shares \$1 par; nonassessable; issued, \$841,615.

Property: 10 claims, unpatented, near Smith river, in the Low Divide district, 120 miles S. W. of Grants Pass, on the S. P. R. and 12 miles from the coast. The mine, which was one of the first copper properties on the Pacific coast, was operated 1857-67, when closed by the low price of copper. Claims show 4 parallel shear zones, with prominent gossans, traceable about 3 miles, ore occurring in lenticular masses and shoots, in serpentine or altered peridotite. The zone has a N.-S. strike, and average dip of about 70°, the orebodies, 3' in width carrying chalcocite and chalcopyrite, estimated to average 2½% copper, \$4.50 in gold and 75c in silver.

Development: by 180' shaft and several tunnels, with about 3,500' of workings. Old workings extend down to the 500' level, but none of the main veins were located.

Equipment: includes 3 buildings. Company has been inactive several years.

ELDORADO COUNTY

CHRISTINA COPPER CO. CALIFORNIA

Address: F. C. Fox, supt., Placerville, Cal.

Owns Seven Bells mine, an old copper producer, now reopened.

ELDORADO EXPLORATION CO. CALIFORNIA

John W. Cover, supt.; Burr Evans, cons. engr., Placerville, Cal.

Property: the Teddy Bear claims on the Mother Lode, about 8 miles south of Placerville, is said to show 2 veins. Some \$60 ore reported found in 150' adit, at 160' depth, 1917. Plans building 50-ton mill and sinking 500' shaft.

GEORGIA SLIDE MINING CO. CALIFORNIA

Property at Georgetown, Eldorado Co., Cal., Robert Cranston, mgr. The Beebe, Mulby Point, and Eureka mines were taken over. Considerable exploration done on the Georgia Slide. Possibilities fair.

SACRAMENTO VALLEY COPPER CO. CALIFORNIA

Offices: S. W. Winn, fiscal agent, 149 Broadway, New York; A. B. Wilkins, mgr., 625 Singer Bldg., New York; T. G. Patton, sec., Placerville, Cal.; J. E. Lawyer, supt., Greenwood, Cal.

Officers: L. H. Wilkins, pres. and treas.; A. B. Wilkins, v. p.; with W. Sheriff, E. C. Voorhies and Donald Woodrum, directors; A. B. Wilkins, mgr.

Inc. Oct. 3, 1911, in Arizona. Cap., \$1,000,000; shares \$1 par; fully paid; non-assessable; all issued.

Property: Shamrock group of 24 claims, about 492 acres, in Sec. 26, T. 12 N., R. 9 E., in Eldorado Co., Cal., 2 miles south and 1 mile west of Greenwood. Does not embrace 12 claims adjacent N. E. in section 23, held by a partnership of similar name to this company.

Geology: Property shows an extensive series of sedimentary rocks with igneous rocks of various ages, intercalated with the sedimentaries, or more commonly occurring as intrusives. Ores occur as sulphide deposits in contact and shear zones, the latter flat-lying, with chalcopyrite disseminated in pyrite, and almost invariably containing gold and silver, but low in copper tenor.

Development: by 10 tunnels varying from 50' to 380' in length. Latest estimates of reserves is the "whole mountain," assaying 5 to 12½% copper.

\$2.50 to \$25 gold, and \$2 to \$15 per ton silver. Shipping ore is estimated to be 50,000 tons. There is no power equipment.

In Sept., 1917, the main Lipton tunnel was being retimbered and a motor truck road constructed to rail at Cool or Auburn, the latter 12 miles from the mine; ore shipments are then to commence from the tunnel. At 1917 prices the value of the ore reserves above the tunnel are figured by company at \$3,000,000.

Literature describing company's holdings and possibilities is in our opinion quite optimistic.

SHENANDOAH MINES CO.

CALIFORNIA

Letters returned in 1917 from former address, Clunie Bldg., 519 California St., San Francisco. A. Tisher, mgr.

Property: 3 claims and 2 mill sites, 63 acres, on Jesus Maria Creek, 5 miles N. W. of Eldorado, has a quartz vein 2' to 5' wide in mica schist and quartzite.

Development: by tunnels. The mine is operated through the lower, No. 1, tunnel, which is about 1,700' long and gives a 90' back on the vein. Five other tunnels ranging in length up to 800' have been driven higher up on the vein.

Equipment: 10-stamp mill, 1,000 lbs. per stamp, dropping 6", 100 drops per minute, crushing 3 tons per stamp. Mill is run by 50-h. p. gasoline engine during the dry season and by water obtained from Jesus Maria Creek; water wheel is a 3' Knight, running under a 90' head. At last account a cyanide plant was being built. Twenty-two men employed.

THREE BUTTES & CONSUMNES COPPER MINES CALIFORNIA

Address: S. L. Watkins and associates, owners, Pleasant Valley, Cal.

Property: 30 sq. miles in Eldorado Co., Cal., said to be heavily mineralized, carrying gold, silver, copper, molybdenum, etc.

Over 2,500 assays are said to show from 1 to 24% copper, with 50c to \$2 per ton in gold for a large part of the deposit.

FRESNO COUNTY

CONTACT MINING & MILLING CO.

CALIFORNIA

Trimmer, Fresno Co., Cal.

Officers: J. K. Apperson, pres.; C. C. Overstreet, sec. Present owners have operated the property since 1894, incorporating in 1914.

Property: 3 claims, unpatented, 9 miles from Trimmer, shows ore containing free gold, galena and pyrite, in a flat pitching deposit in granite, said to average \$21.25 per ton, including a little silver. The gold occurs mostly in the ochre on the footwall; pay shoot varies from 4" to 2' in width. Another vein on the property, 3' wide, is said to assay \$11.60 gold per ton. Partly developed by a 90' tunnel.

Development: 110' adit and two 60' drifts on the vein. Ore is sledged ½ mile to the mill.

Equipment: includes a Straub patent stamp-mill which has ten 175-lb stamps operating in a circular mortar, 115 drops per minute, 5½" drop, driven by a 6-h. p. distillate engine; capacity 4 tons per day. Five men are employed. See M. & M. Res. of Fresno Co., p. 15, California State Mineralogist's Rept., 1915.

COPPER KING MINING CO.

CALIFORNIA

General offices: Union National Bank Bldg., Houston, Tex. Mine office: Academy, Fresno Co., Cal.

Officers: B. N. Garrett, pres.; J. R. Sims, v. p.; H. C. Bocchio, sec.; C. A. Lewis, treas.; D. C. Demorest, eng.; Wm. Stewart, trustee.

Joint stock association. Cap., 100,000 shares, \$10 par, fully paid and non-assessable, 50,000 shares issued.

Property: 11 claims, 220 acres, 10 of these claims are owned in fee and the other is under lease and option to purchase, 5 miles northeast of Letcher and 16 miles to shipping point at Clovis.

Development: by 3 shafts, one working and two for ventilation, sunk on the dip of the vein. Main shaft has been sunk to the 8th level about 800' and has about 3,000' of drifts.

History: owned originally by the Copper King, Ltd., a London company, of which W. H. Daily was gen. mgr. Company is said to have spent \$1,250,000 on mine, palatial residences and surface equipment, and to have produced 4,159,672 lbs. of copper. Company went into hands of receiver in 1903, said to be caused by mismanagement. In 1907 property was sold for \$44,000 to the Hart Mining Co., who produced an amount equal to the purchase price and was forced to close because of the low price of copper at that time. No attempt had been made to operate the property since that time till operations of the present company.

Geology: (extracted from "Copper Resources of California" published by the California State Mining Bureau in 1908). The vein courses N. E.-S. W. and appears to have a width of over 100'. It is schistose and meta-diabase in composition, all mineralized containing lenses of carbonates, oxides and sulphides of iron and copper with the sulphides more pronounced in the lower levels. Granodiorite bounds the belt to the east and diorite to the west.

Production: to date is reported to be 50,000 tons of 8% copper.

It is too early to say what this company will do, as the only reports available are those of investment brokers, but its directors are well known, and the property promising. Stock offered at \$7.50 in newspaper advertisement, 1917.

HUMBOLDT COUNTY

HORSE MOUNTAIN COPPER CO.

CALIFORNIA

Eureka, Humboldt Co., Cal. David Wilson, pres.; George Wilson, mgr., Eureka, Cal.; D. W. Stapp, supt.

Inc. Nov., 1910. Cap., \$1,000,000.

Property: 70 claims, unpatented, in vicinity of the Humboldt Copper Co., with which this corporation apparently is connected in ownership and management. Owns the Ruby copper mine on Horse mountain, in the Hoopa range, Horse River district, on the watershed between Redwood creek and Trinity river, in T. 6 N., R. 1 E. For miles copper occurs along a serpentine-gabbro contact; claims show native copper in a vein 30' thick having 2' of high-grade ore.

Development: by 6 tunnels, No. 6 of 900', another of 450', 3,000' in all.

Equipment: includes engines, boilers, 35 buildings and a \$12,000, 50-ton concentrator with Huntington mill, installed in 1912. Concentrates sacked and shipped by pack train to Korb, on Arcata and Mad River railroad, thence by steamer from Eureka to the Tacoma smelter. Small shipment made in 1914. Concentrates average 20% copper and \$4 gold per ton.

No recent returns. Probably idle.

HUMBOLDT COPPER MINING CO.

CALIFORNIA

Eureka, Humboldt Co., Cal. T. L. Loofbourrow, pres.; W. L. Perrott, sec.

Property: 24 claims, unpatented, well watered and timbered, in Secs. 28-29, 32-33, T. 6 N., R. 4 E., said to show strong veins with a good showing of copper ore, also some gold values.

Development: by 1,750' of drifts, 210' raise, 30' winze, and 700' of diamond drilling.

Equipment: consists of 3 surface buildings only. Doing development work. 1917.

RUBY COPPER MINING CO.

CALIFORNIA

Address: E. A. Walters, Eureka, Cal. F. W. Belcher, sec. Mine near Korb, Humboldt Co., Cal.

Property: the Blind Lead and Ruby groups, 38 claims, 760 acres, unpatented, in Horse Mountain mining district said to show a copper deposit developed by a 1,000' tunnel, and other short openings. Ores are chalc-

pyrite, cuprite, chalcocite and bornite, with some black oxides and occasional gold values. Formation is serpentine with porphyritic diorite dikes and quartzite.

Company planned installation of concentrator. Mine in development stage.

SUNNYSIDE MINE

CALIFORNIA

U. S. Smelting, Refining & Mining Co. own this and the Gold Prince property, and is constructing a new mill at Eureka. Gold Prince mill being

INYO COUNTY

BISHOP CREEK GOLD MINE

CALIFORNIA

Owned by Rocky Point Cons. Mines Co., which see.

CERRO GORDO MINES CO.

CALIFORNIA

Office: 1011 First Nat'l Bank Bldg., San Francisco, Cal. Mine address: Keeler, Cal.

Officers: Frank J. Hambly, pres.; L. D. Gordon, v. p. and gen. mgr.; A. L. Dornberger, sec.; F. J. Hagenbarth, treas.; preceding officers and J. E. Richards, directors; J. Wilson Reno, asst. treas.-purch. agt.; J. C. Climo, supt.

Inc. July 16, 1914, in Arizona. Cap., \$1,000,000; shares \$1 par; non-assessable; 975,000 issued.

The first annual report covering a period of 15 months ending Dec. 31, 1916, showed a balance of \$112,377 after paying dividend No. 1 amounting to \$24,375. Statement showed receipts of \$459,789, of which \$310,764 was from sale of ore. Disbursement were \$146,057 for improvement; labor and supplies \$175,718. A second dividend was declared Dec. 22, 1916, of \$50,000. Report ending March 31, 1917, showed for first three months net profit of \$160,000; cash on hand, \$209,780; ore in transit, \$54,229 and supplies, \$32,582.

Property: the Cerro Gordo mines, 35 claims, 8 miles from Keeler, including the Union mine on Cerro Gordo hill and a water power on Lone Pine creek; formerly belonged to the Four Metals Sm. & Mng. Co. The Aries Consolidated group of 8 patented and 33 unpatented claims was purchased, 1916.

The Union mine is an antigua worked by Mexicans in early days and opened to a depth of 1,200'. The principal ores produced are silver-lead mostly carbonates, with some galena and lead sulphide; also zinc carbonate. The zinc ore occurs from the surface to the 900' level, and the silver-lead ore from the surface to the 1,150' level. Ores also contain gold and copper values. See U. S. G. S. Bull. 540, pp. 97-105.

Development: by the 900' Belshaw shaft, with a winze to the 1,150' level, and tunnels. The Troeger tunnel is now in over 6,000' and cuts the vein system 1,200' below the workings of the Union mine. Underground workings are said to aggregate 20 miles. Production came from the 400' and 700' levels containing the downward extension of the Buena Vista ore-body.

Equipment: includes a Joshua Hendy 100 h. p. electric hoist; an Imperial type 10 Ingersoll-Rand compressor, capacity 600 cu. ft. free air per min., driven by a 75-h. p. constant speed motor. The former steam plant is intact and consists of 70-h. p. steam hoist, 350 cu. ft. Ingersoll-Rand air compressor and 130-h. p. boiler. Electric power, voltage 400, is obtained from the Southern Sierras Power Co.

The Swansea smelter has a 50-ton furnace that was operated for a few months in 1909.

Production:	Tons Ore	Oz. Gold	Oz. Silver	Lbs. Lead	Lbs. Copper	Lbs. Zinc
1915.....	8,926	126	112,541	748,952	121,510	4,544,666
1914.....	4,367	312	303,085	1,195,006	283,086	58,736

Ore produced in 1916 reported as 1,497 tons lead-silver ore, net value, \$44,723 per ton; 11,265 of zinc ore, \$23,759; 27 tons of copper ore, \$17,722 per ton and 9,431 tons slag valued at \$40,383. Net cost of all ore mined was given as \$11.08, giving a net profit of \$17.64 per ton. No effort has been made to estimate ore reserves. Production is, however, steadily maintained as the production of first three months of 1917 indicates: 2,506 tons silver-lead, 2,271 tons zinc ores and 2,939 tons of slag. Ore is shipped to the United States Smelting Co. at Salt Lake City. Company employs 70 men.

Management plans erecting a concentrator.

CORONA MINING & MILLING CO.

CALIFORNIA

Office: 770 E. 4th St., Salt Lake City, Utah.

Officers: J. A. Headlund, pres.; J. S. Ryan, v. p.; J. A. Stanley, sec.; W. G. Romney, treas.; with Thos. W. Bell, J. P. Moss, J. H. Hurd, directors. Thos. W. Bell, supt.; C. E. Merwin, Spokane, Wash., and Moscow, Utah, fiscal agt.

Inc. 1915, in Arizona. Cap., \$3,000,000; shares \$1 par; issued \$1,600,000, non-assessable. Farmers & Stockgrowers Bank, Salt Lake City, registrar. Annual meeting in June.

Property: the Confidence mine, known also as the Mormon Gold mine, 12 claims, 2 patented, 240 acres, in Funeral Range, Death Valley, Inyo Co., Cal., 12 miles from Shoshone, a station on the Tonopah & Tidewater R. R. The mine was worked in early days by a small syndicate of Mormons.

Ore: free milling gold and a little silver in fissure vein in granite; said to assay \$20 per ton. Outcrop of vein said to be 1,200' long and from 4' to 70' wide.

Development: tunnels and several shafts, deepest 140'. Present management claims there are 117,000 tons of \$20 ore in place, which can be mined for less than \$1 per ton. This cost figure is too low.

Company planning to erect a 100-ton stamp mill in 1917.

DARWIN DEVELOPMENT CO.

CALIFORNIA

Address: Darwin, Cal. J. E. Rea, mine supt.; H. Stone, mill supt.

Property: a group of mines at Darwin, Inyo Co., 20 miles south of Keeler, includes the Lane, Lucky Jim, Promontory, Columbia and Defiance mines, all silver-lead properties. The company is developing and securing options on new properties. Frederick R. Weeks, of 71 Broadway, New York, is interested.

ESTELLE MINING CO.

CALIFORNIA

Office: Keeler, Inyo Co., Cal.

Officers: R. C. Troeger, pres.,-gen. mgr.; Roy C. Troeger, sec.-supt.; Adolph Ramish, treas.

Inc. 1902, in California. Cap., \$100,000; shares \$1 par; 90,592 issued.

Property: 30 claims, 520 acres, including the Morning Star group, in the Cerro Gordo mining district, shows complex lead-copper ore with gold-silver values.

Ore: occurs in fissure veins and replacements in lime-porphry.

Development: by a 520' shaft and a 7,100' tunnel. Seven veins are reported to have been cut carrying both shipping and concentrating ore. Veins will have stoping backs of from 2,000' to 3,100'. Company spent \$25,488 for development work in 1916-17. Plans to extend tunnel and drift on veins, blocking out tonnage.

Installed electric power, 1916 and is preparing property for erection of a reduction plant.

INYO COPPER MINES CORPORATION

CALIFORNIA

Office: 215 Balboa Bldg., San Francisco, Cal. Mine address: Keeler, Inyo Co., Cal. R. G. Paddock, pres. and gen. mgr.; F. J. O'Dea, sec.

Inc. Nov. 19, 1910, in California. Cap., \$1,000,000, shares \$1 par, assessable; issued. \$550,000.

Company is a reorganization of the Inyo Copper Mines & Smelters Co. The president stated that it is free of debt but waiting for better financial conditions before attempting to raise money and only a small amount of work was being done.

Property: 19 claims in Ubehebe district, covering a contact zone between limestone and granite porphyry. For a mile this contact is said to show places where there is 1' to 20' of ore carrying 8% to 40% copper. The steep mountain side permits development by tunnel and future work will be of this character.

Development: amounting to 650', includes 6 shallow prospect shafts and as many short tunnels, the longest 120', together with 100' of trenching. Ores carry appreciable values in gold and silver, as well as copper.

INYO GOLD MINING CO.

CALIFORNIA

Cap., \$1,000,000; shares \$1 par; assessable. Stock listed on Salt Lake Exchange.

Property: 17 claims, patented, at Elko, Inyo Co., Cal., developed by 350' of shafts, 700' of tunnels and 75' of crosscuts. Company officials estimate \$650,000 worth of gold-silver ore in sight.

Letters returned from Elko, Cal., in May, 1917.

LORETTO COPPER MINING CO.

CALIFORNIA

Main office: Tonopah, Nev. **Mine office:** Big Pine, Inyo Co., Cal. John G. Kirchen, mgr.; John Cole, supt. Is controlled through stock ownership by Chas. M. Schwab and the Gail Borden estate.

Property: about 750 acres, east of Bishop, has a 40' vein, carrying ore said to average 4% copper and about \$3 gold per ton.

Development: by 1,700' main shaft, said to be in commercial ore, and 2 crosscut tunnels to the N. E., 1 of 90' length said to have cut a 74' vein. Improvements include a smithy and several small mine buildings. Developing and planning to install a 100-h. p. electric hoist and build a railroad to Coaldale, the nearest R. R. point.

Reported early in 1917, that mine was to be reopened and that a process had been found to handle the highly silicious ore.

REWARD GOLD MINES SYNDICATE

CALIFORNIA

Address: Owenyo, Inyo Co., Cal.

Officers: S. W. Cohen, 601 Dominion Express Bldg., Montreal, Canada. H. W. Darling, res. mgr.

Property: Reward, Brown Monster, Hirsch, Telescope, and 2 other claims in Inyo Co., Cal. Controlled by Crown Reserve Mining Co., Cobalt, Ont. First opened in 1853, and produced several million dollars.

Geology: quartz vein, 4' thick, in dark, silicious limestone. (See p. 116, Bul. 540, U. S. Geol. Survey, 1914. Ore carries gold, silver, lead, and a little copper.

Development: operated from main adit, exploration done through 8 levels. Reserves blocked out worth \$250,000.

Equipment: 20 stamps, ball mill, concentrators, and flotation.

According to Crown Reserve company, which holds 90% of this mine, there is enough ore opened to ensure the purchase price, all other expenditure, and a good profit on its investment.

ROCKY POINT CONS. MINES CO.

CALIFORNIA

Bishop, Inyo Co., Calif.

Officers: Gaylord Wilshire, pres., 422 Hollingsworth Bldg., Los Angeles; Mrs. Mary Wilshire, v. p.; H. R. Kearns, sec-treas. E. W. Walter, supt.

Inc. in Ariz. Cap., 1,000,000 shares; \$5 par; in treasury, \$500,000.

Property: referred to under various names, Bishop Creek Gold Mine, Bishop Creek Milling Co., and Wilshire Bishop Creek Gold mine, consists of 99 claims, 12 patented, located on headwaters of Bishop Creek, 16 miles from Bishop, Cal. Reported in June, 1917, that another company, the Consolidated Wilshire Mining, had acquired assets of the Rocky Point; but nothing definite is available.

Geology: claims are said to show a silicified shear zone 800' wide in granite: strike N. 50° W., dip 60° S. The vein is in the center of this zone, running N. 76° W., with no definite walls. It contains dense, banded quartz carrying very fine gold with some arsenopyrite and pyrrhotite.

Development: the mine, idle for several years, was unwatered in April, 1915, and operations resumed. 300' shaft with 2 levels, 1,000' of workings

in all, claimed to disclose an orebody 20' wide and opened up for over 100' with face still in ore. Ore reserves estimated at 13,138 tons.

Equipment: includes a 70-h. p. electric hoist; Sullivan 12-drill compressor, pumps, Bleichert tramway and a 50-ton 10-stamp cyanide mill. Recovery is 85% on \$11.40 ore, \$5.76 as concentrate, \$4 as cyanide recovery and a loss on tails of \$1.70.

Production: for 1915 reported as 6,196 tons of \$11.34 ore. The ore carries 86.3% insol., 4.67% iron, 1.80% alumina, 2.60% lime, 1.70% sulphur, and 1% arsenic. Recovery was 85%. Closed down in Oct. for the winter.

In a suit recently brought by a stockholder to get access to the company books, and secure the names and addresses of 6,000 stockholders, it is claimed that Wilshire holds control of the stock; that there has been no stockholders' meeting since 1913 in London, when no quorum was present; that no financial statement has been furnished or has been accessible to the stockholders since Nov., 1913, and that an assessment of 5c was levied in order to pay indebtedness less than the amount secured by assessment. Wilshire is reported to have answered that the books were available for examination, and that the actual purpose of the investigation is to secure a list of stockholders for the purpose of inducing them to pay to the investigators a fee of 2cts. per share for adjusting the affairs of the company and winding up the corporation.

It was reported that Wilshire proposes to reorganize as the Cons. Wilshire Mining Co., raising funds for enlargement of the mill by an assessment of 6 cts. per share, which was evidently done.

Both the company and its president frequently appear in print, and the stockholders appear to have a long wait before their officers get down to actual mining and an attempt to pay dividends.

SKIDOO MINES CO.

CALIFORNIA

Address: E. A. Montgomery, pres., L. A. Investment Bldg., Los Angeles. Mine at Skidoo, Inyo Co., Calif., J. H. Cooper, supt. **Cap.**, \$1,000,000; shares \$5 par. Reported to have paid dividends of \$385,000 up to April, 1915.

Property: the Skidoo gold mine, is developed by adits and equipped with 15-stamp mill.

Production: in 1914, 9,406 tons ore, gross returns \$14.54 per ton. Costs total \$6 per ton. Reported closed down Sept., 1917, and supplies being sold. One of the company's troubles was lack of water; it laid a 20-mile pipe line that gave much trouble in winter.

STANDARD TUNGSTEN CO.

CALIFORNIA

Address: Bishop, Inyo Co., Cal.

Officers: A. J. Clark, pres.; L. E. Porter, sec-treas., with W. P. Yaney, directors.

Inc. in Nev. Filed in Calif., Aug. 3, 1910. **Cap.**, \$200,000; shares \$1 par.

Property: 10 claims at head of Deep Canyon, 8 miles W. of Bishop, shows large bold croppings of scheelite-bearing garnet rock, close to granite contact. Part of company's holdings were sold 1915, to the Tungsten Mines Co.

Two ore shoots, 6' to 20' wide, shown in an opencut and in a crosscut tunnel, have been mined. Reserves are figured at 25,000 tons, opened on 3 sides and about 100,000 tons probable, which will carry 1% tungstic acid. The ore in the tunnel will run 1½% tungstic acid.

Development: by tunnels and an open quarry. Tunnel in two new claims 200 long. Ore is quarried and carried to the mill over a 1,600' incline surface tramway. Company operates 200-ton mill, equipped with Dodge crusher, Marcy mill, Davis rolls and Isbell tables. In August, 1917, mill was being remodeled, adding a Marcy mill, etc.

Production: in 1917 to Aug. first, 50 tons of concentrate valued at \$75,000.

TUNGSTEN MINES CO.

CALIFORNIA

General office: 1032 Higgins Bldg., Los Angeles, Calif. **Mine office:** H. W. Moore, supt., Bishop, Inyo county, Cal.

Officers: F. M. Townsend, pres., Leo Kaufmann, sec.; with G. L. Cooper, A. J. Clark, L. L. Stevens, F. W. Griffin and J. C. McKinstry, directors.

Cap., \$3,000,000; shares \$10 par.

Property: a group of claims, purchased 1915 from A. J. Clark, situated in a narrow gulch known as Deep Canyon, 7 miles west of Bishop. The scheelite bearing garnet rock occurs in granite. (U. S. Geological Survey Bulletin 640-L, by Adolph Knopf, describes the district.) Company also owns hubnerite claims near Kingman, Ariz.

Development: by 2 tunnels, one on each side of the new mill and connected therewith by 700' tram line.

The 300-ton mill, built 1916, is equipped with Allis-Chalmers rolls, trommels and tables.

No record of production is available.

UBEHEBE COPPER MINES & SMELTER CO. CALIFORNIA

Idle. Office: 956 Rockefeller Bldg., Cleveland, Ohio., **Operating Office:** Tonopah, Nev. **Mine Office:** Lone Pine, Inyo Co., Calif.

Officers: John Salisberry, pres., St. Francis Hotel, San Francisco, Calif.; Henry G. Merry, v. p. and cons, engr.; J. J. Griffith, sec-treas.

Inc. 1907 in Nevada. **Cap.**, \$3,000,000; shares \$1 par.

Property: 50 claims, 1,000 acres in the Butte range, 48 miles from Thorpe on the Bullfrog & Goldfield railway, said to show vein of 8 to 50' width, in granite and limestone, carrying copper ore with gold-silver values. Property advertised 1907 as a mountain of gold-silver-copper ore nearly 2,000' high.

Development: by an 80' shaft and 145' tunnel, with some work on other holdings. The company has done annual assessment work but contemplates no further extensive development until the financial situation improves, and means of transportation are devised. Was a promotion in 1907 of Pearce Hill & Co. of Baltimore, Md. Property has merit and systematic development is needed.

KERN COUNTY

BARBAROSSA MINING CO.

CALIFORNIA

W. E. Wessinger, Duluth, Minn., mgr.

Inc. Oct., 1917. **Cap.**, \$1,000,000; shares \$1 par; \$650,000 in treasury.

Property: 11 claims, 140 acres, including the Barbarossa mine, near Loraine, 15 miles N. E. of Caliente, Kern Co., Calif., shows 7 veins, of which the Barbarossa alone has been worked. It has a N. W.-S. E. strike, with dip 40° E., average width 4', granite footwall, and quartz-porphry hanging-wall.

Ore: free milling gold. **Development:** by 140' shaft, 60' winze and about 400' of drifts.

Equipment: 5-stamp mill, 1½ miles from the mine, gasoline power.

Mine credited with past production of 2,000 tons of \$23 ore.

BIG FIFTY MINE (ANTIMONY)

CALIFORNIA

Owned by Fifty Associates Securities Co., Los Angeles. F. W. Remy, mng. engr. and geologist.

Mine, 15 miles from Caliente, Kern Co., Calif., is reported to show a 50' vein, in porphyry, carrying 30% stibnite. Shipping 4-5 tons antimony daily, late in 1916.

BLACK HAWK MINE

CALIFORNIA

Owned and operated by D. A. Blue, Randsburg, Calif.

Property: 7 claims, in the Stringer district, near Randsburg, Kern Co., Calif. **Ore:** quartz in 6" vein shows coarse gold veins, assaying \$20 per ton. Mill test of 50 tons of gravel from the placer claims said to have assayed \$6 gold and 3 oz. of 60% tungsten per yd. Developed by 125' shaft. Equipped with 5-stamp mill and water power. Developing at last accounts.

BLUE MOUNTAIN MINING CO

CALIFORNIA

Office: 431 Security Bldg., Los Angeles, Calif.

Officers: Chas. K. Barnes, pres., mgr., White River, Calif.; H. H. Koons, v. p.; R. B. Chapman, sec.; J. F. Kent, treas.; preceding with S. E. Yount, directors.

Inc. in Calif. Cap., \$30,000; shares \$1 par; assessable; 29,038 issued. Annual meeting in July.

Gross earnings, 1916, \$37,539; operating expenses, \$15,233. Dividends paid to date, \$14,519.

Property: 9 claims, 170 acres, unpatented, in the White River Mining district, Kern Co., Calif.

Ore: quartz carrying gold and silver values occurs in shoots in a fissure vein in granite. Ore said to be 2' wide and over 800' long, carries 2% iron and some lead and zinc. Average assay \$13.60.

Development: by 300' incline shaft with 3,000' of workings. Company claims ore reserves of 20,000 tons with 5,000 blocked out.

Equipment: includes gas hoist, compressor, pump, etc., and a 5-stamp mill treating 12 tons daily.

BUTTE MINE

CALIFORNIA

F. K. Seaman, mill supt., Randsburg, Kern Co. Mine has 250' shaft, with steady production by leases for 3 years past. New ore body, necessitated enlargement of new 10-stamp mill and 3 shift operation.

CACTUS CONSOLIDATED MINING CO.

CALIFORNIA

Office: 808 Lonsdale Bldg., Duluth, Minn. A. F. Becker, pres.; R. B. Harrington, sec. W. E. Wessinger, supt.

Inc. 1914, in Delaware. Cap., \$1,000,000; shares \$1 par. Is a reorganization of the Cactus Copper Co., which was a reconstruction of the Cactus Development Co. Both companies fully described in former volumes.

Stockholders in the old company were given until June 10, 1915, to exchange their holdings for shares in the Cactus Cons. at the rate of 2½ for 1 and a payment of 6 cts. per share. In March, 1915, the Mammoth group, consisting of 22 quartz claims, 440 acres, in Kern Co., Calif., was acquired.

Development: by several tunnels, said to show 32' of ore, assaying \$10.40 per ton in silver, and a vein on claim No. 8 is claimed to assay 64-74% pure antimony and to be the richest ore in the district. Company also owns and is operating the Leona gold mine, developed to depth of 150' and said to have several veins, 3-4' wide, averaging from \$12-\$30 per ton.

CONSOLIDATED MINES CO.

CALIFORNIA

Office: 710 H. W. Hellman Bldg., Los Angeles, and Randsburg, Kern Co., Cal. Seth J. Tyler supt.

Property: at Randsburg, carries a vein containing gold and tungsten ore, developed by a 350' and by a 500' shaft.

Equipment: includes 5-stamp mill, pumps, compressor and air-drills. Listed in Los Angeles.

GREENBACK COPPER CO.

CALIFORNIA

Mine at Woody, Kern Co., Cal. Joseph Weringer, owner.

Lands: 1,520 acres, 18 miles east of Jasmin, on the Porterville branch of the Southern Pacific railroad. Country rock is granodiorite, showing an ore zone carrying lenses of 20' maximum width, with granite walls irregularly impregnated with chalcopyrite.

Development: by a 185' incline shaft, with 3 levels opened. Carbonate ores stoped from the upper levels have averaged 19.4% copper and 5.7 oz. silver per ton. Work resumed, 1913, after several years.

KING SOLOMON LEASING CO.

CALIFORNIA

Nosser Illingsworth, mgr., Randsburg, Calif. Operating a lease on the King Solomon mine near Johannesburg, Kern Co., Calif., developed to 250' level by shafts and crosscuts. **Shipments:** in 1915-16 to the Red Dog mill said to have yielded from \$60-\$130 per ton.

MAMMOTH CONS. MINING CO.

CALIFORNIA

Mine near Bakersfield, Kern Co., Calif.

Inc. June 9, 1910, in Minn. Cap., \$800,000; shares \$1 par; non-assessable; 465,000 issued. Annual meeting, 2nd Tuesday in January.

Property: 22 claims, 100 acres, 20 miles from the railroad, is said to show silver-gold ore in quartz.

The former president, Mr. R. P. Burgan advises, October, 1917, that the mine is not running, but that a deal is under consideration. Mr. Jas. W. Norton of Duluth, who fathered the company is dead.

RAND MINERALS CO.**CALIFORNIA**

F. R. Heineck, mgr., Glenville, Calif.

Property: the June-Ione tungsten mine, 8 miles N. E. of Glenville, Kern county. The ore carries pyrrhotite and scheelite in a silicious gangue.

Property slightly developed and equipped with 100-ton concentrating mill, installed in 1916.

SHIPSEY MINING CO.**CALIFORNIA**

Address: John Shipsey, Randsburg, Kern Co., Cal.

Property: King Solomon group of 7 claims near Randsburg, Cal., said to have yielded gold worth about \$2,000,000 in past 20 years, from depth of 500'. Five stamp mill reported to be crushing \$35 ore, July, 1917.

WERINGER MINES CO.**CALIFORNIA**

Officers: Jos. Weringer, pres. and mgr., Woody, Kern Calif. F. J. Weringer v. p.; Erwin W. Owens, sec., Nat'l Bank Bldg., Bakersfield, Calif.; Otto Kamproth, treas., with E. H. Woody, Paul Fox and Amasa P. Peak, directors.

Inc. Dec. 17, 1914, in Calif. **Cap.**, \$500,000; \$1 par; 293,543 issued. Secretary is transfer agent. California Corporation Commission granted authority to sell 100,000 shares at 50c in 1915.

Property: the Greenback mines, 68 claims on R. R. land, with 2,200 acres mineral and water rights in sections 1, 2, 3, 10, T. 28 S., R. 29 E., situated 22 miles from R. R. at Oil Center. Mine said to show contact metamorphic deposit a mile long in granite and porphyry, running N. S. and S. W. and dipping 45° to 85°. Orebody, 100' wide, carries copper, molybdenite, wolframite, with manganese-iron ore. Ore said to average 5% copper, 4 oz. silver and \$1.50 in gold.

Development: aggregating 1,600' by 200 and 230' incline shafts, connected at 200' depth. Latest work on 140' level. **Ore reserves:** 10,000 tons claimed. 1,000 tons on dump valued at \$150,000.

Equipment: 20-h. p. gasoline hoist, 75-h. p. engine, compressor, etc. A 100-ton mill was started in April, 1917. It includes jaw crusher, 6'x22", Hardinge ball mill, Dorr classifier, K. & K. flotation machine, and Oliver filter. Property reported on by W. J. Adams, W. H. Storms, H. W. Turner, D. M. Folsom, C. H. White and other engineers.

WILSHIRE BISHOP CREEK CO.**CALIFORNIA**

Bishop, Kern Co., Calif. Operates a mine owned by Rocky Point Cons. Mines Co., which sec. Has 50-ton mill to be increased to 100 tons per day. Property reported on by E. W. Walter, Oct. 1915.

Reported that the Consolidated Wilshire M. Co. had acquired the Rocky Point company, but nothing definite is known.

YELLOW ASTER MINING & MILLING CO.**CALIFORNIA**

Office: Coulter Bldg., Los Angeles. **Mine office:** Randsburg, Kern county, Calif.

Officers: Albert Ancker, pres.; Arthur Asher, v. p.; Rose L. Burcham, sec.; V. H. Rossetti, treas.; H. L. Bennett, asst. sec.; with R. H. Raphael and E. L. Kenny, directors. G. W. Shilling, supt.; J. H. Farrell, cons. engr.

Inc. Nov. 16, 1897, in Nev. **Cap.**, \$1,000,000; shares \$10 par; 86,761 issued; reorganized, April 30, 1917, in Nevada, with cap. of \$1,500,000; shares \$1 par; 1,077,600 issued. Annual meeting, May 16.

Statement for 1916 shows a revenue of \$437,197, less \$313,970 for operations, and \$53,473 for improvements.

From 1898 to October 31, 1917, revenue totaled \$8,725,588, of which \$1,245,789 was distributed.

Dividends: have been irregular for many years. Paid \$38,000 in 1916; \$35,000 to Oct., 1917.

Property: 47 patented and 6 unpatented claims, water rights and placer areas, totaling 796 acres, mostly at Randsburg, Kern Co., Cal., and one mile from Johannesburg on the Santa Fé railroad.

Geology: vein occurs in granite, schist, and porphyry. Main orebody is from 30 to 40' wide, with schist hanging wall. Ore is low grade, averaging \$3.21 per ton during 20 years. Gold is easily extracted.

Development: is extensive, aggregating about 27 miles of tunnels, stopes, open cuts and other workings to depth of 750'. Open cut work has produced most of the ore in the past. Improvements started and underway include stripping of 1,000 tons of overburden daily by steam-shovels, and mining ore by this method. Reserves estimated in December, 1916, by W. W. Hegeman, at 6,278,529 tons of \$1.77 ore. By the new system of screening this value should be raised to \$2.83 per ton, reducing the quantity by 50%.

Equipment: 150-h. p. and smaller hoists, 150-h. p. compressor, machine drills, steam shovels, pumping stations and several miles of water pipelines, 250-ton (per hour) screening plant, 100-stamp mill (back to back design, each 50 stamps driven by 150-h. p. motor), copper plates, steam boilers and engines, 3 oil-burning locos., sixty 3-ton side dump steel cars, machine shops, assay office and the Rand Mercantile store. Recent additions are costing \$250,000. A cyanide plant may be erected to treat 1,000,000 tons of tailing stored. Power is supplied by the Southern Sierra Power Co. So far, \$747,972 has been spent in plant on the property.

Production: from 1898 to October 31, 1917, there was mined 2,713,384 tons, yielding \$8,725,588, equal to \$3.21 per ton. The cost was \$2.44 per ton. Recent returns are as under:

Year	Tons	Value per ton	Cost per ton
1917*.....	98,105	\$2.84	\$1.80
1916	152,827	3.31	2.08
1915	166,446	3.14	1.83
1914	147,793	3.02	1.86
1913	131,481	3.03	2.22
1912	151,746	3.53	2.00
1911	162,683	2.52	1.71
1910	186,370	2.50	1.57

* 10 months.

Present daily capacity of the mill is 450 tons, but when the screening plant is working, up to 700 tons will be treated.

Yellow Aster has passed through much litigation in the past, but is now clear of further trouble, and is being handled in a business-like manner, with an open policy not desired by many companies in California.

LOS ANGELES COUNTY

MERCHANTS FINANCE CO. (Western Metals Co.) CALIFORNIA

Address: Los Angeles, Cal. Company in 1915, built an antimony smelter at Industrial Harbor, Los Angeles, operated antimony mines in California and Nevada and bought ores from the Western States, Alaska and foreign countries. The largest production was made from deposits of antimony ochre and stibnite near Wild Rose Spring, on the N. W. slope of Telescope Peak in the Panamint Range, Cal. These deposits known for many years, have been too far from transportation to be profitably worked until the high price of antimony in 1915 and the completion of a railroad to Trona on Searles Lake, 25 miles from the property made their exploita-

tion possible. The company also worked deposits 30 miles N. E. of Mojave, Kern Co., Cal.

SOUTHERN CALIFORNIA GOLD DREDGING CO. CALIFORNIA
Address: M. L. Brackett & Co., 334 Citizens Natl. Bank Bldg., Los Angeles, Cal.

Officers: A. S. Maynard, pres. and mgr.; Lyman Farwell, sec.-treas.; with A. H. Pratt, F. S. Owens, and W. W. Benson, trustees. O. S. Williams, supt.

Cap., 1,000,000 shares of no par value; non-assessable; 898,000 issued.

Property: 15 claims, 2,528 acres, in Palomas district, Los Angeles, Co., Cal.

Development: drilling started in Jan., 1917. Gravel said to average 51c per yard.

Extracts from reports given in prospectus are: "An average of 36c per cu. yd."; "It will be a Klondyke"; "Sufficient gold...to pay all of the National debt"; "Will yield \$14,435,559"; "Reasonably expect \$30,000 to \$40,000 a month"; "Most promising I have ever seen"; "A good and profitable dredging proposition." Five engineers gave gold contents as 45c, 22c, \$1, 40c and 35c per yard.

The above quotations show that the company is not in conservative hands. Is unfavorably regarded.

MADERA COUNTY

JESSIE BELLE M., M. & SM. CO. CALIFORNIA

T. S. and Ray Daulton, of Madera, Madera Co., Cal., reopened the mine in 1914, under a 4-year lease.

Inc. 1902, in Arizona. Cap., \$1,500,000; shares \$1 par.

Property: 3 patented claims, 40 acres, 7 miles from and in same belt as the Copper Queen mine, in Mariposa Co. Contains copper carbonate ore with gold and silver values.

Development: by 200' main shaft, shows 4 fissure veins, carrying oxide, carbonate and sulphide ores. Has steam power, air compressor and a 30-ton concentrator. Letters returned unclaimed from Madera, Cal. Probably closed down.

MADERA ENTERPRISE MINES & LAND CO. CALIFORNIA

No recent returns. Address: Grub Gulch, Madera Co., Cal.

Officers: Lou K. Johnson, pres.-gen. mgr.; A. L. Emberson, sec.-treas.; S. R. Johnson, mgr.

Inc. in 1914. Cap., \$500,000; shares \$1 par. A close corporation.

Property: 550 acres patented, including the John W. Cates mine, 3 miles N. E. of Grub Gulch.

Ore: gold quartz in fissure vein in schist and slate. Vein runs N. 35° E.; dip 80° N. E. It was discovered in 1881 and worked for a short time, during which it is said to have yielded over \$108,000 from ore averaging \$13.13 per ton. It was then idle until April, 1913.

Development: by 4 tunnels, longest 365', drifts and winzes, totaling 1,500' of underground workings.

Equipment: 10-stamp, 25-ton mill built by present owners, air compressor and engine. Water from the Fresno river furnishes power, except in the dry season, when a gasoline engine is used; there are 1½ miles of ditch and flume. Employs 10 men.

MADERA GOLD MINING CO. CALIFORNIA

Address: 625 Market St., San Francisco, Cal. Mine office: Grub Gulch, Madera Co., Cal.

Officers: R. W. Shingle, pres.; D. W. Shanks, v. p.; J. H. MacKenzie, sec.; above with Walter Dillingham, Clarence Olson, Howard Castle, A. W. Capps and J. Jorgenson, directors; A. N. Campbell, treas.; W. H. Parsons, supt.

Inc. Jan. 4, 1917, in California. Cap., \$1,000,000; shares, \$1 par; non-assessable; 750,000 issued.

Property: 223 acres (220 patented) at Grub Gulch, Cal., said to show

a gold-silver quartz vein in schist, $2\frac{1}{2}'$ wide, dipping 78° and pitching E. W. Pay-shoot is 600' long. Ore is 30% sulphide and assays \$10 per ton.

Development: 800' shaft and 6,000' of underground openings. Ore reserves estimated at 15,000 tons blocked out and 25,000 tons of stope-fillings.

Equipment: 100-h. p. electric hoist, Ingersoll-Rand compressor, Aldrich triplex pump, and 100-ton mill employing amalgamation and concentration.

Profits ought to be fair from the property as it stands.

MARIPOSA COUNTY

EARLY MINE

CALIFORNIA

Geo. H. Hook, supt.; W. H. Washburn, mill supt., Jersëydale, Mariposa Co., Cal. Is a gold mine in southern section of Mother Lode. Ore medium grade and somewhat refractory. Mine unwatered 1917, after $1\frac{1}{2}$ years litigation, and new oreshoot found at a vein intersection on 200' level. Mill has 50-h. p. gas engine, 10 stamps. Employs 30 men.

HORNITOS GOLD MINING CO.

CALIFORNIA

Offices: 127 Montgomery St., San Francisco, and Hornitos, Mariposa Co., Cal. H. W. Morris, pres. In May, 1913, company took over and in 1915 began operating the Ruth Piërce gold mine, consisting of 2 claims, located 4 miles from Hornitos. Mine had been idle for some time. Vein averages 3' in width; developed by a 550' shaft, part vertical and part incline, with about 2,500' underground workings.

Equipment: includes a hoist, driven by 105-h. p. motor, 4-drill compressor, and a 10-stamp mill.

MARIPOSA COMMERCIAL & MINING CO.

CALIFORNIA

Office: Alaska Commercial Bldg., San Francisco, Cal. Owns several mining properties near Mariposa, Mariposa Co., Cal.

Property: the Green Gulch quartz mine, 1 patented claim, in Secs. 12 and 13, on the Mariposa Grant, 12 miles from Bagby; shows a 3' quartz vein in slate, with gold ore.

Development: 300' shaft, and 550' tunnel, total underground workings about 2,500'. Equipped with hoist and compressor. At last accounts was being worked by lessees.

The Guadalupe quartz mine, Sec. 32, Mariposa Grant, 17 miles from Bagby, shows an 18" vein in granite; worked by lessees.

The Mariposa quartz mine, 1 patented claim, in Sec. 23, 16 miles from Bagby, formerly a large producer, is idle. In 1914 a roasting furnace and cyanide plant was being built to treat concentrates at the mine.

In Dec., 1915, suit was brought against the company by G. W. Langan for \$1,500,000, involving title to Mt. Bullion property, the Mariposa mine, and the town site of Ophir, alleging that company failed to fulfill contract to sell the properties after agreements to this effect had been arranged and the first payment made.

Reported early in 1917 that property had been sold to W. J. Morgan & Co., but if so there is little activity evident to show it.

MOUNT GAINES GOLD MINING CO.

CALIFORNIA

Hornitos, Mariposa Co., Cal. Said to be financed by Los Angeles and Chicago capital.

Officers: Wm. B. Davidson, pres.; A. L. Irish, v. p.; D. J. Hoge, sec-treas.; with A. E. Rutherford and P. B. Ellis, directors; W. J. McCray, mgr.

Cap., \$150,000; shares 10c par. The new company has paid for the mine partly in stock and given a first mortgage trust deed for \$68,000.

Property: 200 acres patented and 300 acres unpatented land in sec. 35, T. 4 S., R. 16 E., $4\frac{1}{2}$ miles E. of Hornitos, on the west vein of the Mother Lode, said to show gold ore.

Development: by 1,350' incline shaft with 11 levels and about 8,000' of workings. At present the mine is full of water, but old records are said to show a 5' vein assaying \$7 per ton.

Equipment: includes electric hoist, air compressor and 20-stamp mill with amalgamation and concentration tables. Electric power is obtained from the San Joaquin Power & Light Co.

Mine has been idle since 1910, but the new company, which came into full possession on May 10, 1916, was reported to be installing new machinery, 1917, and preparing to do development work.

MOUNTAIN KING MINING CO. CALIFORNIA

Office: 244 Kearney St., San Francisco.

Officers: Anthony McMillan, pres.; H. T. Harper, sec.-treas.; B. C. Austin, supt., Mountain King, Mariposa Co., Cal.

Cap., \$600,000; shares \$1 par; assessable, 598,340 issued. Gross earnings in 1916 were \$96,650 and operating expenses \$113,714. In June, 1917, earnings were \$4,546. Initial dividend of \$17,950 paid May 31, 1916, equal to 3c per share.

Property: 19 claims, patented, on the north fork of the Merced river on the Yosemite Valley R. R., in Coulterville, dissolved district of Mariposa Co., Cal.

Geology: quartz vein in slate and greenstone, said to carry gold and silver values in iron pyrite and tetrahedrite.

Development: by 450' shaft sunk at 55° incline; also 2,645' tunnel. Greatest depth of workings is 400' below tunnel-level. Sinking and exploration under known orebodies is contemplated. New work in 1916 totaled 3,866',

Equipment: includes air compressor, hydro-electric plant, built in 1915, and a 30-ton stamp mill with concentrators. Power plant has one 350-kva. 3-phase, 4,000-volt generator direct connected to a turbine running at 600 r. p. m. Underground haulage is by electric trolley locomotive.

Production: for year ending March 31, 1917, 311,186 tons of ore. Extraction, 88.3%; 53.2% by amalgamation, 35.1% by concentration. Average value of ore crushed, \$3.09 per ton.

Company is operating a mine with good equipment; but large profits cannot be expected from \$3 ore. A serious accident in 1917 will probably affect the year's results.

POCAHONTAS MINING CO. CALIFORNIA

Office: 112 Market St., San Francisco. Mine office: Lewis, Mariposa Co., Cal.

Property: 320 acres, patented, including the Great Northern mine, in the White Rock district, shows several veins of cupriferous iron ore, between diorite, with altered diabase gangue. The main orebody, about 100' in width, occurs in a mineralized zone up to 1,000' across, having an oxidized zone of about 100' depth, from which a limited production of high-grade ores was made many years ago.

Development: by a 300' shaft, 200' tunnel and 900' of drifting.

Equipment: includes steam power and a hoist, and buildings include an office, laboratory, smithy and bunk houses. Making small shipments to the Selby smelter. Property worked by lessees in 1915-16.

No later returns.

WHITE GULCH MINING CO. CALIFORNIA

Office: 263 12th St., Oakland, C. C. Powning, supt., Bagby, Cal.

Property: the Virginia quartz mine, 8 miles from Bagby, Mariposa Co., The vein varies from a seam to many feet in width with serpentine footwall and diabase hanging-wall.

Development: 750' shaft, with 5 levels.

Equipment: includes a Fairbanks-Morse hoist and 35-h. p. motor; 50-h. p. Ingersoll-Rand compressor; 3 miles of power line; track, cars, pipe, buildings, etc. Also a 10-stamp mill with crusher and amalgamating plates and 50-h. p. gas engine. Company started operations in 1912. In Sept., 1917, 22 men were employed. The mill was treating 30 tons from the 300 and 500' levels and the 700' drift was being extended.

MENDOCINO COUNTY

REDWOOD COPPER QUEEN MINING CO. CALIFORNIA

Idle. Is a San Francisco corporation. E. R. Leach, pres.; Thos. Mellersh, sec.-treas.

Property: 840 acres, patented, is 25 miles from Cloverdale, nearest rail point, Mendocino Co., Cal. Developed by tunnels and winzes. Vein much broken by faults prominent on surface, has a 2' to 4' gossan capping, traceable for a mile. Country rocks are brecciated porphyry and sandstone. Ores include cuprite, melaconite, malachite, azurite, chalcopyrite and tetrahedrite.

Mineralized zone is 300' long, 10-40' wide and 125' deep, carrying kidneys and lenses of sulphide ore with as much as 8-9% copper and small gold-silver values. High sulphur content and absence of arsenic make ore desirable for manufacture of sulphuric acid.

MERCED COUNTY

ORIGINAL MINING & MILLING CO.

CALIFORNIA

Merced, Merced Co., Cal.

Property: the Original Quartz mine, 4 unpatented claims, at Merced, in Sec. 21, T. 3 S., R. 19 E., said to carry a 2' vein, with slate hanging and footwall.

Development: by 800' shaft and several thousand feet of workings.

Equipment: includes compressor, electric hoist, machine drills, 10-stamp mill and several buildings. Employs 40 men.

YOSEMITE DREDGING & MINING CO.

CALIFORNIA

Address: J. W. Neill, Snelling, Cal.; or 159 Pierpont St., Salt Lake City, Utah.

Property: 400 acres along the Merced river, near Snelling, Merced Co., Cal. Gravel is up to 20' deep, and is easily dug.

Equipment: a dredge with 3¼-cu. ft. buckets, screen, Hungarian riffles, 10 Neill jigs, and tailing elevator. Electric power is used throughout. A feature on this boat is the recovery of platinum.

Production: gravel is reported to yield up to 16c per yard, extracted at a cost up to 7c per yard. According to J. W. Neill in the Min. and Sci. Press of Dec. 8, 1917, in the 22½ months preceding July 1 of this year, the boat dug 1,534,750 cu. yd. Besides the gold, there was recovered 41 oz. of platinum and nearly 1 oz. of osmiridium, valued at \$3,438 and \$25 respectively.

Property has been highly profitable for several years, and is in the hands of a capable metallurgist.

MODOC COUNTY

HESS MINING CO.

CALIFORNIA

I. W. Gibbons, supt.

Property: at Alturas, Modoc Co., Cal., said to show gold-quartz ore.

Development: 300' shaft.

Equipment: 10-stamp mill, compressor and cyanide plant. Employs 15 men.

MODOC MINES CO.

CALIFORNIA

Highgrade, Modoc Co., Cal.

Officers: Wm. Wrigley, Jr., pres.; Jas. C. Cox, sec.-treas., Kesner Bldg., Chicago; N. E. Guyot, v. p. and mgr., Kingman, Ariz., directors.

Inc. May 1, 1909, in Arizona. **Cap.**, \$1,000,000; all outstanding; shares \$1 par. Annual meeting July 1. Is a close corporation.

Property: 259 acres, patented, in High Grade mining district, in the extreme N. E. corner of Modoc Co.

Ore: gold, in a vertical quartz vein in rhyolite, with average width of 10", and proved for 150' in length downward to the 200' level. The ore in 25 ton lots returned \$23 per ton gross.

Development: by 210' vertical shaft, with 1,800' of underground workings.

Equipment: includes 6"x10" hoist. Steam power is used. In 1915 about 100 tons of \$23 ore was shipped. Working conditions are bad, due to the heavy snowfall and opposition of ranchers and others. District has merits, but will doubtless remain undeveloped until better feeling prevails at New Pine Creek, Oregon, the railroad station for the district, according to officials of the Modoc company.

For geology of the High Grade district, see U. S. G. S. Bull 594, pp. 38-48.

MONO COUNTY

COLUMBIA CONSOLIDATED MINES CO. CALIFORNIA

John Phelan, pres., Bridgeport, Conn.; E. C. Klinker, mgr.; J. A. Brown, supt., Hotel Golden, Reno, Nev. Mine address: Sweetwater, Mineral Co., Nevada.

Property: 8 claims, unpatented, 160 acres, at Mt. Patterson, Mono Co., 3 miles west of Nevada-California State line.

Ore: gold, silver in fissure vein in porphyry. Recently acquired 160 acres, patented, at Ormonde. Vein has strike of N. 10° E. with 45° dip and average width of 28", of which 1/3 is workable and said to average .05 oz. gold and 40 oz. silver per ton.

Development: by tunnels; No. 1 has about 850' of workings; No. 2 is in 410' with 700' of drifting. Underground workings total 4,500', and are said to block out 4,000 tons ore. Shaft sinking progressing 1917.

Equipment: includes 30 stamp mill and an aerial tram to carry ore from German and Ocean Star mines to the mill.

PITTSBURG LIBERTY MINE CALIFORNIA

Masonic, Mono Co., Cal.

Property: purchased at receiver's sale in 1914 for \$20,000 by the Stall Bros., was formerly owned by the Pittsburg Liberty Mining Co. The mine, near Masonic, was located in 1902 and started shipping to Selby smelter in 1907, operated until 1910 with a reported production of \$600,000; idle until 1915 when work was resumed.

Ore: which carries gold, is found in 5 veins, occurring in metamorphic schist, quartzite and slate; the intrusive is granite. Veins strike N. 25° W. and dip to the east.

Development: by 172' shaft and 2 adits, cutting the vein at 271' and 413' depth.

Equipment: includes 100-h. p. gasoline engine, and the 60-ton Pittsburg-Liberty mill, which was remodeled and equipped with cyanide plant and tube mill in 1915.

Lessees are operating and shipping, 1917. Said to have discovered new 2' vein of high-grade gold ore.

SARITA MINES CO. CALIFORNIA

Address: F. W. and G. E. Stall, mgrs.; W. M. Fuller, supt., Masonic, Mono Co., Cal. Not a share corporation.

Property: the Pittsburgh Liberty mine near Masonic, Cal., said to show a quartz vein in porphyry, dipping 45° W. and pitching W. Orebody is from 4' to 20' wide and shoots are from 50' to 200' long. Ore said to contain gold, silver and copper, worth \$20 per ton.

Development: by 700' tunnel to 200' depth.

Equipment: electric power, aerial tram, and 75-ton concentrating plant. Concentrate assays \$500 per ton. Extraction is 90%.

MONTEREY COUNTY

KINGS QUICKSILVER MINING CO., LTD. CALIFORNIA

Office: 502 King St., London, Ont., Canada.

Officers: Wm. Gray, pres.; W. P. Darsh, sec.; A. A. Lewis, supt.

Property: a group of claims, in Sec. 20, T. 23 S., R. 16 E., Kings Co., 14 miles E. of Parkfield, Monterey Co., Cal.

Ore: native mercury, cinnabar and calcite, occurs in a crushed zone, 35' wide, running S. E. with dip 45° S. W. Country rock is serpentine, shale and metamorphic sandstone.

Development: to depth of 200' by 700' upper and 850' lower tunnels, with raises and winze.

Equipment: includes 10-ton Scott fine ore furnace with brick condensers and 25-h. p. oil engine. Mine worked intermittently since 1902. Present management plans installing concentrator and further development.

NATIVE COPPER MINING CO. CALIFORNIA

Inc. in 1911, to develop the Copper King, Native Copper and other claims on Table mountain, Monterey Co., Cal. W. H. Kerr, Coalinga, Cal., pres., at last accounts.

PATRIQUIN QUICKSILVER MINE CALIFORNIA

Owned by Louis and A. G. Patriquin, Parkfield, Monterey Co., Cal. Gross earnings for 1915 were \$60,000 and operating expenses, \$12,000.

Property: 6 claims, 110 acres, in Sec. 2, T. 23 S., R. 14 E.; near Parkfield, is said to show cinnabar ore in veins and in chamber deposit in serpentine. Orebody said to be 3,000' long, with N. W. strike and dip of 60° N. E.

Development: by 360' tunnel and a total of 3,200' of workings.

Equipment: includes a 2-ton Johnson McKay retort furnace. A 1-12" pipe retort furnace was under construction, March, 1916. About 1,800 tons of 5% ore were treated in 1915, yielding 340 flasks of quicksilver.

NAPA COUNTY

ETNA QUICKSILVER MINE CALIFORNIA

E. de Golla, mgr., and E. B. Frost, supt., Calistoga, Napa Co., Cal.

Property: is situated 9 miles N. E. of Calistoga, and 20 miles from St. Helena, the shipping point. Cinnabar was first found there in 1854, and production of quicksilver is over 40,000 flasks.

Development: by long tunnels and extensive workings.

Equipment: includes a concentrating plant and retorts.

Property was producing in 1917.

WHITE ROCK MINE CALIFORNIA

Address: R. Sweasev, St. Helena, Cal.

Property: one of the largest magnesite mines in the State, 20 miles E. of St. Helena.

Equipment: machine-drills, aerial tram, 5 vertical kilns, auto-trucks, etc.

Production: about 100 tons of raw ore daily, equal to 50 tons of calcined material.

NEVADA COUNTY

ALLISON RANCH MINE CALIFORNIA

Owned by Grass Valley Cons. G. M. Co., which see.

BLACK BEAR MINING CO. CALIFORNIA

Office: David L. Killen & Co., 716 Copper Bldg., Denver, Colo.

Cap., \$375,000; \$1 par; 210,986 shares issued.

Property: 400 acres in Grass Valley mining district, Nevada Co., Cal., said to show several veins carrying gold values. Has 10-stamp mill, hoist and water power.

Denver office's advertising matter is not favorably regarded.

BRUNSWICK CONSOLIDATED GOLD MINING CO. CALIFORNIA

Grass Valley, Nevada Co., Cal. Eastern office: 136 Liberty St., New York.

Officers: W. H. Oscanyan, pres.; R. Chester Turner, v. p.-gen. mgr.; J. C. Nilon, sec.-treas., with J. A. Beckwith, Theo. C. Camp, C. H. Mallen, directors. J. J. Halpin, asst. sec.-treas.; C. H. Mallen, supt.

Inc. Jan. 11, 1890. Cap., \$500,000; shares \$1 par; 395,287 shares issued. J. J. Halpin, 136 Liberty St., New York, transfer agent; Farmers Loan and Trust Co., New York, registrar. Listed on San Francisco Exchange.

Financial statement: for fiscal year ending Jan. 25, 1917, shows balance Jan. 27, 1916, \$49,669; receipts from bullion, \$166,573; from concentrates, \$29,948; and misc., \$5,682; disbursements, \$201,061, as follows: genl., \$20,100; mining, \$132,087; milling, \$28,312; new shaft, \$8,491; repair account, \$5,216; improvements, \$6,855. Cash on hand and New York City bonds, Jan. 25, 1917, \$50,587.

Production: 1916, \$196,520; total production, 1893-1917, \$1,582,847.

Dividends: in 1906, 3c; in 1913, 6c; in 1914, 24c; in 1915, 18c per share. Total dividends to date, 51c; total assessments, \$1.22 per share.

Property: located on the Mother Lode, at Grass Valley, has gold quartz veins in schist and slates. For geology see Lindgren's Gold-Quartz veins in Nevada City and Grass Valley districts, Cal.; 17th Ann. Rept., pt. 2, 1896, pp. 1-262.

Development: by incline shaft to 1,100' level, and by 1,250' vertical shaft, being sunk to the 1,400' level. Underground work in 1916 totaled 2,185'.

Ore: blocked out ready for stoping, Jan. 27, 1917, roughly estimated at 30,000 tons above the 1,200' level. Also a considerable tonnage of low-grade ore indicated by exposed faces. Company contemplates sinking vertical shaft to greater depth and run lower levels from it.

Equipment: includes two 20-stamp mills, one going into commission in Oct., 1915.

Production:

	Tons	Costs Mng.	Per Ton Mfg.	Total	Value Ore Per Ton	% Ext.	Bullion Oz. Au.	Prod. Oz. Ag.
1916	34,091	\$3.87	\$0.83	\$5.90	\$6.44	89.5	7,998	1,856
1915	22,004	4.97	0.84	8.59	11.11	90.8	9,486	2,069
1914	16,237	6.05	.93	10.22	.....	93.9	12,992	2,622

Company is planning to erect a small cyanide plant to treat concentrates at the mine.

CALUMET & CALIFORNIA MINING CO. CALIFORNIA

Office: Calumet, Mich. Mine office: Washington, Nevada Co., Cal.

Officers: Geo. C. Morrison, pres.; Wm. Wedlyn, v. p.; Elbert E. Boyd, sec.; Neil Dick, treas.

Inc. Aug. 3, 1914, in Wyoming. **Cap.**, \$200,000; shares \$1 par; assessable. Property was idle for several years when held by Fairview Mng. Co.; company reorganized 1914 under present title.

In 1916 work was kept going by assessments. A statement of Sept. 14, 1916, shows that out of \$14,067, only \$6,624 was spent on actual exploration, partly unnecessary. This money being gone the time had come for closing down, selling the mine, or raising more funds. In July, 1917, the secretary reports that the property has been abandoned and the machinery sold. The company is without assets and out of business.

CANYON MINES CORPORATION CALIFORNIA

Office: 33 State St., Boston, Mass.

Officers: Frank B. Keever, pres.-gen. mgr., Sharon Bldg., San Francisco, Cal.; Geo. H. Morrill, v. p.; H. A. Makay, sec.-treas. Jas. J. McCarthy, and Frank G. Hobbs, directors.

Inc. in Maine. **Cap.**, 1,000,000 shares, \$1 par. Company owns the shares of an operating company of same name.

Property: 500 acres, 2½ miles from Gorge, Nevada Co., Cal., on the S. P. R. R., 35 miles west of the Nevada-California line, and 172 miles east of San Francisco. Holdings cover a lode with hanging-wall country of gray Calaveras slate and a diorite dike footwall. The lode, said to vary from 5' to 10' in width at north end to 140' across at south end, consists of a stockwerk of quartz stringers and seams.

Development: aggregates 6,188', mostly tunnels, the 1,137' uppermost being 400' deep at face, the 1,862' No. 2 tunnel, 110' lower, while No. 3, 186' below No. 2, is 2,349' long, with a 112' winze below its floor; the 840' Mill tunnel is 700' lower. The superintendent figures reserves to average \$4.91 per ton. Mill runs averaged \$5.15 when mine was worked.

DELHI MINES CO.**CALIFORNIA**

Address: Box 703, Reno, Nevada.

Officers: A. A. Codd, pres.-gen. mgr.; B. F. Boerner, sec.-treas.; H. Eddie, supt.

Inc. May, 1917, in Nevada. Cap., \$3,000,000; shares \$1 par. Is a successor of an old and successful company of similar name that has been inactive for many years.

Dividends: forty-five of 10c each and two of 25c each were paid by the old company.

Property: 11 claims, 5 patented, about 200 acres, in Columbia Hill mining district, 19 miles N. of Nevada City and Grass Valley, Nevada Co., Cal. Claims contain two known vein systems, the Delhi and St. Gothard, the Delhi vein being the only one worked extensively. Mines are credited with production of \$1,514,435 from 1890 to 1914. Examined by Hamilton Eddie in May, 1917.

Ore: free milling gold, with 1% pyrite.

Development: by 4 tunnels, about 200' apart, No. 4, the lowest, being 1,700' long; also by 400' vertical shaft. Vein at this depth said to be 3' to 8' wide and 360' long. Shaft is to be sunk 100' below No. 4 tunnel. Flow of water was 350 gal. per min. in 1914, when work was stopped.

Equipment: surface tramway connecting tunnels, pumps, one 900 and one 1,600 cu. ft. compressor, twenty 1,000 lbs. stamps, concentrators, ditches for water power and buildings.

Another project to reopen an old Californian mine, and if estimated costs of \$2 to \$2.50 per ton are realized, a fair profit should be made, as property is well equipped.

EMPIRE MINES & INVESTMENT CO.**CALIFORNIA**

Office: 375 Sutter St., San Francisco, Cal. Mine address: Grass Valley, Cal.

Property: the Empire mine and the Pennsylvania mine, formerly owned by the Pennsylvania Cons. Mines Co., which was bought for about \$500,000 in 1916.

Ore: quartz carrying gold values. Shipping over 400 tons daily in 1916.

Development: by 2,600' and 4,600' incline shafts.

Equipment: includes 500-h. p. electric hoist, and 100-ton stamp mill.

Company had a great deal of costly litigation in 1915-16 with the North Star Mines Co., Grass Valley, Cal., over extra-lateral rights. The case was finally compromised in 1916 and both companies are mining part of the disputed orebody.

EXCELSIOR CONSOLIDATED MINING CO.**CALIFORNIA**

Inc. May, 1914, as a reorganization of Excelsior Cons. Gold Mines Co. and controlled by Worcester, Mass., parties. Cap., \$3,000,000; shares \$1 par. R. B. Elder, mgr., W. H. Rea, supt.

Property: Excelsior group, in Meadow Lake district, Forest Hill, Nevada Co., about 7 miles from Cisco, the nearest railroad station, said to show oxide ore with gold values averaging \$10 per ton. Ore is treated by amalgamation and cyanidation.

Development 135' shaft and drifts. Use of Baltimore tunnel has been secured for further development at depth.

Equipment: 9-stamp mill, a Marks centrifugal mill, 700-h. p. Horseshoe Bar electric power plant, bunk house and mine buildings. The mill treats about 250 tons of ore daily. Employs about 70 men.

Ore reserves: management claimed to have \$35,000 worth of ore in bins. No recent returns.

FAIRVIEW MINING CO.**CALIFORNIA**

Washington, Nevada Co., Cal.

Reorganized as Calumet & California Mining Co., which see.

GOLD POINT CONSOLIDATED MINES, INC.**CALIFORNIA**

Office: Crocker Bldg., San Francisco. Mine office: Grass Valley, Nevada Co., Cal.

Officers: F. W. McNear, pres.; Errol MacBoyle, v. p. and mng. director; E. L. Oliver, sec.-treas.

Cap., \$2,000,000; shares \$1 par.

Property: company controls the Union Hill mines, Gold Point, South Idaho, Idaho Development, and Snook properties in the Grass Valley district, comprising 300 acres and a length of 8,000' along the strike of the Union Hill, Georgia, Greek, Lucky-Cambridge, Gold Point, and South Idaho veins. The famous Idaho-Maryland vein passes into these properties at a depth of 2,000' on the incline, and is thereafter controlled by the Gold Point Consolidated Mines.

Development: at present most of the development is being done on the Union Hill property (see Union Hill Mines). A shaft has also been sunk on the South Idaho vein to a depth of 150'. This shaft is equipped with oil-burning steam boiler, hoist, pumps, etc., six men are employed. In the near future the development of the other holdings will be undertaken.

GOLDEN CENTER MINING CO.

CALIFORNIA

Mine office: Grass Valley, Cal.

Officers: Rodney McCormick, pres.; J. W. Howard, sec.; C. A. Brockington, supt.

Cap., 300,000 shares, \$1 par; 285,000 issued.

Bullion from 3 years operation, \$312,291, of which \$152,000 was spent for property, \$90,000 for improvements, \$21,990 in dividends.

Property: 130 acres, including Golden Center Peabody workings under the town of Grass Valley.

Development: 6,000' to date; main shaft, 1,100' deep, is being sunk another 1,000'. Crosscut in hanging-wall at 1,100' level to be driven to cut Peabody vein. 85 men were employed. In July, 1917, ore extraction and milling were suspended to allow extensive exploration on which \$200,000 is to be spent.

Equipment: includes hoist, compressor, 20-stamp mill, etc. Cyanide plant to be erected.

Production: good yields were made for a time, enabling dividend to be paid, and many improvements to be made. Property in good hands.

GRASS VALLEY CONS. GOLD MINES CO.

CALIFORNIA

Mine office: Grass Valley, Cal.

Officers: Rodney McCormick, pres.; J. W. Howard, sec.; C. A. Brockington, supt.

Cap., 900,000 shares, \$1 par; 615,709 issued.

Financial: cost of property, \$88,000; improvement acct., \$175,000; reserve fund, \$43,728.

Property: Allison Ranch mine, south of Grass Valley, which produced gold worth \$2,300,000 from 1856 to 1866. In July, 1917, the adjoining Benoit tract of 168 acres was bought.

Development: by 9,000' of underground work to depth of 1,662'. Ore reserves estimated at 50,000 tons.

Equipment: twenty 1,575-lb. stamps, cyanide plant, etc. Mill started July, 1917.

Controlled by same people as Golden Center of Grass Valley M. Co. An old mine with good record and possibilities.

MOUNTAINEER MINES CONSOLIDATED

CALIFORNIA

Address: F. J. J. Sloat, 240 N. 7th St., Hamilton, Ohio.

Officers: Fred Searles, pres.; Carrol Searles, v. p.; J. W. O'Neil, sec.; F. J. J. Sloat, treas., with Herman Brand, Ed. Schmidt and P. B. Ender, directors.

Cap., \$1,000,000; shares \$1 par. Capital reduced from \$3,750,000 and organization not completed since.

Property: 15 claims, 3 patented, in Nevada City district, Cal. Claims said to contain a gold-silver-lead vein in granodiorite with ore averaging \$11 per ton.

Development: by 1,200' incline shaft and 2,000' tunnel with total workings of 10,000' to depth of 1,200'. Ore reserves estimated, but not blocked out, at 125,000 tons. Mine worked by leasers.

NORTH STAR MINES CO.

CALIFORNIA

Offices: 22 William St., New York; 15 Exchange Pl., Jersey City, N. J.; Grass Valley, Cal.

Officers: Geo. B. Agnew, pres.; Sidney M. Colgate, v. p.; with C. E. Dodge, Walter Douglas, and William Hague, directors; W. D. Pagan, sec.-treas.; A. B. Foote, gen. supt.

Inc. April 10, 1899, in New Jersey. **Cap.**, \$5,000,000; shares \$10 par; \$2,500,000 outstanding. Stock is listed on Boston and San Francisco Exchanges. New York office and Old Colony Trust Co., Boston, transfer agents. Central Trust Co., New York, registrar. Annual meeting, 2nd Wednesday in April.

Income account for 1916 shows: total production North Star mine, \$1,160,007; production Champion mines, \$124,724; interest and dividends, \$37,755; balance from 1915, \$942,469, total \$2,264,955.

Expenditures: total operating expenses, \$1,054,091; dividends absorbed \$300,000; balance Jan. 1, 1917, \$910,864.

Balance Sheet:		Plant and	Champion		
Assets:	Property	Improv'm'ts	Mines	Current	Total
1916.....	\$1,271,764	\$253,393	\$976,411	\$910,864	\$3,412,432
1915.....	1,489,512	222,070	854,757	942,469	3,508,808
Liabilities:		Capital Stock	Surplus Dec. 31		Total
1916.....		\$2,500,000	\$912,432		\$3,412,432
1915.....		2,500,000	1,008,808		3,508,808

Dividends: 2% in 1899; 5% in 1903; 6% in 1904; 8% in 1905; 10% in 1906 and 1907; 15% in 1908; 23% in 1909 and 1910; 17% in 1911; 12% in 1912 and 1913; 18% in 1914; 10% in 1915; 12% in 1916. In 1917, 3% was paid for the first quarter, but the second quarter was passed, on account of high cost of operations, supplies, etc. Total dividends, to date, \$5,137,040.

Property: the North Star mine, 1½ miles S. of Grass Valley, and the Champion mine, at Nevada City, Nevada Co., Cal. Other properties in the district are being examined by the company with a view to their acquisition.

The North Star, the main producer of the group, was discovered 1851 and operated continuously to date, with exception of 10 years, 1874-1884, first by the original locators and later by the North Star Quartz, the North Star Gold Mining Co., and the North Star Mining Co.

Geology: ore carries gold and silver in a quartz gangue, the precious metals occurring free or associated with pyrite, galena, and sphalerite. The veins have a maximum width of 5', with ore shoots averaging 400 to 600' long and proved for 2,000' in depth.

Development: new work in 1916 amounted to 6,384' and produced a total of 6,826 tons of ore. This work opened profitable orebodies between the 2,700' and 4,400' levels, both east and west of the shaft, adding to the ore reserves a tonnage probably exceeding what was extracted during the year. No development was done below the 4,400' level.

The office, machine shop, mill and cyanide plant, etc., which were formerly near the collar of the North Star shaft have all been moved near the Central shaft, as no ore is now hoisted through the North Star shaft.

At the Champion mine, Nevada City, new development work amounted to 4,910'. The Providence shaft was sunk to a depth of 2,529'. Operations at the Champion property resulted in a total operating deficit of \$121,179. A total of 28,050 tons was crushed, the yield of which was \$4.45 a ton.

Milling plants: company now operates 2 mills, sixty 1,500-lb. stamps for the North Star mine, and forty 1,000-lb. stamps for the Champion. Ore is hoisted at the Central shaft of the North Star mine in 4-ton skips, dumping into bins over 1½" grizzlies. The coarse from the grizzlies goes into a bin separate from the fines and thence over two sorting tables to

two 14x14" Wheeling crushers. As it passes over the sorting tables it is washed and the waste sorted by hand; 7 men picking out 70 tons of waste a day. Bins at shaft have capacity of 500 tons of ore and 100 tons of waste. Ore is hauled to mill in 2½-ton side dump cars by 5½-ton electric locomotive. Mill bins have a capacity of 1,000 tons. Each ten stamps in mill are belted to a 35-h. p. back-gear motor. Pulp flows over twelve 3'x16' copper plates, thence to 7 Richards pulsator classifiers and three 5' cones. Overflow (slime) to cyanide, underflow to 7 double-deck Deister concentrators. Middlings from concentrators to single deck concentrator, concentrates to 5'x10' tube mill, tailings to twelve 100-ton leaching vats for cyanidation. Ground concentrates from tube mill over amalgamated plate to thickeners to 3 Devereaux agitators, slimes overflow from classifiers to Dorr thickeners, thence to Pachuca agitators and Oliver filters. Concentrate tailing after treatment in Devereaux agitators is added to slime. Merrill presses used for precipitation. Total cost of milling and cyaniding is 90.1c per ton crushed.

Flotation was being tried early in 1917 at the Champion mine, where the gold is now mainly in sulphides. The Champion mine is not developing favorably. The total outlay on the property has been \$1,762,100, and gold yield \$785,689. The North Star mine gives encouragement for the future. To date it has produced 1,469,724 tons of \$12.66 ore, or \$18,610,334. Company's financial position is particularly strong.

Production of the North Star mine in 1916 was 135,760 tons, hoisted, of which 24,430 tons were sorted out as waste, leaving 111,330 tons crushed; yielding \$10.42 per ton, at a total cost of \$6.26 per ton. Of the total production 80.78% was obtained in the mills by amalgamation and 19.22% by cyanidation. The value lost in tailings is estimated at 35c per ton crushed.

PHOENIX CONSOLIDATED MINES CO. CALIFORNIA
Office: Humboldt Bank Bldg., San Francisco, Cal. A. Goering, supt., Box 171, Nevada City, Cal.

Officers: Judge B. V. Sargent, pres.; A. B. Mahony, v. p.; C. Martel, sec.; S. O. Trescott, treas.; H. C. Bocchio, mgr.; all of San Francisco.

Inc. Dec. 21, 1916, in Nevada. Cap., \$1,000,000; \$1 par; 600,000 issued; 400,000 held for development fund.

Has a 4-year lease and option to 1921 on the Phoenix Cons. mine, formerly worked by the Phoenix Gold Mng. Co., for \$15,000, payable out of a 15% royalty.

Property: 4 claims, 2 patented, 320 acres, 1 mile N. of Nevada City, Nevada Co., Cal., adjoining the Odin and Manzanita mines. Ore deposits consist of a gravel channel which is believed to be the continuation of the Manzanita channel, credited with \$7,000,000 gold production. There are also 3 quartz veins occurring along a rhyolite-granodiorite contact. One vein was worked to water early in the 80's and the ore is said to average \$20 gold per ton.

Development: tunnel being driven to tap the Manzanita channel.

Quartz veins are not being developed at present.

QUAKER HILL BLUE LEAD MINES CO. CALIFORNIA
Address: 37 Wall St., New York City. Inc. 1917, in Delaware. Cap., \$3,500,000.

Incorporators: H. E. Latter, C. L. Rimlinger and C. M. Egner.

Reported to own gravel properties in the Colfax quadrangle, Nevada Co., Cal.

SOUTH YUBA MINING & SMELTING CO. CALIFORNIA
French Corral, Nevada Co., Cal. Al. Elliger, pres.; C. D. Tregonning, supt. Cap., \$50,000.

Property: 10 claims, in process of patenting, including the Red Ledge mine, 10 miles N. W. of Nevada City, the nearest rail point. Mine shows granodiorite and diabase. There are 3 known veins, mainly copper-bearing, and 1 vein, originally worked for its gold ores, carries considerable quantities of this metal in the copper zone below.

Development: by 6 tunnels, longest 330', with total openings of about 2,000', showing malachite, chalcopyrite and good values in gold and silver. Principal tunnel, starting just above the South Yuba river, is expected to intersect 3 veins, including a 35' vein of cupriferous hematite, and give a back of about 1,500'.

Equipment: includes a 10-stamp mill, cyanide plant and water power. Reported bonded to a New York syndicate.

SPENCE MINERAL CO.

CALIFORNIA

Office: 1061 Mills Bldg., San Francisco, Cal. Mine near Spenceville, Nevada Co., Cal. D. M. Kent, sec.

Property: an old mine, operated 1875-1903, the shaft caving in the latter year. Fully described Vol. XI, Copper Handbook.

Property was bonded in 1917 for 2 years to McLain & Hales, who have unwatered shaft and recovered a fair quantity of copper from the water, making 2 shipments to New York.

UNION HILL MINES

CALIFORNIA

Office: Crocker Bldg., San Francisco. Mine office: Grass Valley, Nevada Co., Cal.

Officers: F. W. McNear, pres.; Errol MacBoyle, v. p. and mng. director; Robert E. Hall, sec.; E. L. Oliver, treas.

Cap., \$1,000,000; shares \$1 par.

Property: 150 acres in the Grass Valley district, controlling 2,800' along the Union Hill, Georgia, Greek, and Lucky-Cmabridge veins. All of these veins have produced and are producing free milling gold ore, also considerable quantities of tungsten (scheelite) ore.

Development: work is being done on the various veins on the 600', 800' and 1,000' levels. The inclined shaft (60°), 1,000' deep, is now being sunk to the 1,400' level.

Equipment: includes water-power hoist capable of sinking to a depth of 2,000', electrically driven 20-drill Sullivan compressor, complete 20-stamp mill, pumps, carpenter, blacksmith, and machine shops, assay office, buildings, etc.

Production: 10 stamps crushing gold ore from development, and 10 stamps on tungsten ore. Gold production \$3,000 to \$5,000 per month. Tungsten production since June 15, 1917, 25 tons scheelite concentrate carrying from 65 to 70% tungstic trioxide, value \$45,000.

Forty men are employed.

WILLOW VALLEY MINING CO.

CALIFORNIA

Office: 443 Holbrook Bldg., San Francisco. Mine office: Nevada City, Cal.

Officers: M. Dozier, pres.; J. L. M. Shetterley, v. p.; C. E. Reith, sec.-treas.; A. W. Hoge, C. F. Kinsey, R. W. Bender, directors. A. W. Hoge, supt.

Inc. May 18, 1915, in Cal. **Cap.,** \$1,000,000; shares \$1 par. Annual meeting in May.

Property: 9 claims, 4 patented, 125 acres, in Nevada City district, Nevada Co., has several veins, containing gold and silver ore, which occur in granodiorite and slate and dip from 20° to 70°. Developed by shaft and tunnel to depth of 800'.

Equipment: includes electric power, compressor, pump, tramway, stamp mill, etc. Developing only, 1916-17.

PLACER COUNTY

BOREALIS CONSOLIDATED MINES CO.

CALIFORNIA

Address: Letters returned from office of president, Dr. G. W. Hille-gass, Bacon Bldg., Oakland, Cal.

Property: 40 acres, including the Eureka mine, in Ophir district, 4 miles from Auburn, Placer Co., Cal.

ore: quartz, exposed in shoots, averaging \$12 per ton.

Development: by 3 compartment shaft.

Ore reserves: estimated in 1915, by company, at 17,000 tons of \$12 ore in sight on Eureka ground.

Equipment: 20-stamp mill, electric hoist, good for 1,500', and air compressor. Regular shipments of concentrates to custom smelter made in 1915.

DAIRY FARM MINING CO.

CALIFORNIA

Property operated by Van Trent Mining Co., is practically worked out and will shortly be abandoned. See Vol. XII for description.

HIDDEN TREASURE MINING CO.

CALIFORNIA

Address: Harold T. Power, mgr., Call Bldg., San Francisco.

Owms gold-bearing gravel mine, 1,545 acres, five miles north of Michigan Bluff, in Damascus mining district, Placer Co.

ORO FINO MINING CO.

CALIFORNIA

East Auburn, Cal.

Officers: Wm. L. Curtis, pres.; Geo. H. Hyde, v. p.; Haines Gridley, sec.-treas.-mgr.

Inc. Aug. 29, 1913, in California. **Cap.**, \$200,000; shares \$1 par; 196,865 outstanding. Annual meeting, 2nd Monday in March.

Dividends: at rate of 12% yearly started Dec. 20, 1916. Paid to 1917, \$11,722.

Property: the Bellevue & Bullion mines, 13 claims, 8 patented, 95 acres, in Ophir Mining district, Ophir, Placer Co. Shows a fissure vein, 1'-4' wide, running E.-W., with dip of 75°, between schist hanging-wall and grano-diorite footwall. Ore is quartz with some sulphides, assaying from \$7-\$10 per ton in gold and silver.

Development: by 500' vertical shaft, with a total of 4,300' underground workings. Management estimated 20,000 tons of ore blocked out, Jan., 1917.

Equipment: includes 50 h. p. electric hoist, compressor, 2 electric pumps, and 10-stamp, forty-ton mill. Mill started operating in Oct., 1915.

Production: gross in 1915, yielded \$112,614.

PLUMAS COUNTY

COPPER QUEEN MINE

CALIFORNIA

Mine at Portola, Plumas Co., bonded to J. R. Walker, of Salt Lake City. Developed by tunnel, showing a vein of gold-copper ore. See Walker Mng. Co.

CRESENT GOLD MINE

CALIFORNIA

Crescent Mills, Plumas Co., Cal., being developed by Philadelphia Exploration Co. (which see), Crocker Bldg., San Francisco; Albert Burch, mgr.

EAGLE COPPER CO.

CALIFORNIA

Taylorville, Plumas Co., Cal. Owns groups of claims covering low-grade pyrite deposit with limited development. Company built small smelter, 1912.

EAGLE HILL MINE

CALIFORNIA

Address: G. H. Goodhue, mgr., Indian Falls, Cal.

Property: 23 claims, 460 acres, ½ mile east of Genesee, Plumas Co., Cal. Claims are reported to show chalcopryrite ore occurring in contact and fissure veins in porphyry and carrying 2% copper, \$1.10 gold and 2 oz. silver.

Development: by 48' vertical shaft and 560' tunnel, which is being driven on vein, 1917. Is a prospect.

ENGELS COPPER MINING CO.

CALIFORNIA

Office: 393 Mills Bldg., San Francisco, Cal. Mine office: Englemine, Plumas Co., Cal.

Officers: Henry Engels, pres.; F. Klamp, v.-p.; Landon A. Bell, sec.; E. E. Paxton, treas.-gen.-mgr., above with Richard Spreckles, I. J. Truman, Jr., J. F. Humburg and O. G. Traphagen, directors. John Reinmiller, supt.

Inc. 1901 in Cal. Cap., \$2,000,000 shares \$1 par; non-assessable, 1,501,511 shares issued.

Statement Dec. 31, 1916 shows: liabilities, \$108,951; reserves for depreciation and depletion, \$172,716. Profits and loss, \$377,915. Gross earnings, \$1,039,515; operating profit, \$551,568.

Dividends: paying 1½% per share monthly, since July 20, 1916.

Property: 127 claims, about 2,600 acres, well watered and timbered, consisting of two groups, the Engels and Superior.

The Engels group at 5,000' elevation is in Sec. 3, 4 and 9 of T. 27 N. R. 11 E. The copper belt is 1,800' wide on this group and has been developed for over 2,500', running N. E. and dipping West. Orebody consists of high lenses lying in porphyry alongside of diorite dikes and well adopted for development by tunnel.

Development: work mostly done within the last 3 years, amounts to 14,465' of drifts, crosscuts and raises. Longest tunnel is 2,500' at a maximum vertical depth of 700'. Ore is principally bornite with some chalcocite and chalcopyrite and averages about 3% copper. A carbonate capping overlies a portion of the orebody with sulphide ore at shallow depth.

The Superior mine was opened in the summer of 1916 and results have been very favorable. Main tunnel has been driven 700', crosscutting the general strike of the ore, and is still in the orebody, having been continuously in ore from its portal averaging 3% copper with large lenses of 20% to 30% copper. Lengths of tunnels on the Superior total about 2,000'.

Ore reserves: company claims to have not less than 3,000,000 tons of ore above present tunnel levels; 500,000 tons bornite ore blocked out and total probable reserves of not less than 10,000,000 tons of 2½% copper ore.

A 3 compartment shaft is being sunk, 1917, on the Superior and a new tunnel, 1½ miles long, will be started towards the Engels mine, cutting the orebody 1,000' below the present working level.

Equipment: includes 500 ton Minerals Separation oil flotation plant, 1½ mile rope tramway, 400 h. p. hydro-electric plant, 6 compressors with total capacity of 6,000' per minute, saw-mill and all necessary buildings, etc.

In 1916, company built a 22 mile standard gauge railroad from its property to the main line of the Western Pacific, costing about \$500,000, thus greatly reducing its transportation costs.

Power used is hydro-electric, partly from company's 400 h. p. plant, but mainly from the Great Western Power Co.'s Butt Valley plant. The Great Western Power Co. has constructed a new line from its big Las Plumas plant to the Engels property, at its own expense, amounting to about \$150,000.

Company is building a 3,000 ton mill in 4 units of 750 tons capacity each. The first unit will be operating in October, 1917. New mill is located near the Superior mine and eventually the present mill will be moved down and form one of the units. A 2 mile rope tramway is under construction to carry the ore from the upper, or Engels group, down to the new mill.

Production: in 1915 was 2,893,133 lbs. copper, 30,726 oz. silver, and 414 oz. gold; in 1916, 4,400,000 lbs. copper; 41,219 oz. silver and 565 oz. gold. Mill treated 138,712 tons of ore in 1916, concentrates averaging 32.39% copper.

Employs 250 to 300 men.

FIVE BEARS MINING CO.

CALIFORNIA

Office: 503 Rector Bldg., Chicago, Ill. **Mine office:** Genesee, Plumas Co., Cal.

Officers: F. A. Meidinger, pres.; A. Vermaas, sec.; J. D. Meidinger, treas.; preceding, with G. H. Goodhue, directors.

Inc. April 10, 1903, in South Dakota. Cap., \$2,500,000; shares \$1 par, non-assessable; issued, \$2,428,174.

Property: 10 claims, patented, 200 acres, well timbered, 28 miles from the Indian Valley railway, shows fissure veins in talcose schist, and contact replacement deposits between schist and porphyry. The gossan was

worked, 1876-93, for gold. Main vein, of 14' estimated average width, carries chalcopryrite, associated with pyrite, estimated by management to average 6% copper, 1.5 oz. silver and \$1.40 gold per ton.

Development: 2 tunnels, of 380' and 1,540', latter a drift tunnel, following the vein fault-fissure, showing low-grade chalcopryrite for an average of about 12' width. Mine has 3,774' of workings, estimated to show 80,000 tons of ore, with 9,500 tons blocked out for stoping.

Equipment: includes a 50-h. p. water plant, a 3-drill air compressor, 50-ton mill with ten 850-lb. stamps, and electric light plant. There are 11 buildings. Operated under bond and lease with 25 to 30 men employed in 1917.

GENESEE VALLEY COPPER CO.

CALIFORNIA

Probably dead. Last address, Genesee, Plumas Co., Cal.

Officers: A. L. Beardsley, pres.; Henry Metz, v. p.; Mel. J. Smith, sec-treas.; A. B. Clark and J. E. Baum, directors.

Inc. Nov. 1, 1909, in Nevada. **Cap.**, \$2,000,000; shares \$1 par, non-assessable; issued \$1,000,000. Annual meeting, August 1. Properties have been transferred to Mel. J. Smith, trustee, to satisfy creditors' demands.

Property: 15 claims, unpatented, 300 acres, in 3 groups, and a 120-acre mill site, showing porphyry dike in meta-andesite, with bornite disseminated through the porphyry. Dike runs N. 20° W., dips 54° S. W. Orebody reported as 80 to 300' wide, 3,000' long and proven for 150' depth, assaying 3% copper, 2 oz. silver and \$0.50 gold per ton. Company reported, 1913, about 100,000 tons. No recent development except drilling to determine tonnage and value. Ore shows 90% recovery by Minerals Separation flotation process, concentrates carrying 35% copper, 10 oz. silver and 1 oz. gold per ton. Property considered promising. Idle and will probably remain so for some time.

MADERO MINE

CALIFORNIA

Under development by U. S. Smelting Refining and Mining and Exploration Co., at Portola, Plumas Co., Cal. Copper ore mined 1917, and stored for shipment.

PHILADELPHIA EXPLORATION CO.

CALIFORNIA

Office: Albert Burch, mgr., Crocker Bldg., San Francisco, Cal.

Officers: Harold Boericke, pres.; Gideon Boericke, v. p.; John Boericke, sec. C. A. Joy, supt.

Inc. Oct., 1916, in Delaware. **Cap.**, \$100,000; stock assessable. Is a close corporation with only 5 shareholders.

Property: 14 claims, 3 patented, 140 acres, including the old Crescent and Green Mountain mines, near Crescent Mills, Plumas Co., Cal. Mines have not produced since 1886. **Ore:** gold-bearing quartz veins in granodiorite.

Development: by 400' shaft and 6,000' tunnel. Workings being unwatered and reopened, 1917.

Equipment: includes 50 h. p. electric hoist, compressor, 3 centrifugal pumps.

PLUMAS BASIN MINES CO.

Address: U. S. Exploration Co., Oroville, mine under lease and bond, and operated by U. S. E. Co., which has found good ore on 300' level.

PLUMAS EUREKA CORPORATION

CALIFORNIA

Chas. D. Stark, Jr., mgr., Johnsville, Plumas Co., Cal. Company was reorganized in 1916.

Property: one of the oldest and most prosperous gold quartz mines of California, having distributed over \$17,600,000 in dividends.

SENECA CONS. GOLD MINES CO.

CALIFORNIA

Address: J. J. Reilly, supt., Seneca, Plumas Co., Cal.

Property: the White Lily mine and claims a mile above Seneca on North Fork Feather River is driving 1,000' tunnel, and has mill in which cyanide plant will be installed 1917.

SIERRA RANGE COPPER CO.**CALIFORNIA**

A. L. Beardsley, mgr., Sioux City, Iowa. Mine office: Genesee, Plumas Co., Cal.

Property: the Mountain Lion group, shows a vein of gold-silver-copper ore, developed by tunnels, and the Iron Dyke and Hirschman groups.

The Iron Dyke is under bond to the U. S. S. M. & E. Co. Main tunnel in 700', opening high grade ore. Twenty men employed.

SOUTHERN EUREKA MINING CO.**CALIFORNIA**

Greenville, Plumas Co., Cal.

Inc. in Washington by George D. Needy, E. F. Yeager, M. A. DeHuff, Hal. J. Cole and H. R. Van Dreathen, all of Spokane. Cap., \$2,000,000.

Property: the South Eureka, Hibernia, McClellan and Wardlaw mines, 12 claims, 450 acres, traversed by half a mile of the Crescent-Indian Valley and other lodes near Greenville.

Work was resumed late in 1916 and a mill was proposed.

UNITED STATES EXPLORATION CO.**CALIFORNIA**

Office: 617 Pacific Bldg., San Francisco. Mine office: Granite Basin, Plumas Co., Cal.

Officers: O. P. Posey, pres.; C. N. Miller, sec. and mgr.

Inc. 1904, in Nev. Cap., \$1,000,000; shares \$1 par; promotion stock, 300,000 shares.

Owns the Pepin mine. Report of E. C. Reed, mining engineer, gives value of \$20.50 for 240' of ore-shoot. Vein said to average 2' wide. Machinery on ground for 75-ton mill, including crusher, rolls, jigs, concentrators.

In Aug., 1917, the Robinson mine, which was under option to company, passed to the Golden Feather Mines Co.

WALKER MINING CO.**CALIFORNIA**

Office: 618 Kearns Bldg., Salt Lake City, Utah. Mine near Portola, Plumas Co., Cal.

Officers: J. R. Walker, pres.; J. B. Whitehill, sec.-treas.; with Wm. Wraith, J. F. Cowan, and B. R. Howell, directors. V. A. Hart, mgr.

Inc. 1913 in Arizona. Cap., \$1,250,000; shares \$1 par; all issued. Also 100,000 \$1 pfd. shares issued. Stock listed on the Salt Lake Exchange. Control of company is said to have been purchased, 1913, by the Cowan-Browning interests of Salt Lake City and Ogden.

Property: 34 claims, 10 patented, heavily timbered, elevation 7,100' is an unorganized district, 19 miles N. W. of Portola, on the Western Pacific railroad.

Geology: the claims show diorite largely overlain by volcanic tuff; the diorite showing fissuring and alteration for length of several claims. The vein is in diorite and contains commercial ore from 4 to 45' wide. Ore carries primary chalcopryite and averages 4% copper, 2.75 oz. silver, and 0.02 oz. gold per ton.

Over 15,000 tons of ore of the above grade has been treated in the flotation mill from September, 1916, to June, 1917. This ore was largely from development work. Concentrates are shipped to Utah smelters.

Development: during 1916, approximately 2,500' of drifts and crosscuts have been driven, the vertical shaft sunk to a total depth of 215', and 260' of raises put up, besides starting stopes on the two upper levels. Contracts have been let and work started for the sinking of a 2½ compartment incline winze below the bottom level on the dip of the fissure; also for about 1,500' of drifts and crosscuts, besides raises.

Equipment: the mine has a 120 h.p. steam plant, large hoist, compressors, etc. A new boarding house, shop, saw mill, etc., were completed last summer. A bunk house, small dwelling houses, and hospital were built in 1917. An aerial gravity tram carries ore to the mill and supplies to the mine.

The mill capacity was doubled in 1917, and now treats 200 tons daily. In

Nov., 1917, electric power from the Great Western Power Co. superseded steam. Employs 200 men.

Control: the control of the property was optioned to the International Smelting Co. of Salt Lake City on August 13, 1918, for a reported price of \$630,000; expiration of same October 1, 1918.

RIVERSIDE COUNTY

ASSETS REALIZING MINES CORP'N CALIFORNIA

Address: 810 Merchants Nat'l Bank Bldg., Los Angeles, Cal.

Officers: J. V. Priest, pres. and gen. mgr; F. R. Kellogg, v. p.; E. Fritze, sec.; with Chas. P. Grogan, Wm. A. Neer, C. L. Logue and E. S. Parker, directors.

General balance sheet for year ending March 31, 1917, shows: total assets, \$787,116, which includes: properties, \$595,652; development and equipment, \$105,807; treasury stock, \$80,171. Liabilities: paid in capital, \$576,994; notes and accts. payable, \$43,115; surplus, including treasury stock, \$167,005. Annual meeting, June 23rd.

Property: 400 acres, including the Arica, Big Butte, Crescent, Eldorado and January 1-11 claims, in the Ironwood Mng. district, Riverside Co., Cal. **Ore:** gold-silver, in six veins between dolomite hanging and schistose foot-walls.

Development: 2 shafts, one 700' deep, with 4 levels from the 80' to 330' levels. The 138' level said to be opened for 270' in ore averaging \$10 to \$30 per ton in gold. The second shaft, 330 deep, has levels at 165', 230', and 330' depths, and ore is said to average \$20 per ton.

Equipment: 150-ton plant, equipped with crusher and rolls, Hardinge mill, air-compressor, pumps, 20,000' of 2" pipe, assay office, boarding house and 10 buildings.

Ore reserves: reported, 18,000 tons ready for stoping.

BENDIGO MINES CO. CALIFORNIA

Address: Vidal, Riverside, Co., Cal.; Lester Scott, supt.

Purchased, Jan. 1915, the Morgan and Bradley group of claims, 7 miles from Vidal and did development work during the year. The ore is copper-gold and returns from shipment of several cars are said to be \$50 per ton.

Developed: by a 150' incline shaft, with a 60' vertical winze from lower level which is claimed to have opened up a 3' vein of ore. \$75,000 said to have been taken from the small block of ground opened by the shaft. There is also a large deposit of gypsum on the property. Company plans to sink a vertical shaft connecting with the winze.

CONTINENTAL MINES DEVELOPMENT CO. CALIFORNIA

Office: 301 First National Bank Bldg., Riverside, Cal. Harwood Robbins, pres.

Inc. 1911 as a holding company. **Cap.**, \$500,000; shares \$1 par.

IRON MOUNTAIN COPPER CO. CALIFORNIA

Office: 301 First National Bank Bldg., Riverside, Cal. Mine near Blythe City, Riverside Co., Cal.

Officers: Harwood Robbins, pres.; E. W. Tucker, v. p.; Holton Webb, sec-treas.

Inc. about July, 1911, in California. **Cap.**, \$10,000; shares \$1 par; issued, 5,000 shares.

Property: 35 claims, about 700 acres, known as the Crescent group, in Ironwood mining district, Riverside county, Cal., 26 miles S. of Blythe Junction on the Parker cut-off of the Santa Fé railroad. Claims show fissure veins in granite and porphyry, the main ledge being traceable 2 miles.

Development: includes 120' shaft with a level at 100' depth that is 70' long and shows high-grade copper ore containing visible gold. Ore shipments by former owners averaged \$100 per ton. Outcrop shows high-grade ore at several places. Mr. Robbins, who is said to have furnished all the money thus far, plans putting in a small smelter.

SACRAMENTO COUNTY

NATOMAS COMPANY OF CALIFORNIA CALIFORNIA

Offices: P. C. Knapp, sec., 310 Samsome St., San Francisco; Emery Oliver, Box 1160, Sacramento and Natoma, Cal.

Officers: F. B. Anderson, pres.; Louis Sloss, v. p.; John D. McKee, treas., with P. T. Morgan, Curtis H. Lindley, W. M. Newhall, G. E. Webber, H. Fleishacker, F. W. Griffin, all of San Francisco, and F. W. Kiesel of Sacramento, directors.

Inc. Dec. 24, 1914, in California. **Cap.**, \$25,000,000; shares \$100 par; non-assessable; \$16,104,000 issued. **Bonds** authorized: \$16,500,000; \$10,-049,100 issued.

Balance sheet for 1916 shows gross earnings of \$2,912,861, of which \$2,137,120 was from gold, silver and platinum; \$221,225 from land rentals, and the remainder from sales of rock, etc. Operating expenses totaled \$1,488,235. Profit from dredging was \$988,885. Non-operating expenditures in 1916 were \$1,147,551, for deferred land payments, bond redemptions, sinking fund, reclamation district No. 1000 costs, and dredge construction and purchase, the last being \$375,000. After allowing \$1,660,984 for dredging-ground exhaustion and depreciation for 2 years, there was a deficit of \$377,442. Properties are valued at \$19,123,566. Current assets are \$1,947,-678 and current liabilities, \$365,947.

Company is a reconstruction of Natomas Consolidated of California, whose history is long and complicated. Past troubles have been due to incorrect estimates of value and amounts of dredging ground, the land reclamation project, and because the large profits of dredges were largely absorbed by bond interest. These burdens are gradually being lifted by a careful management.

Property: 15,423 acres of mining lands, near Folsom, Sacramento Co., and near Oroville, Butte Co., Cal.; also over 70,000 acres of farm lands in Sacramento Co.

Equipment: includes 14 large, modern, electrically-driven dredges. Improvements in machinery and gold-saving apparatus are continually being made, also in leaving the dredged ground suitable for agriculture.

Two plants crush dredged rock for all purposes; the quantity produced in 1915 being 369,500 tons of crushed rock, 19,500 tons of washed gravel and 111,200 tons of screened gravel.

Reclamation of lands cost \$4,270,000 to end of 1916, including roads, drainage, levees, irrigation systems, etc. About 55,000 acres are under lease for fruit and other crops.

Production: 14 boats dug a total of 25,868,000 cu. yds. of gravel, averaging 8.26c., at cost of 4.44c per yard in 1916. Total profit was \$988,885. Reserves of dredgable gravel are estimated at 250,000,000 cu. yds. Old tailing is also being retreated.

If Natomas were operating its dredges alone, good dividends could be paid; but until the land project is self-sustaining there can be no distributions of profits.

SAN BENITO COUNTY

NEW IDRIA QUICKSILVER MINING CO. CALIFORNIA

Office: 70 Kilby St., Boston, Mass.

Officers: W. B. Buckminster, pres.; H. C. Buckminster, v. p., sec., treas., and gen. mgr.; with K. Haas, R. B. Stearn, F. Rothschild, Andrew Adie, Sydney Harwood, C. B. Wiggin and J. E. Simpson.

Inc. 1896 in Wyoming. **Cap.**, \$500,000; shares \$5 par; all issued. Stock listed on Boston Curb. American Trust Co., Boston, registrar. Annual meeting, third Wednesday in January, at Cheyenne, Wyo. Company has been a dividend payer since 1897, with total disbursements to date of \$24.30 per share, or \$2,430,000.

Comparative Balance Sheet:

Assets:	Plant	Deprec.	Supplies	Cash	Quicksilver	Total
Dec. 31, 1916....	\$186,471	\$302,718	\$55,737	\$9,575	\$200,000	\$754,501
Dec. 31, 1915....	234,979	254,209	19,482	24,448	98,850	631,970
Dec. 31, 1914....	258,170	231,019	20,651	6,823	73,200	589,863
Liabilities	Capital	Unp'd	Profit &	Sell		Total
	Stock	Drafts	Loss	Agts.		
Dec. 31, 1916....	\$500,000	\$37,284	\$118,128	\$99,089		\$754,501
Dec. 31, 1915....	500,000	33,078	98,892	.....		631,970
Dec. 31, 1914....	500,000	.....	89,863	.....		589,863

Income in 1916 was \$832,445 from quicksilver sold, less \$98,850 metal carried over from 1915, but plus \$200,000 for metal sold and on hand, making gross receipts \$933,595. Expenses totaled \$514,359, and dividends \$400,000, which left a balance of \$19,236. In 1915 the income was \$505,987, and profit \$159,028; in 1914, there was a loss of \$45,010.

Property: the New Idra and San Carlos mines at Jamestown, San Benito Co., Cal. Ore in 1916 came from upper levels of New Idria mine and dumps, also from San Carlos upper levels and dumps.

Operating results:	Flasks Quicksilver	Net Earnings	Cost per Flask	Average Price
1916.....	10,828	\$419,236	\$47.50*	\$89.57
1915.....	6,250	159,028	55.50	74.21
1914.....	6,550	Loss 45,010	52.	48.31
1913.....	9,700	65,012	30.	39.54
1912.....	9,600	73,763	31.80	42.46
1911.....	9,750	136,809	26.50	46.54
1910.....	10,800	186,939	26.	47.06
1909.....	8,900	109,639	27.50	46.30
1908.....	9,600	147,289	25.50	44.84
1907.....	7,675	89,650	25.50	41.50

*Includes cost of erecting new mill and aerial-tram, \$70,000, or about \$6.40 per flask.

Construction during 1916 included a 1-mile aerial-tram from San Carlos mountain to the furnaces, crushing plant, concentrating plant, new houses, etc. A tram from Idria mine to the furnaces, storage bins, electric-bins, electric-power line, power drag for Idria mountain, and wet-sorting plant are proposed. Company now has an assayer and furnace expert, studying economical problems.

Production in 1917 has been increased to 1,000 flasks per month by May. Employs 200 men.

A progressive policy is now maintained at New Idria, and with mercury at over \$100 per flask profits in 1917, should be equal if not larger than in 1916.

SAN BERNARDINO COUNTY

ATOLIA MINING CO.

CALIFORNIA

Address: 1404 Humboldt Sav. Bank Bldg., San Francisco. **Mine office:** at Atolia, San Bernardino Co., Cal.

Officers: E. C. Voorheis, pres.; E. A. Stent, sec.; J. H. Mackenzie, mgr.; Chas. S. Taylor, supt.

Property: a number of claims at Atolia on the Randsburg branch of the A. T. & Santa Fé R. R. are being worked for tungsten ores. The ore occurs as scheelite in both placer deposits and fissure veins.

Development: a 900' shaft with electric hoist and full equipment. The loss of the concentrating mill, destroyed by fire on Jan. 25, 1916, caused suspension of all operations for several months, but a new mill with a daily capacity of 100 tons has been built, making a concentrate containing from 50-75% scheelite.

The ore is hauled from mine to mill on 4-ton trucks which deliver 100 tons a day. From a large bin the ore is fed to a 10x18 Joshua-Hendy jaw crusher; then passes by bucket conveyor to the hopper feeding the rolls for finer crushing. Half of the product is fed into a single mill unit, composed of two 5' Huntingtons. The discharge passes over two large Deister roughing tables, where the most of the tungsten is extracted; the residue passes on to the Frue vanners. The other half of the rolls product goes to the 8' Marcy ball mill whose capacity is 30 to 40 tons in 24 hr. The 30-mesh pulp is discharged onto a Deister roughing table and then passes to a Dorr classifier. The slime from both units is thickened for concentration by use of three 8' Callow cones and then passes over three double-decked sliming tables; then to three double-decked Deister tables, whence the tailings are carried to the pond. The plant is operated by about 25 electric motors, each unit of machinery being driven by a separate motor. The mill will use 30,000 gal. of water when running full capacity and will produce 5 to 7 tons of concentrates every 24 hrs. The new electric hoist will be installed on the 900' level of No. 1 mine, to be used in sinking a winze on the ledge for prospecting the vein at greater depth.

Over 300 men are reported to be employed. Is one of the largest tungsten producers of the Country.

Shipments of concentrates and high-grade ore in 1916 amounted to 2,500 tons.

BROOKLYN MINING CO.

CALIFORNIA

Mine at Dale, San Bernardino Co., Cal.

Development: by 800' shaft, at which depth a rich find of gold ore was reported in 1914. Has gasoline power and a 3-stamp mill. Property optioned to Los Angeles parties for \$190,000, who were developing and shipping at last accounts.

CLIPPER MOUNTAIN GOLD MINING CO.

CALIFORNIA

Office: 600-1 Hellman Bldg., Los Angeles, Cal.

Officers: B. G. Doak, pres.; E. Petersen, sec.; preceding with A. H. Hayes, C. J. Gardner and J. C. Meadows, directors.

Inc. Sept. 12, 1916, in California. Cap., 1,000,000 shares, 10c par; 625,646 shares outstanding.

Property: 4 claims, 80 acres, in Clipper Mtns., near Danby, San Bernardino county. A 50' dike is said to traverse the property. Two compartment shaft is being sunk, 300' deep, Aug., 1917.

Equipment includes 32 h. p. engine, hoist, compressor, pump, etc. Management plans sinking to 500' level, crosscutting and drifting at 100' intervals, also installing necessary machinery.

COCOPAH COPPER CO.

CALIFORNIA

Idle.

Mine and works office: Ivanpah, San Bernardino Co., Cal. Dan. Murphy, pres.; Dr. L. D. Godshall, v. p. and gen. mgr.; G. Holterhoff, Jr., sec.-treas.

Property: on Clear mountain, 20 miles from Ivanpah, the nearest railway point, includes the Copper World and Mohawk mines, formerly operated by the Ivanpah Consolidated Smelting Co. The Copper World group shows a broad mineralized zone, up to 300' in width, with a silicious iron outcrop carrying some malachite and occasional oxides. Mine has a 180' vertical shaft, with about one-half mile of workings, on a 5' vein, carrying mainly copper carbonates and oxides, in regular masses.

The Mohawk mine, 2 miles south of the Copper World, shows a 4' orebody with nearly vertical dip, between a porphyry foot and limestone hanging, similar to that of the Copper World, but carrying more azurite.

GIANT LEDGE GOLD & COPPER CO.

CALIFORNIA

Idle. **Office:** 500 Frost Bldg., Los Angeles, Cal. **Mine office:** Barnwell, San Bernardino Co., Cal. A. Glassell, pres. and gen. mgr.; H. G. Stoddard, v. p.; Mrs. L. Stone, sec.

Inc. July, 1901, in Arizona. **Cap.**, \$1,000,000, increased, 1910, to \$1,500,000; shares \$1 par. Company has kept out of debt.

Property: 30 claims, a 40-acre mill site and miscellaneous holdings, about 800 acres, in the New York district, 5 miles from Barnwell, closed down for five years. Fully described Vol. XII.

GOLDEN WEST MINING CO.

CALIFORNIA

Address: Needles, Cal. Company issued 100,000 shares each to T. A. Dumont and H. C. Adams for 17 patented claims in Ibez district, San Bernardino Co., Cal.; also selling 50,000 shares at 50c for development and plant.

GOLDSTONE MINING CO.

CALIFORNIA

Address: Goldstone, San Bernardino Co., Cal.

Officers: C. C. Rumrill, pres.; F. A. Shorey, v. p.; G. M. Leonard, sec.; W. S. Hubbard, treas.; all of Springfield, Mass. A. A. Turner, cons. engr.

Cap. \$2,000,000; shares \$1 par.

Property: 14 claims in new Goldstone district, 35 miles from Barstow, Cal., developed by shafts and pits. Ore occurs at limestone-diorite contact.

Company well known at Springfield, Mass., on account of queer share dealings by certain firms. No late news, as property is mostly leased.

Lessees shipped some good ore.

LUCILE GOLD & COPPER MINING CO.

CALIFORNIA

Letter returned, 1917. Probably closed down. Mine near Kelso, San Bernardino Co., Cal.

Officers: Dr. S. K. Walsworth, pres.; Frank L. Pitney, v. p.; F. R. Pitney, sec., treas. and mgr.; with C. V. Boyd, directors.

Inc. Nov., 1906, in Arizona. **Cap.**, \$1,000,000; shares \$1 par; 900,000 shares outstanding. Annual meeting, 3rd Tuesday in April. Management report \$650 expended on assessment work in 1915.

Property: 5 claims, unpatented, 100 acres, on the western slope of the Providence mountains, 11 miles from Kelso. **Ore:** gold-silver-copper, with iron sulphide, occurs in fissure veins in granite-porphry, said to be 25' wide, and to assay 69% iron, \$4.50 gold, \$1.50 silver and 6% copper per ton.

Development: 220' tunnel and 100' shaft. Mine has no equipment.

MOHAVE UNITED MINING & MILLING CO.

CALIFORNIA

Address: 506 Baker-Detwiler Bldg., Los Angeles, and Copper King Camp, Crucero, P. O. Baxter, Cal.

Officers: P. H. Lietzow, pres. and mgr.; John Hoeft, v. p. and supt.; O. E. Lietzow, sec.-treas., also directors.

Inc. July 5, 1916, in Arizona. **Cap.**, \$100,000; shares 10c. par; non-assessable; 550,000 issued.

Property: 142 claims, 2840 acres, in San Bernardino Co., Cal. Gold-silver-copper ore occurs in granitic schist; copper minerals are carbonates.

Development: by tunnels 42 and 25' long, with total workings of 167', estimated to block out 1,000,000 tons of ore, which is absurd.

MOJAVE ANNEX TUNGSTEN MINING CO.

CALIFORNIA

Office: 411-12 I. W. Hellman Bldg., Los Angeles, Cal.

Officers: J. B. Evans, pres.; H. G. Parsons, sec.-treas.; with C. M. Dunwoody, directors; P. H. O'Connor, supt.

Inc. Sept. 26, 1916, in Nevada. **Cap.**, \$250,000; shares \$1 par.

Property: about 140 acres in the Clark Mountain district, San Bernardino Co., Cal., 12 miles from Roach, Nev., on the Salt Lake Route. Claims are adjacent to the Mohave Tungsten Mining Co. Wolfram veins said to carry 5% tungstic trioxide (WO₃).

Equipment: 20-ton mill has been erected, and is operating on wolframite ore, Sept., 1917. With tungsten at \$25 per unit company should make big profits.

MOJAVE TUNGSTEN CO.**CALIFORNIA****Office:** 74 Broadway, New York.**Officers:** P. De P. Ricketts, mg. director; J. T. Smith, v. p.; G. F. Stringer, sec.; J. T. Anyon, treas., with J. J. Cone, Julian Cochman and R. M. Whitman, directors. F. S. Naething, supt. in California; N. H. Brown, supt. in Colorado.**Inc.** Nov. 23, 1915, in Del. Cap., \$1,000,000; par value \$2; non-assessable; all outstanding. Traded on New York and Boston Curbs. Transfer offices: The Corporation Trust Co., Jersey City; American Trust Co., Boston. Registrars: Empire Trust Co., New York; State Street Trust Co., Boston.

Statement issued Aug. 31, 1916, showed a profit of \$34,888 for 8 months.

Property: (California) 32 unpatented claims in the Clarke mining district San Bernardino Co., Cal., 20 miles from Jean, Nev., the shipping point. Tungsten occurs chiefly as wolframite in a quartz vein in gneissoid granite. The vein is practically vertical with N. W.-S. E. course.**Development:** by 2 main and 5 prospecting shafts, disclosing numerous small bodies of high grade wolframite ore. The longest oreshoot so far encountered was about 125' long on the 100' level in No. 1 shaft.**Colorado Property:** the Bracken group of 6 patented claims, at Boulder Falls, Boulder, Colo., containing the well-known Good Friday vein with the usual ferberite ore.**Development:** by 3 shafts, the Burdette main shaft 350' deep, connecting with No. 1 tunnel. There are 3 tunnels in the face of the mountain. Ore in No. 2 has been continuous for a distance of nearly 1,000'. On January 1, 1917, the consulting engineer estimated ore containing 330,000 lbs. of tungstic acid opened up.**Equipment:** includes a small mill on the California property. At the Colorado property the Begge-Clarke mill was acquired in May, 1917; this was the leading custom mill of the district with a capacity of 1,000 tons of tungsten ore monthly.**Output:** the Californian property is still in the development stage, and the output has only been 4 or 5 tons of tungsten concentrate monthly. The Colorado property is shipping regularly and is now on a basis of about one ton of concentrate daily. The output for the last few months has been sold to the French and Italian Governments.**ORO BELLE CONS. MINES CO.****CALIFORNIA****Address:** W. B. Andrews, 340 Wilcox Bldg., Los Angeles, Cal. and Hart, via Goffs, Cal.**Officers:** W. B. Andrews, pres.-mgr.; A. E. Seaman, v. p.; C. Wilson, sec.; F. W. Royer, treas.; with Thos. A Merritt, directors**Inc.** 1916 in Nev. Cap., 1,250,000 shares; \$1 par; 635,000 issued; 500,000 reported to have been given for the property, 1,000 shares issued to directors and incorporators and balance under option until Oct., 1918, to John Hays Hammond and associates, of New York.**Property:** the Oro Belle Mine and millsite, in Hart Mining district, San Bernardino Co., Cal., about 14 miles W. of Searchlight, Nev. **Ore:** mainly gold, occurs in two veins. On the 700' level the vein is said to be 6' wide and to carry 4' of ore averaging \$8 per ton. The Woodward lode was cut on the 100' level, showing a width of 125' and giving assays of from \$5 to \$20.**Development:** by 814' vertical main working shaft with levels at every 100', a total of 2,700' of lateral work.

In 1915, the Oro Belle was under lease to the Tonopah Belmont Development Co. but option was relinquished within the year.

Development work only being done.

ORO BELLE MINES CO.**CALIFORNIA**

Reorganized, 1917, as Oro Belle Cons. Mines Co., which sec. Stock exchangeable on basis of 2 old shares for 1 of the new.

PACIFIC MINES CORPORATION**CALIFORNIA**

Offices: 120 Broadway, New York, N. Y. Mine office: Stagg, San Bernardino Co., Cal.

Officers: J. N. Beckley, pres.; David I. Walsh, v. p.; J. H. Hobbs, sec.-treas.; Josiah Anstice, asst. sec.-treas.; above, with Jas. M. Curley, Col. Sir Henry Mill Pellatt and D. C. MacDonald, directors; Frank W. Royer, mgr.

Inc. 1910 in New York. **Cap.**, \$1,000,000; shares \$5 par; reincorporated May 2, 1916, in Maine. **Cap.**, \$1,000,000; shares \$1 par; 642,000 shares issued; 300,000 shares treasury stock offered to the public, 1916.

International Trust Co., Boston, and **U. S. Corporation Co.**, New York, transfer agents; **Federal Trust Co.**, Boston, and **U. S. Corporation Co.**, New York, registrars. Company is a consolidation of the Bagdad Chase Gold Mining Co. and the Roosevelt Mining & Milling Co. **Dividends:** to end of 1912, \$205,440. Last payment of 2% paid July, 1916. Listed for 642,000 shares on Boston Curb.

Property: 15 claims, patented, about 300 acres, in Bullion Mountain district, 9 miles from Ludlow. Country rock is trachyte porphyry and quartz monzonite. Orebodies occur in a silicified breccia along an E.-W. fault line, and have an average dip of about 35° N. Ores carry malachite and oxide with a little chalcocite and average 1.5% copper, 1.56 oz. silver and 0.36 oz. gold per ton.

Development: by about 8,000' of workings, including three shafts, deep-est 300', and several tunnels. **Ore reserves:** estimated at 100,000 tons of \$10 ore and 200,000 tons of \$5 ore, according to report of F. W. Royer.

Equipment: includes an 85-h. p. Union gas engine, 3 hoists and a 10-drill compressor. Company also owns the Ludlow and Southern 9-mile standard-gauge railroad, with 2 locomotives.

Production: to end of 1915 is estimated at \$3,000,000. Production in 1914, 1915 and 1916 was about 100 tons per day. Shipments made under contract to United Verde smelter at Clarkdale, Ariz., reported to show net profit of \$4.49 per ton. Management plans increasing shipments to 200 tons in 1917 and erecting a mill to treat the low-grade ore on the property.

PARADISE MINE**CALIFORNIA**

R. Randolph Bruce, mgr.

Property: 5 claims on Spring Creek, about 20 miles N. of Barstow, said to have an orebody, proved for 1,000' in length, carrying carbonate and sulphide of lead, with iron oxide, in a gangue of silicious lime. The mine was idle from 1903-16.

The property is credited with production of 2,000 tons ore to 1904, that averaged 51.4 oz. silver and 59% lead. Shipments from Oct. 1, 1916, to Jan. 31, 1917, amounted to 1,050 tons, averaging 40 oz. silver and 40% lead p. t. Reported shipping 150 tons per month to the Trail smelter in 1917. 20 men employed.

SAGAMORE MINING CO.**CALIFORNIA**

Idle.

Offices: Third and Chestnut St., Philadelphia, Pa., and 401 First Nat'l. Bank Bldg., Riverside, Cal. Mine near Purdy, San Bernardino Co., Cal. Norman P. Sloan, pres. and mgr.

Property: 8 claims, 160 acres, known as the New York mine, 5 miles S. E. of Manvel, in the New York mountains, an extension of the Providence range, shows limestone, quartzite and schist, with intrusive dikes of rhyolite and felsite along which the principal veins are found. Ores found in the quartzite are gold bearing, the silver and copper ores being in limestone.

Development: by shafts of 30', 45', 100' and 150' and several tunnels, longest being 454', showing a number of veins ranging from 18" to 4' in width. A complete report on the property was made, 1902, by Carl Andersen.

Equipment: includes gasoline power and a 50-ton mill.

QUEEN MINE**CALIFORNIA**

Address: G. H. Hamstadt, owner, Nipton, Cal. Operated under lease by W. W. Wishon, Searchlight, Nev.

Property: 9 claims, 150 acres, in New York mountains, San Bernardino Co., Cal., said to show fissure veins in monzonite carrying gold-silver values.

Development: by 1,100' of underground workings, mainly tunnels. No. 2 tunnel reported to have opened up 10' of ore assaying 2.5% copper, 0.9 oz. silver.

Working, 1917.

UNITED GREENWATER COPPER CO.**CALIFORNIA**

Office: Tonopah, Nev. Mine office: Dale, via Amboy, San Bernardino Co., Cal.

Company operating the Supply mine and owns the O. K. mine. This group is developed by shafts of 800' and 1,100'. Has a 50-ton cyanide plant which was enlarged in 1915. Reported to have treated 60 tons of ore daily, 1915, averaging \$14 per ton. Milling costs said to be 75c per ton.

No recent returns.

WHITE PINE MINING CO.**CALIFORNIA**

Address: T. H. M. Crampton, supt., Las Vegas, Nev. F. A. Crampton, 207 Oregon Ave., Santa Monica, Cal.

Officers: F. A. Crampton, pres.; D. M. Hewey, v. p.; C. H. McCarter, sec.-treas.; also directors.

Inc. Aug. 5, 1915, in Nevada. Cap., \$1,000,000; shares \$1 par; non-assessable. 725,000 issued. Annual meeting 1st Wednesday in January.

Income from ore sales in 1916 was \$18,000 and expenses \$47,000.

Property: the Piute mine and 21 claims, 398 acres, at Cima, San Bernardino Co., Cal., and the Green Monster Extension at Goodsprings, Nev. The former group contains two mines shipping lead-silver and copper ores; the latter a zinc mine, is idle. Mines examined by J. N. Nevius, A. H. Black, O. B. Luhr and F. A. Crampton.

Geology: the Cima property shows contact deposits in limestone and granite, 2' to 8' wide. The longest shoot is 110'; the smallest 45'. Ores carry silver and lead, copper and zinc.

Development: at the Piute is by 210' shaft and 2,000' of workings. Reserves said to be large with over 2,000 tons blocked out. The shaft is to be deepened 200' and 3,000' of driving and 1,500' of prospecting done. In 1916 all operations were at the Piute mine.

Production: in 1915, 10 tons of copper and 35 tons zinc ores; and in 1916, 65 tons copper, 500 tons zinc and 350 tons of lead ores. The latter carries 9½% copper, 32% zinc and 26% lead.

SAN DIEGO COUNTY**ENCINITAS COPPER CO.****CALIFORNIA**

Office: 715 Timken Bldg., San Diego, Cal. C. A. McGee, pres.; W. H. MacKinnon, supt., Encinitas, San Diego Co., Cal.

Property: 8 miles east of Encinitas shows a vein in diabase and porphyry, said to carry 4% copper, 5 oz. silver and \$4 gold.

Recent tests have shown the ore amenable to flotation and a 50-ton plant will be installed, 1917.

FRIDAY COPPER MINES CO.**CALIFORNIA**

Care: Beecher Sterne, 1169 22nd St., San Diego, Cal. Is a close corporation, Inc. in California.

Owns a nickel property, 4 miles S. of Julian and 64 miles from San Diego. Ore is closely similar to that of Sudbury, Ontario, and carries 6% nickel, with but 1% copper. Ore is 35% sulphide. Described in U. S. G. S. Bull. 640, p. 77, 1917.

Development: work in progress, blocking out tonnage by 250' shaft. Mine was expected to produce by October, 1917.

MONTEZUMA MINING & REDUCTION CO. CALIFORNIA

Address: F. W. Nash, 752 State St., San Diego, Cal.

Officers: F. G. Webb, pres.; F. E. Wallace and F. W. Nash, v. p's.; R. H. Halstead, sec.; W. C. Narlow, treas.; also directors.

Inc 1917, in Delaware. Cap., \$1,000,000; shares \$1 par, fully paid and issued.

Property: 13 claims, 260 acres, in Grapevine district, Hot Springs mountain, San Diego, Co., Cal. Said to show a vein in granite, carrying gold values.

Development: by about 5,000' of workings to depth of 165'.

Ore reserves: estimated at 30,000 tons of \$12 gold ore.

Equipment: includes 40-h. p. hoist, 120-h. p. compressor and 100-ton mill.

*SAN LUIS OBISPO COUNTY***OCEANIC QUICKSILVER MINE CALIFORNIA**

Murray Innes, owner, 217 Kohl Bldg., San Francisco, Cal. E. W. Carson, mgr., Cambria, San Luis Obispo Co., Cal.; Thos Knowles, supt.

Property: 3 patented claims, 500 acres, about 5 miles E. of Cambria, shows a contact deposit 800'x650'x20' in width running N. W., with nearly vertical dip, in serpentine and sandstone formation. The ore contains cinnabar and iron sulphide, assaying 0.4% quicksilver.

Development: to depth of 650' by 300' vertical winze and 1,500' tunnel. Underground workings total 5,000'.

Ore reserves: estimated by owner at 300,000 tons with 150,000 tons blocked out, July 1, 1917.

Equipment: includes 25-h. p. hoist, compressor, pump, ½-mile wire tramway and two 50-ton furnaces.

Recent production: 1,125 flasks in 1913; 1,256 flasks in 1914; 1,213 flasks in 1915; 1,070 flasks in 1916; June-July, 1917, at rate of 150 flasks monthly. Concentrates average 5% quicksilver. Average price received during 1915 was \$91 per flask.

Property bonded in Feb., 1916, to Clark & Coolidge of Boston, who erected 200-ton concentration plant which proved unsatisfactory. Mine closed down and reverted to owner and again operating, 1917.

*SANTA CLARA COUNTY***QUICKSILVER INVESTMENT CO., INC. (THE) CALIFORNIA**

Office: 45 Broadway, New York.

Officers: Geo. H. Sexton, pres.; Robt. Gibson, v. p.; Harry A. Nichols, 2nd v. p.; Chas. A. Frank, sec.-treas.; A. Heyward McAlpin, asst. sec.-treas.; above with Ira Barrows and Wm. Herbert, directors.

Inc. 1915, in Virginia. Cap., \$1,061,900, in \$61,900—7% cumulative, 1st preferred, issued to noteholders of old company; \$421,300—7%, 2nd preferred, and \$578,800 common shares; shares \$100 par; \$461,900 outstanding. All stock is held in a 5-year voting trust; voting trustees: Chas. A. Frank, chairman, Robt. Gibson and Ira Barrows, N. Y. City.

Company has a 25-year lease from 1915 on the Almaden quicksilver mine of the Quicksilver Mining Co., through its subsidiary the New Almaden Co., Inc., and will pay 20% of its net profits to owners. Reported operating at a loss; indebtedness to noteholders, March 1, 1915, was \$61,900. More than \$60,000,000 has been produced by Almaden mine.

QUICKSILVER MINING CO. CALIFORNIA

Offices: 45 Broadway, New York.

Officers: Jos. Kaufmann, pres.; Edw. Reynaud, v. p.; Chas. F. Tracy, sec.-treas., with Clinton E. Whitney, T. Tileston Wells, Clarence W. Francis, John Wells, W. L. Steinbarg, Wm. H. Lotty, Henry L. Steitz and A. H. Jarman, directors.

Inc. 1867, in New York. Cap., 100,000 shares; \$1 par, in 57,087 common and 42,913 preferred, 7% non-cumulative. Annual meeting, 3d Wednesday in June, in N. Y. City. Stock listed on the New York Stock Exchange. Farmers Loan & Trust Co., New York, transfer agent; Equitable Trust Co., New York, registrar. In 1914, company defaulted on payment of notes, and was refinanced March, 1915.

Dividends: few and far between; none has been paid on the common since 1882 when 40c was paid. Payments on preferred: June, 1891, 4%; May, 1899, ½%; July, 1900, ½%; May, 1901, ½%; May, 1902, ½% May, 1903, ½%.

Property: claims totaling 6,800 acres, including the New Almaden quicksilver mines at New Almaden, near San Jose, Cal. Mine is the oldest producer of quicksilver in the United States. Company has given a 25-year lease from Feb., 1913, on its mines to the New Almaden Co., a subsidiary of the newly organized Quicksilver Investment Co. and will receive 20% of net profits. Stockholders were offered voting trust certificates in new company on basis of one share of second preferred for 10 shares of old preferred in consideration of payment of \$3 for each share of old stock. New common was exchangeable for old common stock at same ratio plus \$1.50 per share of old common.

The ores recently worked carry 0.2% to 1% mercury, being the low-grade ore left in previous years workings and old fills. Prospecting of unworked territory had not been successful at last accounts.

On Dec. 1, 1917, it was reported that the directors had applied to the Supreme Court of New York for a voluntary dissolution of the company, on the ground that its assets do not ensure payment of obligations. Maurice Delches was appointed receiver, and testimony against the move is to be heard on Jan. 10, 1918. Indebtedness totals \$94,000.

SHASTA COUNTY

AFTERTHOUGHT COPPER CO.

CALIFORNIA

Office: 117 Chamber of Commerce, St. Louis, Mo. Mine office: Ingot, Shasta Co., Cal.

Officers: Geo. L. Porter, pres. and treas.; J. Taylor Stratton, v. p.; E. Bibbins, sec., with Chas. P. Keller, C. Cambirn, S. F. Lund and Jno. A. Elliot, directors; Jasper Robertson, gen. mgr.; John Bull, smelter supt.

Inc. Jan., 1909, in Arizona. Cap., 1,600,000 shares, \$10 par; 1,544,898 shares issued. Is successor of Great Western Gold Co. A 20-year first mortgage 6% gold coupon bond issue of \$800,000 authorized; 350,000 issued, Sept., 1917.

Property: 19 patented claims, 380 acres, with mill and smelter sites and timber lands giving total holdings of 1,704 acres. Lands include the Afterthought, Liberty, Last Chance, Section 15 and Bull groups, mines more or less developed being Afterthought, Copper Hill and Copper Grand. Lands are on the east side belt which extends from Ingot to DeLamar, and is entirely distinct from the copper belt on the west side of the Sacramento river. Lands show porphyry, slates and shales, carrying contact deposits with sulphide ores, there being 5 known orebodies, of which 2 are under development, 1 being reported by company to be 160'x500'x33' in size.

The Afterthought mine, in the Furnaceville district, 20 miles east of Redding, had about 2,000' of workings, when taken over by predecessor of present company, and now has shafts at 218' and 327', with 7 tunnels, main tunnel being about 2,500' long, with a total of 8,500' of workings, reported by management to show 400,000 tons of ore, estimated to carry 2.7 to 3.4% copper, 10 to 25% zinc, a trace of lead, 6.4 oz. silver and 52 cts. gold per ton. Ore is almost exclusively chalcopyrite and sphalerite, a little oxidized ore having been shipped under former ownership. In 1905 ore smelted assayed 2.81% copper, 14.3% zinc, 11.6% iron, 18.7% sulphur, 5.3% alumina, 7.4%

barium sulphate, 5.4% calcium carbonate and 18% silica. The main working tunnel cuts a 25' body in the Copper Hill mine.

Equipment: includes blast furnaces, electric power, a 115-h. p. steam plant at the mine, with 20-h. p. and 30-h. p. hoists and a 5-drill air compressor.

A 14-mile standard-gauge railway, known as the California, Shasta & Eastern railway, connects the mine and works at Ingot with the Southern Pacific railway at Bella Vista.

The smelter: 1 mile north of Cow creek, and 1½ miles north of the mine, connected therewith by a 30" tramline, includes a small sampling mill. The smelter, blown in March 24, 1905, has water-jacket blast furnaces of 42"x96", rated at 75 tons, and 42"x150", rated at 250 tons daily capacity.

Development: work and ore extraction resumed in 1917, and flotation plant installed, that is treating 300 tons daily. To separate the zinc from copper, the flotation pulp is conveyed to a Skinner furnace, lightly roasted at 400° to 500° heat, and retreated in flotation cells.

Employs 100 men.

On Nov. 30, 1917, the mine was closed until the Spring of 1918, on account of treatment troubles which are expected to be solved during the shut-down.

AMERICAN MINING CO.

CALIFORNIA

Address: Redding, Shasta Co.

Inc. and controlled by Jas. Sallee.

In 1914 the company started to work the old American mine in the French Gulch district, whose holdings consist of 11 claims. Development work of the old mine includes 4 tunnels from 50' to 1,400' in length, and one stope 125' long and 240' in height. When mine shut down under former management ore is said to have assayed \$20 in gold per ton. It occurs in a fissure vein, strike N. 70° W., dip S. 75° E., slate walls. Pay shoot is 2' wide. A 10-stamp mill is on the property. Results of work of the new company not known.

No recent information received.

ARPS COPPER CO.

CALIFORNIA

W. W. Henry, Jr., supt.

Inc. 1917, in California.

Property: the Arps group, 15 claims, unpatented, in T. 34 N., R. 4, W., Shasta Co., Cal., developed by 5 tunnels, of about 1,600' aggregate length, showing sulphide ore. A deposit of manganese ore, 1,200' long and about 125' wide, was discovered in 1914; samples said to assay 40% metal.

About 16 men employed. Plan installing flotation mill. Shipping to Kennett smelter, Aug., 1917.

BALAKLALA CENTRAL MG. & SMELTING CO.

CALIFORNIA

Address: Coram, Shasta Co., Cal.

Inc. in Wyoming. Cap., \$5,000,000, shares \$5 par; one-third of issue owned by Balaklala Consolidated Copper Co., the remainder by the Mammoth Copper Mining Co.

Owens 3 claims surrounded on all sides by Balaklala Consolidated Copper Co.'s holdings. Inactive.

BALAKLALA CONSOLIDATED COPPER CO.

CALIFORNIA

Office: 111 Broadway, New York. **Works office:** Coram, Shasta Co., Cal.

Officers: Thos. W. Lawson, pres.; W. A. Kerr, v. p. and treas.; S. A. Holman, gen mgr.; preceding officers and H. W. Hoops, directors. A. R. Buchanan, sec.

Inc. Feb. 24, 1906, in Nevada. Cap., \$10,000,000, shares \$25 par. Bonds, \$1,500,000 have been retired.

Company was a reorganization of the Balaklala Mining Co., control of which was sold simultaneously to two parties, making a snarl requiring reconstruction to untangle. Is controlled, through ownership of entire stock

issue, by the First National Copper Co. Windsor Trust Co., New York, and Federal Trust Co., Boston, transfer agents; Trust Company of America, New York, and First National Bank, Boston, registrars.

Company report for fiscal year ending June 30, 1916, gives cash \$435,337, and total assets, \$10,800,829. Profit for two years ending June 30, 1916, amounted to \$79,265.

The report for year ending June 30, 1917, shows profit of \$444,309 compared with net profit of \$174,656 from resumption of operations in August, 1915, to June 30, 1916.

Profit and loss account:

Net ore sales.....	\$837,910
Cost of operations.....	393,601
Net profits	444,305
Other income	9,003
Total profit	453,311
Other charges:	
Exploration and development other property....	52,975
Experiments with Hall process	116,909
Dividend paid August, 1916	150,000
Total charges	319,884
Surplus	133,427
Previous surplus	79,265
Total surplus	212,693

Balance sheet of First National Copper Co., shows cash on June 30, of \$126,192, while Balaklala on same date had cash of \$373,977 in addition to demand loans of \$150,000.

Vice-Pres. Wm. A. Kerr says: "The past year's operations have been very successful, the mines having been operated continuously. Production of ore amounted to 108,465 tons, shipped to the Mammoth Copper Mining Co. under contract, from which net recovered values were 2.35% copper and \$1.25 in gold and silver, showing a net operating profit of \$444,309. Dividend of 40 cents a share was declared payable Aug. 15, to stock of record July 21.

"An extensive development program was carried on by diamond drilling throughout the year, which resulted in materially increased ore reserves, approximately 40 cents a ton having been spent on this exploratory work, which will be continued on a more liberal scale this year. An additional sum of \$52,975 was spent on exploration and development of other properties held under option by the company with view to prolonging its life."

Property: 65 claims, patented, 1,169 acres, also 800 acres of miscellaneous lands, including a smelter site, the town site of Coram and right-of-way for tram line. Mineral holdings are at Kimberly, in the Flat Creek district, 4 miles northeast of the Iron Mountain mine, and adjoin the Trinity mine. Property reported to carry 5 orebodies, with 2 developed. Apparently 4 orebodies are portions of the same ore zone, separated by faulting. Lands carry 3,040' of the strike of the main ore zone, developed for about 1,100'. Country rock is rhyolite, ore occurring in lenticular masses as replacement of country rock, in flat bodies, with slight dip to north, and greatest extension east and west, with a series of north and south step faults, causing displacement from a few feet to more than 100'. The two main orebodies are developed for lengths of 900' and 1,100'. Ore is cupriferous pyrite, copper values being mainly in chalcopyrite, with a little chalcocite and covellite, all carrying gold and silver values, estimated by management to average about 2.65% copper, 0.9 oz. silver and 50 to 60 cts. gold per ton. The larger orebody developing about 1,000,000 tons, gives a typical analysis of 2.7% copper, 0.95 oz. silver, 0.03 oz. gold, 21.4% silica, 31.5% iron, 0.3% lime, 3.4% alumina, 2.2% zinc and 35.2% sulphur.

Principal workings are known as the Windy Camp and Weil. The mine

has large reserves of low-grade ore. Development is by a large glory hole, and by tunnels, with upraises, providing for open-cast mining, giving cheap extraction, there being about 20 tunnels, including the Weil tunnel of nearly 6,000' length. Mining operations were resumed Aug., 1913, and were of a desultory nature for 2 years. The property has been working steadily since Aug. 13, 1915, shipping 250 tons of ore daily, increased May 13, 1916, to 300 tons, to the Kennett smelter of the U. S. Smelting Co. under a 10-year contract. Ore shipped assays about 2.81% copper per ton.

Ore reserves: said to be about 3,000,000 tons of 2.83% copper ore with 1.32 oz. silver and 60 cts. gold per ton.

Power equipment includes a steam plant installation of about 1,000 h. p. and electric power. Machinery includes a number of hoists, 5 compound air compressors and about 40 rock drills. Buildings include an office, store, school, hospital, sawmill and about 75 dwellings, all but the necessary mine buildings being located in the town site at the smelter.

The mine and smelter are connected by a Bleichert aerial tram of 16,130' length, of 75-ton hourly capacity, operated by gravity, having 62 wooden towers, highest 85'. The 1,700-ton smelter is thoroughly modern and well equipped. Ore passes through 4x10' revolving sizing drums, coarse material going to the blast furnaces and fines to the calciners. The 500' bin house has bins for ore, fluxes and fuel. The roast building has four 50-ton McDougal calciners.

The furnace building, of steel frame, no wood being used, has three 600-ton water-jacket blast furnaces, each 56"x240", first blown in Oct., 1908, and a 17x96' reverberatory furnace, of 150 tons daily capacity, for fines, burning petroleum, the waste heat generating power in 2 Stirling boilers, the power house having 3 additional Stirling boilers, burning petroleum. The converter plant has 96"x150" shells of horizontal type, and an electric traveling crane. The product when operating is 99% blister copper carrying 75 oz. silver and 1.5 oz. gold per ton, sent to Perth Amboy works for electrolytic refining. Power plant includes 3 Connersville blowers, each driven by a 450-h. p. tandem compound steam engine, direct-connected. The slag line has electric locomotives.

Although the smelter is about 14 miles from the nearest cultivated lands, the "smoke farmers" of northern California were busy and controversy with the Shasta County Farmers' Protective Association led to the installation of the Cottrell electrolytic flue dust precipitator, which took out the dust, but not the acid fumes, and hence was not successful. The Young process used at Campo Seco (Penn Mining Co.) and the Hall process were also unsuccessful. The Heslewood method in 1915 was the last one to be tried out, but was not satisfactory.

The smelting record is given in Vol. XI, the Copper Handbook.

Production: 1915-16, to June 30, 76,559 tons, netting \$174,656.

BALAKLALA COPPER CO.

CALIFORNIA

Reorganized as First National Copper Co.

BULLY CAVE CO.

CALIFORNIA

Address: c/o Hatch & Clute, 100 Broadway, New York. Mine at Winthrop, Shasta Co., Cal.

Officers: E. S. Hatch, pres.; Vincent P. Donihee, v. p.; Frank M. Clute, treas. and directors; Frank F. Gearn, sec.; E. J. McLaggan, supt. **Cap.** \$5,000.

Property: owns the McClure group and has an option on the Michigan group on Bully Hill adjoining and west of the Bully Hill Copper Co.'s mine. Claims show two mineralized shear zones with clay gouge walls and about 40 "ore channels" 1½' to 6' wide. The ore carries iron pyrite with chalcopyrite and zinc sulphide.

Development: by Hawkeye tunnel, 1,050' with 74' and 150' drifts; Ydalpom II tunnel, 1,115' and 3 drifts; North Star tunnel, 1,050' and 2 drifts; Recorder 1,600' drift and winze; Recorder II, 400' tunnel; Ydalpom I, 150 tunnel.

Equipment: includes all necessary machinery, houses, etc. Company also owns a gold mine at Cave Creek, Maricopa Co., Ariz.

BULLY HILL COPPER MINING & SMELTING CO. CALIFORNIA
Office: 30 Church St., New York. Mine P. O.: Winthrop, Shasta Co., Cal.

Officers: D. M. Riordan, 525 Market St., San Francisco, Cal., pres. and mgr.; L. B. Judson, v. p.; M. F. Westover, sec.; Herbert R. Hanley, asst. mgr.; preceding officers, A. H. Jackson, A. W. Burchard and J. B. Keating directors.

Inc. 1900, in New Jersey. **Cap.**, \$2,500,000; shares \$25 par, reduced 1905 to \$1,000,000. Bonds, \$400,000, issued for construction of Sacramento Valley & Eastern railroad, stock of which is owned by the Bully Hill. Is controlled, through practically entire stock ownership, by the General Electric Co., Schenectady, N. Y.

Property: 450 acres, 320 patented near Delamar, Shasta county, includes the Bully Hill, Rising Star, Rising Sun, and old Winthrop & Baxter groups, all in the eastern end of the copper belt. Owns 14-mile railway (Sacramento & Eastern), connecting with S. P. R. R. at Pitt station.

Geology: ore occurs in nearly vertical N. E.-S. W. shear zones, or veins, in metarhyolite, varying from 4' to 400' and averaging 30'. Definite walls, if present, are post-mineral gouges; basalt forms the east wall. The ore forms irregular lenticular bodies that average 45' wide by 200' long and are connected by narrow seams of ore. Ore is a complex mixture of sulphide carrying chalcopyrite with zinc and antimony and low gold-silver values.

Development: several tunnels, lowest No. 3, crosscutting the vein at 1,100' and 600' below the outcrop. A 950' shaft was sunk at this point with levels 100' apart, and all necessary connections for work and air.

The 400-ton smelter has one blast furnace, two calcining furnaces, five converters and all necessary machinery, etc. It has been idle since 1910.

Company built a small experimental plant at Delamar, Cal., to try out electric smelting and recovery of zinc values. This plant, remodeled in 1915, produces 300 to 400 lbs. metallic zinc per day, using direct electrolysis of zinc sulphate solution with regeneration of acid. (See Met. & Chemical Eng'g, Feb. 1, 1916, p. 120.) The ore has also been tested by the Minerals Separation Co.'s flotation process with favorable results.

In Oct. 1917, Rising Star shaft was repaired and silver-gold-copper ore from lower levels was being shipped to the Mammoth smelter at Kennett.

COPPER MOUNTAIN CONS. MINING CO. CALIFORNIA

Address: Harry K. White, 53 State St., Boston, Mass.

Supposedly dead. Former mine near Redding, Shasta Co., Cal. See Vol. XII, 1916.

DELTA CONSOLIDATED GOLD MINES CO. (THE) CALIFORNIA

Office: Redding, Shasta Co., Cal. Mine on Dog Creek, near Delta, Cal.

Officers: Dr. Sherman T. White, pres.; C. Tracie, v. p.; S. D. Furber, sec.; A. Bystle, treas.

Inc. Sept. 3, 1903, in So. Dakota. **Cap.**, \$2,000,000; shares \$1 par; outstanding 1,150,000 shares, assessable. Last assessment 1/2c. due Sept. 15, 1917.

Property: the Pioneer group of 11 patented claims, 115 acres, and 80 acres timber land, on Dog creek, 6 miles west of Delta, shows quartz veins in andesite, and ores contain gold, silver, and a little copper. Ore shoots average 2' in width, with length of 300' and are said to have average assay of \$22.40.

Development: by tunnels with 3,500' of workings. Management claims to have 20,000 tons ore blocked out. Idle since 1915, but intends building a 50-ton stamp mill and cyanide plant.

Company has built a narrow-gauge railway connecting with the Southern Pacific tracks at Delta.

FIRST NATIONAL COPPER CO.**CALIFORNIA**

See Balaklala Cons. C. Co.

Office: 111 Broadway, New York. Mine and works office: Coram, Shasta Co., Cal.**Officers:** Thos. W. Lawson, pres.; Wm. A. Kerr, v. p. and treas.; A. R. Buchanan, sec.; with Frank M. Leland, gen. mgr.; preceding, with H. W. Hoops, John A. Young and E. M. Buchanan, directors.**Inc.** Jan. 20, 1908, in Nevada. **Cap.**, \$3,000,000; shares \$5 par, assessable; paid in \$3.75; 600,000 shares outstanding. Cash on hand, June 30, 1917, \$128,192.

Is said to have 5,500 shareholders, including American Smelters Securities Co., owning 80,000 shares. Stock is listed on the New York and Boston Curbs. Empire Trust Co., New York and State Street Trust Co., Boston, registrars; Registrar & Transfer Co., New York, and International Trust Co., Boston, transfer agents. Annual meeting, last Thursday in October, at Carson City, Nev.

Is a holding company, owning the entire capital stock of the Balaklala Consolidated Copper Co., which in turn owns the entire capital stock of the Coram Water Co., and other subsidiaries and a third interest in the Balaklala Central Mining & Smelter Co. **Dividends:** 25 cts., Aug., 1916; 40 cts. Aug., 1917.

The mining property and smelter are described under the above titles. The smelter was shut down in 1909 by fume litigation in the California courts, and cannot resume operations until some device is successful in eliminating the damage done by smelter fumes. Mine closed Aug. 21, 1914, on account of low price of copper, and resumed operations Aug. 25, 1915. Shipping 300 tons of 2.8% ore daily to the Mammoth smelter of the U. S. Smelting Co. at Kennett, Cal. Company has entered into a 10-year contract with the U. S. Sm. Co. Management claims to earn about \$2.25 per ton on 19c copper.

The Balaklala Consolidated Copper Co. had a bond-issue of \$1,500,000, which was paid by the First National, in 4 annual installments of \$375,000 each. The First National authorized, 1909, a \$1,000,000 bond issue, flotation of which was a failure, but pledged some of these bonds for a loan of \$375,000, which loan presumably was paid by the proceeds of the last assessment. The stock was manipulated to \$10 per share by Boston interests in 1915. Property fully described under Balaklala Consolidated Copper Co.

FRIDAY-LOWDEN COPPER CO.**CALIFORNIA**

Idle. Letters neither answered nor returned from Redding, Shasta Co., Cal.

Officers: T. H. Benton, pres.; S. E. Bretherton, v. p.; John R. Lowden, sec.-treas. and gen. mgr., at last accounts.**Inc.** 1909. **Cap.**, \$2,000,000.**Property:** 15 claims, partly patented, 300 acres, near the Balaklala, Mammoth and Trinity mines. Considerable diamond drilling done is said to have proven extensive orebodies, and there are 5 tunnels of 800' aggregate length.**GARDELLA DREDGING CO.****CALIFORNIA**

Lawrence Gardella, who operated gold dredges at Oroville for several years, is manager of this company. Two boats have been working on Clear creek, near Redding, Shasta Co., for some time, and two more are being constructed. These will leave the tailing material level enough to use for agricultural purposes.

GOLINSKY MINING CO.**CALIFORNIA**

Mine near Kennett, Shasta Co., Cal. George Bayha, pres.; W. D. Tillotson, v. p. Sold to the Golinsky Copper Co. in 1911.

Property: 14 claims, adjoining the Mammoth mine on the east and 4

miles west of Kennett, shows an ore shoot 30' wide carrying low-grade copper ore with gold values. Equipment includes electric power. Idle.
GREEN HORN MOUNTAIN COPPER CO. CALIFORNIA

Offices: 401 Mills Bldg., San Francisco, and Green Horn Mt., Shasta Co., Cal.

Officers: Albert Hanford, pres.; M. E. Dittimar, v. p.; F. M. Lee, sec.-treas.; preceding, with Luther Elkins and Andrew Turner, directors. M. E. Dittimar, supt., Redding, Cal.

Inc. Sept. 25, 1915, in Nevada. Cap., \$400,000; shares \$1 par; outstanding May 5, 1916, \$250,000. Annual meeting, Jan. 15.

Property: 12 claims, 360 acres, 160 acres patented, on Green Horn Mt., in French Gulch mining district, includes the Green Horn mine. Said to show gold-silver-copper sulphide ore, occurring as a fissure in porphyry. Vein strikes N. 61° W., dips 40°. Assays said to average 4.5% copper per ton.

Development: 3,000' of tunnels. Greatest depth of workings, 480'. Management claims 120,000 tons of ore blocked out.

Production: for 1914, 25,118 lbs. copper; 1915, 36,283 lbs. copper; all
HAZEL GOLD MINING CO. CALIFORNIA

French Gulch, Shasta Co., Cal. J. O. Jillson, pres.; E. L. Young, supt.

Property: 178 acres patented and 485 acres, unpatented, at 2,300' elevation, on N. side of Cline Gulch, 5 miles N. E. of French Gulch, includes the Gladstone mine, the largest gold quartz producer in Shasta county. Claims were originally located by T. Cummings in 1896. After exhaustion of oxidized ore the mine changed hands several times until acquired by present company in 1901.

from 442 tons ore. Concentrator planned for 1916. No later returns.

Ore: free milling gold. Two fissure veins with E. W. strike and dip of 60° S. have been mined from adit level to 7th level; below 7th the dip changes to steep N.; average width 2½' to 3'; walls are slate. Ore shoot is 300' long. Milling ore averages about \$10 per ton.

Development: the upper 1,000' of vein has been mined by tunnels, while lower portion is worked from a winze on the main adit (Ohio) level. On the lowest, 1,300' level, a 700' crosscut cut the vein in Nov., 1915. Mine makes about 70 gal. water per minute.

Equipment: includes a 375-h. p. double-drum electric hoist, compressor plant, electric haulage from mine to mill, 9 miles of power and 5 miles of telephone lines. An electrically driven 30-stamp mill is equipped with concentrating tables and electroplating plant. Stamps weigh 1,050 lbs., drop 106 times per min., from height of 6"; capacity, 100 tons in 24 hours, through a 40-mesh screen; 92% extraction. Electric power is obtained from Northern Cal. Power Co. Company employs 140 men.

Production: previous to 1901, said to be \$85,000; 1901-1914 said to be \$3,000,000; yearly production about \$360,000.

See U. S. G. S. Bull. No. 540, pp. 35, 37, 46, 57-60; Mines & Min. Res. of Shasta Co., State Mineral Report 1915, pp. 43-44.

LITTLE BULLY HILL MINING & SMELTING CO. CALIFORNIA

Idle. Mine near Winthrop, Shasta Co., Cal. Cap., \$1,000,000; shares \$1 par.

Property: 5 claims, said to adjoin the Bully Hill mine, and to be opened by a 130' tunnel and several trenches, that show sulphide ore. Company's prospectus misleading and its operations apparently unsuccessful. No recent information secured. Probably dead.

LITTLE NELLIE MINING CO. CALIFORNIA

Address: Redding, Cal.

Operations resumed Oct., 1917, after two years' shut down, during which time 30 diamond drill holes were put down to an average depth of 800', defining lenses of 2% to 7% copper ore. Mill now running 15 stamps on gold ore; copper ore is to be shipped to Mammoth.

MAD MULE MINING CO.**CALIFORNIA**

Owens the Mad Mule mine, formerly known as the Banghart, 5 miles N. W. of Stella, in the Shasta mining district.

Mine is fully described in U. S. G. S. Bull. 540, pp. 40, 42, 52-54. See also Cal. State Mineralogist's Report 1915, Mines & Min. Res. of Shasta Co., p. 47.

MAMMOTH COPPER MINING CO. OF MAINE**CALIFORNIA**

Is a subsidiary of the U. S. Smelting, Ref. & Mng. Co., 55 Congress St., Boston, Mass. Mine office: Kennett, Shasta Co., Cal. A. P. Anderson, gen. mgr.; G. W. Metcalfe, mgr.; R. E. Hanley, supt., Mammoth mine; J. H. Kervin, supt., Mammoth smelter; D. G. Stuart, cashier.

Inc. Aug. 2, 1904, in Me. Cap., \$2,500,000; shares \$25 par; 60,000 issued, all owned by U. S. S. R. & M. Co.

Property: the Mammoth group which is the principal property, comprises 1,117 acres, patented, and 434 acres, unpatented, 3 miles N. W. of Kennett, on the Shasta route of the S. P. R. R. The orebodies consist of a series of long, flat lying lenses, occurring irregularly in a rhyolitic zone of pre-Devonian age, ore occurring mainly as replacements of porphyry in fissure and shear zones. Occasionally quartz phenocrysts are distinguishable, but usually little or no trace remains of the original rock. Ore as mined averages 4% copper and \$2 in gold and silver.

Development: consists of 5 tunnels, No. 5, the lowest serving as haulage tunnel. It is 10' wide, 8' high and supplied with 3' gauge track, 56-lb. rail and electric haulage. The current production of about 1,000 tons of ore daily comes from between the 600' and 2,100' levels.

Last year's exploration was vigorously carried on, and although some good ore was opened, there was not enough to replace the quantity mined. Reserves, therefore, show a decline. The small rich lenses in Sec. 29 are exhausted. A tunnel is in 1,400' to prospect this area, but has found nothing of importance.

Equipment: compressor plant with 4,960 cu. ft. capacity per min., supplies air for drills, and two 175-h. p. motor generators supply electric motors with direct current. There is a full surface equipment and quarters for 600 men. Precipitating tanks are located below the tunnel to catch mine water and recover from it its contained copper in the shape of copper cement which is reduced at company's smelter into blister copper.

Production: was 233,848 tons copper and 10,597 tons zinc ore in 1916. Mining costs averaged \$1.56 per ton and exploration and development costs \$0.59 per ton in 1915.

In addition to the Mammoth mine proper, the company owns the following properties:

Friday Lowden group: 150 acres patented, 188 acres, unpatented, adjoining the Mammoth on the south, was acquired in 1915. Crosscut tunnel 4,000' long, April, 1917, is expected to cut the Mammoth ore zone 400' below No. 5 tunnel near this point.

Spread Eagle group: 22 claims, 163 acres unpatented, 15 miles S. W. of Kennett, was bought in 1913. Shows large bodies of pyrite carrying low copper values. Exploration work being carried on and although no ore has yet been found, indications said to be favorable.

Stowell group: 10 claims, 188 acres, 128 patented, 1/2 mile W. of the Spread Eagle group, was bought in 1916 for \$78,000. Exploration work has yielded a reserve of \$48,100 tons of 3.71% copper ore carrying \$1.50 in gold and silver per ton. An aerial tram has been constructed, connecting with the old Balaklala tram. Output is 175 tons daily. Prospects are good, and the mine is equipped with plant equal to a large output.

Sheridan group: 45.7 acres, patented, belonging to the Balaklala Central Mng. Co., in which the Mammoth Co. owns 60% interest, is undeveloped, though surface indications are favorable.

Anderson group: 15 claims, 260 acres, unpatented, 4 miles N. of Kennett, was located 1914. Group covers an ore bearing zone and is being

prospected. No ore of commercial grade has yet been found. Diamond drilling was done in 1917.

Butters section: 2,719 acres, patented, 2 miles N. of Kennett, in the Shasta Co. copper belt, adjoins the Mammoth and Anderson groups. Is being prospected.

Little Mammoth group: 57 acres, patented, in the Old Diggins mining district, Shasta Co., 6 miles N. of Redding and 6 miles S. of Kennett, was acquired to supply silicious ore for the Kennett smelter. Mine was formerly producer of gold bearing quartz, but ore now in sight is too low-grade to pay. Idle.

Buchanan Mine: 57 acres, patented, 7 miles from Raymond, Madera Co., Cal., purchased 1909, contained a small vein of ore running high in copper, gold and silver. Ore was extracted and shipped and mine closed down.

Properties taken under lease by the company in 1917 include the old Shasta King, Donkey, Grotfend, Delta, and Keystone, all in territory contiguous to the smelter at Kennett. They have been equipped and are being developed.

Company also owns 195 acres, patented smelter site, $\frac{1}{2}$ mile N. of Kennett; 184 acres, patented town site and 657 acres additional tracts.

The Mammoth Co. also owns the Taylor iron mine, 14 miles from Nevada City, Nevada Co., Cal., comprising mineral rights to the Robinson and Sanford ranches. Orebody estimated to contain 188,047 tons of 1.65% copper ore carrying small gold-silver values and 47% sulphur. Ore is a heavy iron pyrite, low in silica, valuable for sulphuric acid manufacture. Property lacks railroad facilities.

The Mammoth Copper Mining Co. owns and operates a copper smelter at Kennett. The plant has 5 furnaces, 3 of which are in operation. The plant has a capacity of 450,000 tons of charge per year. The smelter is equipped with a converter plant from which the blister copper is shipped to the refinery of the United States Metals Refining Co. at Chrome, N. J. With the usual auxiliaries, the smelter is supplied with a large baghouse, the purpose of which is to render the emissions of the smelter harmless to agricultural interests. By reason of this baghouse it is the only one of the smelters in Shasta Co., which is permitted to operate; such permission having been obtained by a decree of the United States Court. As a by-product of the baghouse a fine dust is obtained which carries high values in various metals, and steps are being taken to recover the values, which it is expected will add materially to the revenues of the company. The smelter treats the whole output of the operating mines and is easily accessible from any of the mining territory in Shasta Co. which the company is exploring. The smelter is also treating custom copper ores originating in northern California and silicious ore from California, Nevada and Oregon. There are frequently found in the Mammoth group of mines copper bearing ore bodies that carry high percentages of zinc. The smelter is equipped with a sorting plant for these ores which turns out a high-grade zinc product. The smelter is equipped with a power plant, machine shop, boiler shops, round house, etc., to allow an uninterrupted and economical operation.

The ore is brought from the Mammoth Mines to the smelter by the company's system of transportation operating in 3 sections: 1st. It is drawn from the mine chutes into narrow gauge railroad cars and taken over a 2-mile electric railroad, equipped with two 25-ton locomotives, six 25-ton gondola cars and nine 10-ton flat cars, to a set of ore-bins. 2nd. From these bins the ore is taken down a steep inclined gravity railroad in skips to another set of bins. The gravity railroad has a length of 4,000' and a drop in this distance of 1,700'. The skips have a capacity of over 23 tons of ore and travel at a speed of 2,000' a minute. 3rd. From these lower bins the ore is taken to the smelter over a steam railroad operated with three 40-ton locomotives and 22 standard steel railroad cars. The capacity of the transportation system is ample for 1,500 tons of ore per day.

An electrolytic zinc plant costing \$350,000 has been built on Backbone creek a mile above the smelter, using same process as that in operation at

Winthrop by the Bully Hill Copper Co. The new plant has 25,000 tons of baghouse dust to start with, that carries 23% zinc beside gold, silver, cadmium, bismuth and antimony.

Company employs about 1,200 men.

MOUNTAIN COPPER CO., LTD.

CALIFORNIA

Secretary's address: 3 Lombard St., London, E. C., England. Operating office: 332 Pine St., San Francisco, Cal. Mine office: Keswick, Shasta Co., Cal. Works office: Martinez, Contra Costa Co., Cal.

Major F. B. Lawson, chairman; Henry J. Wenham, J. T. Middleton, E. T. McCarthy and A. N. Frewer, directors; Wm. F. Kett, gen. mgr.; W. L. Cole, mine supt.; T. B. Swift, smelter supt.; Jardine, Matheson & Co., Ltd., 74 Wall St., New York, American sales agents.

Inc. Dec. 1, 1896, in Great Britain, and reorganized May 10, 1902. Cap., £250,000; shares £1 par. In 1899 the company changed its capitalization of £1,250,000 into £250,000 in shares and £1,000,000 in 6% debenture stock; shares £4 par, on which a first payment of £1 per share was made Jan. 16, 1905, leaving £750,000 of stock outstanding. The change in 1899 was practically a complete amortization.

Balance sheet for 1915 showed profit of £78,325.

Dividends: before reconstruction, 1897-1901, aggregated 58½%. Profits were £150,255 in 1907; £28,112 5d in 1908; £24,557 12s 4d in 1909; a deficit of £3,042 in 1910; profit of £55,069 in 1911; £81,686 in 1912; £53,456 in 1913; £35,562 in 1914; £106,365 in 1915; £232,106 in 1916.

Property: is extensive, including the Iron Mountain and Hornet mines, 10 miles N. W. of Redding. The Iron Mountain mine was opened, 1880, for silver, and had a 20-stamp mill, treating the gossan in a small way for some years after 1884.

The Iron Mountain mine had a gossan of 100' to 300' width, covering a lens of ore, 100' to 400' wide, 800' long and 500' deep, in a shear zone of meta-rhyolite. The ore carries chalcopyrite associated with pyrite, averaging about 5% copper, 2 oz. silver and slightly under \$1 gold per ton. The orebody was worked pillar-and-stall, and stopes filled with waste, but pillars have been robbed and the mine now shows little high-grade sulphide ore, though there are reserves of 500,000 tons of silicious ore averaging 4 to 5% copper. The old orebody being pyrite, there was trouble from fires, but the application of the plenum system of ventilation, by Mr. Wright, restored normal conditions. Considerable cement copper was secured from the charged waters coming from the fire zone.

Ore reserves in No. 8 mine at end of 1915 were 187,000 tons, and in Complex mine, 75,000 tons.

The Hornet mine, lying to the north of the Iron Mountain, developed about 5,000,000 tons of pyrite ore, averaging only about 1% in copper tenor, with patches up to 2.5% copper, and carrying 47 to 50% sulphur. Gold and silver values are very small but the ore is valuable for the manufacture of sulphuric acid, saving the small copper and precious metal values as by-products.

The mines are connected with Keswick by an 11-mile narrow-gauge steam railway, traversing a rugged country, with an average grade of nearly 4%, the elevation gained being 2,000'.

In Sept., 1917, company was treating an average of 500 tons daily in its flotation mill. Including mill concentrates, pyrites from the Hornet mine and other ores, about 15,000 tons a month are shipped from the mines to the Martinez smelter.

Employs about 500 men in Shasta Co. and 200 at the smelter in Contra Costa Co.

The Keswick smelter, fully described in Vol. VIII, Copper Handbook, has been dismantled. A 250-ton oil flotation mill started operating in March, 1915 and was enlarged to 500 ton capacity in 1917. It is located 5 miles from Iron Mountain on the narrow gauge railway.

The 350-ton Martinez smelter, on San Francisco bay, has one of the most extensive and best planned acid works in existence, built at a cost

of approximately \$1,250,000. The Hornet ores, low in copper but rich in sulphur, are burned, the sulphur fumes collected in lead-lined chambers and transformed into sulphuric acid by the Meyer chamber process, the cinder remaining after the roasting is smelted for its copper contents. The acid is sold crude and also is used as the basis of commercial fertilizers for which there is a considerable demand in the rich fruit and agricultural districts of California and the other Pacific coast states. The Martinez works also do a general custom business and are fully equipped with steam, electric and pneumatic power.

A 150-ton leaching plant was added to the smelter in 1917, and is successfully extracting copper from the cinders remaining after the sulphur is burned from the Hornet sulphide in the manufacture of sulphuric acid.

Production: Sept., 1917, was at the rate of 650 tons daily from the mines at Iron Mountain, and 350 tons daily from the Hornet. At one time, only a decade ago, this company was among the largest copper producers of the world, but has since greatly declined in output, production having been 29,727,040 lbs. fine copper in 1901; 19,116,160 lbs. in 1903; 6,814,000 lbs. in 1907; 3,638,619 lbs. in 1908; 2,775,197 lbs. in 1909; 2,987,815 lbs. in 1910; 5,400,000 lbs. in 1911; 5,614,000 lbs. in 1912; 6,890,000 lbs. in 1913; 5,454,000 lbs. in 1914; 7,280,712 lbs. in 1915; 9,172,390 lbs. in 1916.

Company has been managed with great prudence and marked success, both financially and technically and notwithstanding the depletion of an originally rich mine, has been able to make a successful change of base by which low-grade pyrite ores are utilized for the manufacture of acid.

MOUNTAIN MONARCH GOLD MINING CO. CALIFORNIA

Probably dead. A Shasta Co. promotion. See Vol. XII.

PITTSBURGH & MOUNT SHASTA GOLD M. & M. CO. CALIFORNIA

Office: 403 Real Estate Savings Bldg., Pittsburgh, Pa. **Mine office:** Keswick, Shasta Co., Cal.

Officers: J. J. Schneider, pres.; Buffalo, N. Y.; R. Schmitt, v. p.; T. V. Scott, sec.-treas.; above with E. G. Lang, J. S. Phillips, F. A. Johnston, F. L. Hadley, R. W. Medick, G. E. Meyer, J. P. Jayme, B. H. Scott, G. H. Clapp and H. C. Steul, directors; C. F. Wieland, mgr.; J. J. Partington, supt.

Inc. 1903, in West Virginia. **Cap.**, \$2,500,000; shares \$1 par. Bonded debt, \$117,000 (\$200,000) authorized 6% first mortgage notes, due May 20, 1919.

Property: 10 claims, patented, 175 acres, known as the Bennington group, in the Flat Creek district, north of Redding, said to have been bought for \$18,000 cash and \$60,000 shares, also 24 patented claims, the Alleghany group.

Development: several thousand feet of underground work. A 4,400' main tunnel and 2 other tunnels show a vein of gold and silver-bearing copper ore, of varying tenor. Two diamond drills working, 1917.

Equipment: includes 15-stamp mill, carpenter shop, smithy, boarding house and 3 bunk houses, with electric power.

SHASTA BELMONT MINING CO. CALIFORNIA

Office: Carson City, Nev. **Mine office:** Winthrop, Shasta Co., Cal.

Officers: Will E. Casson, pres.; W. Brougher, v. p.; Jas. T. Davis, sec.-treas.; with S. L. Lee, W. H. Cavell, directors. Wm. Arps, supt.

Cap., \$1,000,000; shares \$1 par; 700,000 issued, and 50,000 offered at 25c each in Dec., 1916.

Property: 8 claims, unpatented, 140 acres, known as the Graham group, in the Copper City district and in the west central part of the Shasta copper belt. The group is about 3 miles east of the Bully Hill mine and smelter, and 8 miles from the Mammoth mine. The property is said to have a surface outcrop resembling that of the Bully Hill mine.

Development: by a 75' shaft, 4 short tunnels and several opencuts, all showing streaks and bunches of high-grade copper ore. Buildings include a cabin and smithy. Company did development work in 1914-1915 and made one small shipment of ore to the Mammoth smelter, which ran 7.21%

copper and about 4 oz. silver. Driving lower tunnel to reach the main ore-body. In Aug., 1917, the lower tunnel was being extended to open a small rich vein and in September the Leonard crosscut had cut 13' of copper ore.

SHASTA COPPER EXPLORATION CO.**CALIFORNIA**

Redding, Shasta Co., Cal. M. E. Dittmar, mgr.; O. Scribner, sec.; Chas. Wheelock, supt.

Property: about 650 acres, lying between the Balaklala and Iron Mountain mines, near Kennett, is developed by 8 tunnels, of about 3,000' aggregate length. No. 7 tunnel cut 3 small stringers of copper ore. Company did a large amount of exploration and development work, 1915, but no recent report has been received despite repeated requests mailed them.

SHASTA-KENNETT COPPER CO.**CALIFORNIA**

Address: M. B. Lindley, Room 608, No. 136 Liberty St., New York City. Mine office: Kennett, Shasta Co., Cal.

Inc. 1907, in Colorado. Cap., \$2,500,000. W. R. Girdner, M. J. Jordan and L. E. Dabold, organizers.

Property: near Kennett, has a 600' tunnel, said to show ore bodies carrying low to medium grade copper ore.

SHASTA MAY BLOSSOM COPPER CO., CONS.**CALIFORNIA**

Office: 604 Mills Bldg., San Francisco, Cal. Mine office: Winthrop, Shasta Co., Cal.

Officers: Frank J. Blake, pres.; Simon Peter, v. p.; Kingsley W. Cannon, sec.; Carl Henrich, treas.; M. B. Lindley, directors.

Inc. 1903, in Arizona, as a reconstruction of the Shasta May Blossom Mining & Smelting Co. Cap., \$10,000,000; shares \$1 par.

Property: known as the Keith group, has 22 claims, about 300 acres, ½ mile N. of De La Mar, in the Pittsburgh or Copper City district. The claims show prominent outcrops and have several deposits between granite porphyry footwalls and slate hangings. The East vein outcrop, said to be 30' wide and traceable for about 1,500', shows copper ore with gold and silver values. The middle vein, 5' to 40' wide and said to be traceable, 1,900', carries sulphide ore, and is opened by tunnels of 200', 300' and 650', with about 1,500' of workings said to show a considerable tonnage of chalcopryrite ore. The West vein, reported to be upwards of 100' in width, has a 100' shaft and 780' tunnel which show ore giving assays of 2 to 7% copper and \$2 to \$2,000 per ton in combined gold and silver values. The mine, as a whole, is reported to have about 4,000' of workings.

In 1917, company reports that it is driving the "Compressor," or lower tunnel toward the 7 outcropping lodes.

Equipment: includes a hoist, air compressor, electric light and power station and machine shop.

SHASTA MONARCH MINING CO.**CALIFORNIA**

Redding, Shasta Co., Cal. T. W. Rogers, supt.

Property: 80 acres at Stella (Whiskeytown), Shasta Co., has been worked for many years; credited with a production of \$127,000 from 1870-1912. There are 4 parallel veins, strike N. 50° W., dip 50° N., in alaskite porphyry near the contact with meta-andesite; pay shoot averages 18" in width; ore is free milling.

Development: by tunnels.

Equipment: includes a 10-stamp mill, erected 1914, at which time 10 men were employed. (For geology, see U. S. G. S. Bull, 540, pp. 38, 39, 50, 51.)

SHASTA NATIONAL COPPER CO.**CALIFORNIA**

Office: Flatiron Building, San Francisco, Cal.

Officers: W. H. McEwen, pres.; M. P. Fries, v. p. and gen. mgr.; Horatio Alling, sec.-treas.; with S. S. Norton and A. Kennedy, directors.

Inc. in 1917. Cap., \$5,000,000; shares \$1 par. Company was organized to develop 1,000 acres of copper bearing land adjoining property of Mammoth Copper Co., Shasta Co., Cal.

STOWELL MINE.

Owned by Mammoth C. Mining Co. and described thereunder.

TRINITY COPPER CO.**CALIFORNIA****CALIFORNIA**

Office: 33 State St., Boston, Mass. Mine office: Kennett, Shasta Co., Cal.

Officers: Thos. W. Lawson, pres.; Arnold Lawson, v. p.; John M. Reynolds, sec.; Allen Arnold, treas.; preceding with Arthur P. French, John N. Reynolds, John R. Turner, E. A. McSweeney, directors.

Inc. Oct. 18, 1900, in New Jersey. Cap., \$8,000,000; shares \$25 par; 240,000 shares outstanding. International Trust Co., Boston, registrar; Federal Trust Co., Boston, transfer agent. Shares listed on Boston Stock Exchange and on the New York Curb. Federal Trust Co., Boston, transfer office.

Trial balance as of Sept. 1, 1916, showed assets totaling \$6,188,744, including \$5,221,000 for property, \$711,980 for development and construction, \$218,799 for expenses through Eastern office, \$56,500 for railway and power company, and \$464 cash. Liabilities include A. S. & R. smelting contract payable in ore, \$28,548; ore account, \$39,471; and accounts payable, \$120,725.

Property: 1,700 acres, also a patented town site, near Kennett, with total holdings of 3,233 acres. Property includes the Shasta King, which is the principal mine, the Lost Desert and King Copper groups.

The Shasta King group, 12 claims, adjoins the Balaklala mine, on the southern fork of Squaw creek, 4 miles east of Iron mountain. The main double track tunnel is 1,145' long; there is another tunnel driven 175' vertically lower. The mine has 15,000' of workings and property has been tested by 5,119' of diamond-drill borings.

The orebody is a lens, claimed to be approximately 150' wide by 1,000' long, but apparently the ore does not go to great depth, and it is possible that the bottom limits have been reached. The property is said to have ore reserves of 400,000 tons, with fair chances of 750,000 tons, and possibilities of a greater tonnage. The crosscut tunnels, driven in from the sides of the mountain, connect with drifts on the orebody, which is low-grade pyritic ore containing disseminated chalcopyrite, and holding 1 to 2½% copper, with combined gold and silver values of about \$1 per ton. The ore carries small quantities of zinc and an excess of iron, and probably averages around 2½% copper and 1 oz. silver per ton, with small gold values. The Trinity also has an orebody, of undetermined size, on the opposite side of the gulch from the Shasta King.

The Shasta King mine has ore bins, and a 2,000' incline tram, of about 500 tons daily capacity, leading to the head house of the Balaklala tramway. The Copper King group of 22 claims, on Motion creek, about 2½ miles S. of the Shasta King mine, has about 1,000' of exploratory workings, but apparently no ore has been found in place. The Statesman group has been partially explored, in an effort to locate and develop silicious ores required for fluxing the heavy sulphide ores of the Shasta King mine. The Uncle Sam group, held under bond and lease at last accounts, also has been explored for fluxing ores, the Shasta King having large bodies of low-grade copper sulphide, but lacking the silicious ores required to make free-smelting furnace mixtures. The Uncle Sam group shows some oxidized ore, at and near surface, of 3 to 8% copper tenor.

Equipment: includes a steam plant with 6-drill air compressor and power drills; also a diamond drill, with which considerable boring has been done. Buildings include a laboratory, warehouse, shops, hospital and about 25 houses for employes.

The company was reported to be ready for production Sept., 1907, at the rate of about 150 tons daily. It started production Oct., 1908, and shipped ore to the Balaklala smelter, but closed down early, 1909, and no record of the actual production of copper can be secured. The Trinity Co. claimed to have a contract with the Balaklala smelter calling for the treatment of 300,000 tons of ore for the first year and 360,000 yearly for the 9 succeeding years; with a minimum of 300 and maximum of 1,000 tons

daily, which was to have been matted for \$3 per ton, but the contract was not carried out, and the mine has been closed down since Feb., 1909, waiting first for 15 ct. copper and now for the Balaklala smelter to resume operations. For history of the company, see Vol. X, Copper Handbook.

President Lawson stated, at the annual meeting, 1913, that Trinity's day will come and that the property's decriers will be forced to "eat their born-of-ignorance criticisms." His statement was in part as follows: "Trinity is still awaiting the resumption of First National-Balaklala smelting operations, and if these efforts are successful, the unbroken chain of Trinity's misfortunes should be at an end."

On Aug. 13, 1917, T. W. Lawson told shareholders that the mine was again in operation and the entire property to be diamond-drilled; also that an advantageous 10 to 15-year contract had been made with the U. S. S. Co. for 200 tons of 3% ore daily. Furthermore that even if no additional ore is discovered the present developed deposit will supply 3% ore for many years. He added that a mining and financial statement would soon be made. He advises: hold on to shares, as Lawson tips on Butte, Chino and Copper Range were all correct. Verbum sap.

VICTOR POWER & MINING CO.

CALIFORNIA

Office: J. H. Sharpe, 828 Hearst Bldg., San Francisco. **Mine office:** Knob, Cal.

Officers: J. H. Sharpe, pres.; A. Bonick, v. p.; A. A. Barber, sec.-treas.; with A. W. Kirk and G. C. Garrett, directors.

Inc. Oct., 1907, in California. Cap., \$500,000; shares \$1 par.

Property: 3,400 acres in Harrison Gulch, Shasta Co., Cal., including the Midas, Gold Hill, Bonanza and other mines. The first named is credited with a gold yield of \$4,000,000.

Geology: quartz vein in diabase and slate, dipping 74° and pitching N. W. The orebody is 12' wide and 200' long, ore averaging \$22 per ton.

Development: by 1,200' vertical shaft. **Workings total 45,000'.**

Equipment: includes 250 h. p. Diesel engine, 70 h. p. electric hoist, 90 h. p. compressor, three 20 h. p. pumps and 80-ton concentrating plant.

SIERRA COUNTY

ANDY FITZ M. & M. CO.

CALIFORNIA

Address: 1391 Fruitvale Ave., Oakland, Cal. Andrew Fitzgerald, supt.

Property: The Fruitvale mine, in the Allegheny district, near Downiesville, Sierra Co., carries a vein of gold quartz ore. Developed by tunnel.

Company refinanced 1914 and underground development work to be resumed.

CROESUS MINING CO.

CALIFORNIA

Office: 734 Fifth Ave., New York. D. F. Sheehan, supt.; Chas. W. Smith, mill supt.

Property: the old Plumbago mine at Allegheny, Sierra Co., Cal.

Ore: gold quartz in veins in granite and amphibolite schist. Veins strike N. W.; dip N. to N. E. Ore usually occurs as small masses of high-grade in nearly barren quartz. See U. S. G. S. Bull. 580, pp. 176, 178.

Development: by tunnels, the longest over 4,000'.

Equipment: 15-stamp mill at Plumbago mine, put into commission July 5, 1915. Employs about 50 men.

GRAY EAGLE GOLD MINING CO.

CALIFORNIA

Address: Pacific Bldg., San Francisco, Cal.

Property: at Downiesville, Sierra Co., Cal. S. C. Love, supt. Was examined by New York interests in 1916.

KATE HARDY MINES CO.

CALIFORNIA

Office: Bacon Bldg., Oakland, Cal., A. D. Grant, supt.

Property: the Kate Hardy mine and mill at Forest, Sierra Co., Cal., has been operated intermittently since 1860 and is credited with a production of over \$225,000 in gold. Six veins have been cut on the property from

6-10' wide, carrying mainly oxides, but some sulphides. The main vein runs N. 20° W. and dips about 80° W. Pay ore occurs in patches of free gold and auriferous arsenopyrite. Developed by several tunnels, longest 600'.

Equipment: includes a 3-stamp mill, 1 classifier and Wilfley tables.

Geology: fully described in U. S. G. S. Bull. 580, pp. 181.

No recent information, but probably working irregularly.

NORTH FORK MINING CO.

CALIFORNIA

Office: 405 Crocker Bldg., San Francisco, Cal. **Mine office:** Forest, Sierra Co., Cal. **Geo. W. Stone, gen. mgr.**

Property: the North Fork mine, in Alleghany district, near Forest, shows a 2' quartz vein carrying arsenical sulphides and free gold. Developed by 1,000' crosscut in amphibolite, and a 20' incline shaft. Plan erecting 5-stamp mill and sinking shaft to 400'. In May, 1917, rich ore was cut at 265' in the incline shaft.

ORIENTAL GOLD MINING CO.

CALIFORNIA

Under lease to Croesus Gold M. & M. Co., 734 Fifth Ave., N. Y. City. **Mine office:** Alleghany, Sierra Co., Cal. **D. F. Sheehan, mgr.**

Property: the Oriental mine, on Kanaka creek, about 1½ miles W. of Alleghany, has 2 quartz veins in granite and schist, with strike N. 70° W., and dip 35° N. The ore contains pyrite, arsenopyrite and gold.

Development: by tunnel 4,150' long and several crosscuts.

Equipment: includes 10-stamp mill with two 6' Frue vanners. Property was idle for several years, but lease was acquired by the Croesus Gold M. & M. Co., and development work is now under way.

SIERRA ALASKA MINING CO.

CALIFORNIA

W. S. Schuyler, pres.-mgr., Pike, Cal. J. F. Dickson, v. p.; O. Crook, sec.

Inc. Jan. 22, 1912, in California. Cap., \$2,000,000; \$1 par; all issued.

Property: near Pike, Sierra Co., carries a quartz vein with gold and pyrite, without base sulphides. Developed by 900' shaft and 1,700' of workings.

Idle, 1917. Has a 40-stamp mill with 10-ton cyanide annex.

SIXTEEN TO ONE MINE

CALIFORNIA

Property: situated ¾ of a mile south of Alleghany, Sierra Co., Cal., was located in 1908 and is credited with a production of \$150,000 to \$300,000 in gold to 1914.

Ore: quartz in a vein ranging from a narrow streak up to 4' in width. Country rock is amphibolite.

Development: by tunnels, main tunnel 900' long. Twenty men employed at last accounts. Production not given, like many other Californian mines.

TIGHTNER MINE

CALIFORNIA

Address: A. B. Foote, North Star Mines, Grass Valley, Cal.

Property: near Alleghany, Sierra Co., Cal., formerly owned by H. L. Johnson, and sold to Grass Valley men for \$550,000, the last payment being made in June, 1917.

Dividends: not published; but from \$100 to \$1,000 per share has been paid at various times, totaling fully \$1,000,000 in 5 years.

Geology: quartz vein in amphibolite schist, which is much altered and sheared near the walls of the vein. Faulting is frequent, and the shoots irregular.

Ore: carries gold, often in large, coarse particles and masses, associated with arsenopyrite and galena.

Development: in early days a bedrock tunnel in a drift-gravel mine cut a vein, but no attention was paid to it until 1907, when the tunnel was reopened and about \$400,000 extracted up to time of selling to present owners in 1911. The lower tunnel is over 4,000' long.

Equipment: complete, with 20-stamp mill.

Production: not published, but \$1,000,000 to June, 1913, and fully as much since.

SISKIYOU COUNTY

BELGIUM-BOHEMIAN MINING CO.

CALIFORNIA

A Belgium company, that in 1914, owned the Highland mine, Liberty mining district, 11 miles S. E. of Etna Mills in the Klamath Reserve, Siskiyou Co., Cal.

Property: 100 acres at 640' elevation.

Ore: free-milling gold in shoots 130' long and 2' wide; strike N. 40° E.; dip 30° S. E. Footwall is a dioritic schist and hanging-wall is quartz porphyry.

Development: tunnels with several thousand feet underground workings; main tunnel 600' long. All work has been done near apex of mountain so that only a shallow depth has been obtained. Supplies are packed in over a 3-mile trail.

Equipment: includes a 10-stamp mill, run by gasoline. Mine is credited with a production of \$350,000.

BIG CLIFF MINING CO.

CALIFORNIA

Idle. Does not reply to letters. See Vol. XII. Mine in Salmon River district, 18 miles from Etna Mills, Siskiyou Co., Cal.

BLUE LEDGE MINE

CALIFORNIA

Office: 82 Beaver St., New York City. Mine near Hutton, Siskiyou Co., Cal. Property is held by the Mexican S. & R. Company, a subsidiary of the Compania Metalurgica Mexicana. Mine shipping to Tacoma, 1917.

Property: 27 claims, patented, about 440 acres in the Elliott mining district on Upper Appelgate river, 4 miles south of the Oregon line, also a large smelter site at Seattle Bar. Property located 1889, but only slightly developed until 1909. Company has spent over \$700,000 in work since that time.

Geology: the vein, with strike of N. 10° S., and almost vertical dip, slightly inclined west, traceable some 3,000' by prominent outcrops of 50 to 250' width, lies between a footwall of gray to black, slightly micaceous schist, and a hanging wall of soft white mica-schist, the walls not always being clearly defined, and with mineralization extending into the hanging wall. Orebodies are lenticular deposits, with clay gouge, said, by several authorities, to be in huge laminations in the schist formation, but ore apparently is persistent to depth. Ore is mainly chalcopyrite, associated with a little sphalerite and occasional native copper, average value being 6% copper and \$5 gold per ton.

Development: 9 tunnels, with upwards of 2 miles of workings and nearly 7,000' of diamond drilling.

Vein averages 5' in width and the mine workings block out 110,000 tons of 6% ore with 70,000 tons more probable. Main working tunnel is connected with others, by raises to surface 500' above. A winze opens a 600' drift on ore, 300' below the main tunnel. The mineralized wall rock carries commercial values and contains lenses of high grade ore, but above estimate refers to the quartz vein only.

Equipment: includes a hydro-electric power plant, taking water from Elliott creek under a head of about 150', at pressure of 85 lbs. Buildings include an office, assay office, boarding house, dwelling and sawmill. The company has improved the town site with waterworks, sewers and a school house, and has built a good road between Hutton and Yreka. A 40-mile railway to connect with the Southern Pacific, at Medford, Ore., has been projected. Mine is an important producer in 1917, shipping its high-grade ore to Puget Sound smelters.

DAKIN MINE

CALIFORNIA

See Mason Valley Mines Co.

FORKS OF SALMON RIVER MINING CO.

CALIFORNIA

Care A. C. Aiken, pres.; Flatiron Bldg., San Francisco Cal. Mines at Sawyer's Bar, Cal., and Blairsden, Plumas Co., Cal. B. M. Newcomb, v. p.; F. M. Doak, sec.-treas.

Inc. Nov. 1, 1909, in Cal. Cap., \$200,000; shares \$1 par; all issued.

Property: two mines, one a hydraulic mine, located on the North Fork of the Salmon River, 14 miles from Sawyer's Bar, Siskiyou Co., and the other an old quartz mine near Sierra City, Cal.

Development: by 3 tunnels of 1,700', 1,300' and 2,500', one with back of 1,500'.

Ore: in shoot 6' wide and 600' long averaged nearly \$20. Development work is now being done at both properties. At the hydraulic mine, enough gravel is being washed to pay a small profit; it is one of the best equipped hydraulic properties in California, and is served by 4,500 miners inches of water through a flume 4 miles long, delivering it at a pressure of 250'. The company has 10 years supply of gravel. The old works at the quartz mine are being cleaned out preparatory to an examination.

Production to date, \$3,000,000.

GREY EAGLE COPPER CO.

CALIFORNIA

Office: 14 Wall St., New York. Mine office: Happy Camp, Siskiyou Co., Cal. Wm. Koerner, supt.

Property: 40 claims, 16 patented, owned by the Mason Valley Mines Co. (which see) of Thompson, Nev., said to show a blanket copper sulphide deposit in mica-schist, with dip of 15° N. E. and N. W. strike.

Development: by tunnels. Considered promising.

ISABELLA COPPER MINING CO.

CALIFORNIA

Directors: K. E. Rader, M. A. Fesler, Howard W. Williford, of Berkeley; E. J. Rader, Sacramento, and E. E. Rader, of Barzilla, San Mateo Co., Cal.

Inc. 1911. Cap., \$500,000. Property in the Etna Mills district, Siskiyou Co. A 100' tunnel was being driven at last accounts.

JOE CREEK COPPER CO.

CALIFORNIA

Idle. Hutton, Siskiyou Co., Cal. Is one of the many prospects of the copper belt of northern California, whose owners believed a copper out-crop could be made to pay cost of development and equipment from ore mined from shallow workings.

Property: apparently owned formerly by Copper King Mining Co., lying between the Blomfield group and the Blue Ledge mine, has opencuts and crosscuts developing the mine to a depth of 400'. Mine is said to carry several large orebodies, ranging 5 to 8% in copper tenor and \$8 per ton in combined gold and silver values, an estimate considered excessive.

KING SOLOMON MINE.

CALIFORNIA

Owned by C. B. Cottrell, Westerly, R. I. W. H. Young, supt. Cecilville, Siskiyou Co., Cal.

Property: 40 acres in Secs, 6 and 7, T. 38 N., R. 11 W., near Randsburg, in the Liberty Mining district, Siskiyou Co., Cal., shows a 5' vein of free milling ore, with quartz porphyry foot and slate hanging-wall. The vein runs N. S. and dips 60° E. Developed by 460' tunnel, 130' shaft and drifts.

Equipment: includes an 8-stamp mill, hoist, boiler and buildings.

In June, 1917, mill was working nearly 2 shifts daily on ore from 450' depth.

MEXICAN SMELTING & REFINING CO.

CALIFORNIA

Office: 82 Beaver St., New York. A subsidiary of the Compania Metalurgica Mexicana and holds title to the Blue Ledge mine in Siskiyou Co., Cal., which see.

TRAIL CREEK MINING CO.

CALIFORNIA

Callahan, Cal. G. A. Foster, pres. and supt.; G. Hart, sec.

Property: 100 acres in Trail Creek, Siskiyou Co., reached by trail from Callahan. A fissure vein occurring between schist walls, dips 60° N., course N. 40° W., is said to carry an ore shoot 300' long and 2' wide. Workings consist of 850' tunnel, drifts and a stope 200' long.

Equipment: includes two Huntington mills, run by water power and several buildings. Owners claim 3,000 tons ore reserves. Production to July, 1915, \$40,000.

SOLANO COUNTY

SAINT JOHNS MINES CO. (quicksilver)

CALIFORNIA

Address: Box 606, Vallejo, Cal.

Officers: C. G. Dennis, pres. and mgr.; John Martin, v. p.; C. F. Colmar, sec.

Inc. June, 1914, in Cal. Cap., \$150,000; shares \$1 par; outstanding \$90,000. Transfer office: 600 Call Bldg., San Francisco. Annual meeting, January 1.

Condensed balance sheet for 1916 shows: assets, \$106,603. Liabilities include: capital stock, \$90,000; surplus, \$8,198; other liabilities, \$8,405. Gross earnings, 1916, reported as \$40,202 with operating expenses of \$40,310.

Property: 713 acres on Soscol ranch, 6 miles N. E. of Vallejo. Solano Co., is said to show cinnabar ore occurring as bunches in sandstone and shale over a width of 2' to 30'. Developed by 320' shaft and tunnels; greatest depth of workings, 320'. Management reports 12,000 tons ore blocked out, average assay 0.27 quicksilver.

Equipment: includes a 25 h. p. gasoline hoist, two 7½-ton Neate and one 15-ton Scott furnace, capacity 30 tons daily and a 25 h. p. oil engine with 15 kw. generator.

Production: 1916, 9,068 tons ore, yielding 48,675 lbs. quicksilver; 5.37 lbs. recovered per ton of ore; cost per 75 lb. flask, \$82.11.

SUTTER AND TEHAMA COUNTIES

CALIF. & MASS. COPPER MINES CO.

CALIFORNIA

Inactive. Described Vol. VIII. Property at Red Bluff, Tehama Co., Cal., is leased for 99 years to Chicago Copper Refining Co., which see.

CHICAGO COPPER REFINING CO.

CALIFORNIA

Office: Kesner Bldg., Chicago, Ill. Mine office; Red Bluff, Tehama Co., Cal.

Officers: Wm. Wrigley, Jr., pres.; A. G. Cox, v. p.; N. E. Guyot, sec. and supt.; Edw. Dickinson, treas.; preceding, with Chas. P. Whitney, directors.

Inc. Aug., 1908, in Wyoming. Cap., \$2,000,000; shares \$5 par; non-assessable. Has no connection with the Chicago Copper Refining Co. of Illinois, now bankrupt.

Has a 99-year lease on the property of the California & Massachusetts Copper Mines Co.

Lands: 72 claims, 1,600 acres, unpatented, well timbered and watered, on Tom Head mountain, 25 miles west of Red Bluff, known as the Tom Head mine.

Geology: property shows schists, cut by rhyolite dikes, carrying 3 veins, with gossans of 90 to 300' width, 1 vein of 30' estimated average width, carrying chalcopyrite, associated with pyrite, estimated to assay 2 to 3% copper, 0.5 oz. silver and \$1.40 gold per ton. Mine formerly was reported to carry bornite and native copper, and No. 3 tunnel is said to have given ore assaying up to 18% copper, with small gold values.

Developed: by tunnels of 45', 355' and 460', with about 2,000' of workings, estimated by management to show 250,000 tons of ore.

Equipment: includes an 80 h. p. steam plant, with a small hoist and 4-drill Sullivan air compressor. Lands carry undeveloped water power, estimated at 3,200 h. p. There is a 4,000' sawmill, and 10 buildings. Management is said to plan experiments with flotation process. Property, though low in grade, gives evidence of having large orebodies. Superintendent reports that "while property is intact and protected, work will not be resumed until Forestry Bureau exactions cease and smoke restrictions are modified so as to permit smelting."

KLEINSORGE MINE

CALIFORNIA

Address: W. E. Kleinsorge, Sacramento, Cal.

Property: an extensive area 40 miles by road S. E. of Red Bluff, Tehama county, on the S. P. R. R., in rough and bare country.

Geology: the hills, which are steep, consist mainly of serpentine, in places much shattered. In this rock chrome occurs as veins, pockets and disseminations. The last type of deposit covers a considerable area, and will only be commercial by concentrating.

Equipment: 7-mile road, two camps, aerial tram, loading bins, etc.

Production: started about mid-year, 1917, and amounts to several car-loads monthly of ore assaying 42% Cr₂O₃ and low in silica.

PACIFIC GOLD DREDGING CO.

CALIFORNIA

See Yukon Gold Company.

TEDOC MINING CO.

CALIFORNIA

W. A. T. Agard, supt., Red Bluff, Tehama Co., Cal.

Owns chrome mines on Tedoc mountain, 51 miles from Red Bluff, on Eureka road. Built 11 mile road 1917, to connect mine with stage road. Has contracted for shipments of 4,000 tons of chrome ore in 1918, by motor truck.

TRINITY COUNTY

BOBS FARM MINING CO.

CALIFORNIA

Sacramento, Cal., J. H. Byers, pres.; W. H. Montgomery, sec.

Property: 100 acres, in Sec. 5, T. 37 N., R. 12 W., in Trinity Reserve, at an elevation of 5,000', was located in 1883. Said to be the best producer in the New River mining district, Trinity Co., but is very expensive to operate, as supplies must be packed over a trail from North Fork, a distance of 40 miles, from the latter town.

Ore: gold in vein with diabase hanging wall and quartz porphyry foot-wall; strikes E.; dips 45° N.; width of orebody 2', and length 260'; maximum depth of workings 700'.

Development: tunnels; longest, 1,300'; 6 levels from 60' to 700' long; 2 crosscut tunnels, 300' and 600' in length; several thousand feet of workings.

Equipment: includes 3-stamp mill and one 3' Huntington mill, run by steam and water power. Twelve men employed in 1914. Said to have produced \$350,000.

See Mines & Min. Res. of Trinity Co., Cal., State Mineralogist's Report, 1915, p. 151.

BROWN BEAR MINING CO.

CALIFORNIA

Address: Redding, Shasta Co., and Deadwood, Trinity Co., Cal.; Thos. McDonald, pres.; B. McDonald, supt.

Property: 586 acres, of mineral land, 200 patented, and 671 acres of timber land, includes the Brown Bear mine, on north side of Deadwood Gulch at Deadwood, discovered in 1875, and worked ever since. The property is a consolidation of several mines and as a whole has been the largest producer in the Weaverville Quadrangle and the most famous mine in Trinity County. It is credited with a production of \$7,000,000 to \$10,000,000.

Geology: there are 2 main veins, the Monte Cristo and the Last Chance 200' south of the former, which lie for the most part in Bragdon slate formation, but also cut an intrusive soda granite porphyry. Veins are parallel, and strike N. 80° E. The Monte Cristo dips steeply to the north; the Last Chance dips south 60° to 80°. Width as a rule is not over 2', more commonly about 6", but stopes have been mined to a width of 22'. Ore-shoots are several hundred feet in length; those of the Last Chance vein pitch at a flat angle to the East. The veins show clay slips along both walls, so it is rare that the ore is frozen to the wall. Quartz is the principal gangue mineral; the ore contains pyrite, galena, sphalerite and arsenopyrite. Pyrite being the most common, rich ore is usually found, where galena and sphalerite are present. The best ore mined runs about \$100 per ton, but the average grade is between \$20 and \$50.

Development: 7 crosscut tunnels ranging in length from 100' to 2,400', the lowest being 1,080' below the outcrop. There are several miles of underground workings.

Equipment: includes a 10-stamp mill, 2 Wilfley tables and water power obtained from Deadwood Creek through a 3-mile ditch.

Lessees have been working the mine.

See Mines & Min. Res. of Trinity County, State Mineralogist's Rept., p. 141; and U. S. G. S. Bull. 540, p. 70.

ENTERPRISE GOLD MINING CO.

CALIFORNIA

Owens the Enterprise mine, 160 acres, in East Fork mining district, $7\frac{1}{2}$ miles north of North Fork, in the Trinity Forest Reserve, Trinity Co., Cal. The first claim, Lone Jack, was located in 1882, and mine has been operated more or less continuously since.

Ore: free milling gold occurs in vein in diorite. Vein has N. E.-S. W. strike and dip of 10° to 45° N. W. Ore occurs in 3 shoots, 900', 300' and 300' long, with average width of 14".

Development: by tunnels longest 1,400', has 3,000' of workings, with 3 stopes from 300' to 900' long, 50' to 240' high, and average width of 5'. Greatest vertical depth of development is 500'. At last accounts considerable ore was said to be blocked out.

Equipment: includes compressor plant, small electric plant and 10-stamp mill employs 12 men. Production to date said to be over \$350,000. Cost of operating is over \$7 per ton.

FIVE PINES MINING CO.

CALIFORNIA

Five Pines, Trinity Co., Cal. H. J. Van Ness, pres.; L. Van Ness, mgr.

Property: located in 1896, is on the N. E. side of Van Ness creek, about $1\frac{1}{2}$ miles above its mouth and 2 miles N. W. of Minersville. Mine is said to have produced to 1915 almost \$300,000, and to be the best producer of the district.

Ore: free milling gold quartz with calcite, occurs in a series of pockets in a contact vein between meta-andesite and overlying slate and sandstone.

Development: 225' incline shaft with a level at 125'.

Equipment: includes a small hoist and 2-stamp mill. Coarse gold and 80% of total value is recovered in hand mortar. Water power is used. Employs 4 men. See U. S. G. S. Bull. 540, p. 73, and Mines & Min. Res. of Trinity Co., State Mineralogist's Report, 1915.

GLOBE CONSOLIDATED LEASE, INC.

CALIFORNIA

Subsidiary of Crown-Reserve Mining Co., Ltd., Cobalt, Ont. Held option on Globe mine, Trinity Co., Cal., but according to gen. mgr., S. W. Cohen, anticipations were not realized, and the option allowed to lapse.

GLOBE CONSOLIDATED MINING CO.

CALIFORNIA

Canadian corporation, whose property was under option to Crown-Reserve Mining Co. of Ontario.

Address: Dedrick, Trinity Co., Cal.

Property: Bailey, Chloride, Globe groups, 200 acres, at an elevation of 6,100', in Canyon Creek mining district, 4 miles north of Dedrick, in Trinity Reserve, Trinity Co. Claims said to have 4 veins in hornblende schist, of which the Globe and Bailey are the main veins; the Globe is 6' wide, with a known oreshoot of 1,500' length; the Bailey can be seen 500' below this. Ore is free milling, assaying \$9 per ton.

Development: to date, by 6 tunnels, from 250' to 1,700' long, greatest depth on vein 620' with several thousand feet of underground workings. A large body of fair grade ore is said to be blocked out. The mine is 27 miles from a railroad; transportation is by auto.

Equipment: includes a 5,600' gravity tram from mine to mill, compressor, electrical plant, sawmill and dwellings. There is a 20-stamp mill and 125-ton cyanide plant. Water power is obtained from Canyon Creek. Plant is said to have cost over \$300,000.

Production: said to have produced \$750,000 in gold under previous owners, who had insufficient ore blocked out to operate at a profit. See

U. S. G. S. Bull. 540, p. 76-78; Mines & Min. Res. Trinity Co., Cal.; State Mineralogist's Report, 1915, pp. 145-7.

ISLAND COPPER CO.**CALIFORNIA**

Office: Security Bank Bldg., Oakland, Cal. Frank A. Leach, pres.; C. H. Wilcox, v. p.; E. R. Leach, mgr.

Property: 4 patented mining claims and other property aggregating 265 acres, in the S. W. corner of Trinity Co., within 500 yards of the Northwestern Pacific R. R., operating from San Francisco to Humboldt bay. The postoffice is Island Mountain, Trinity Co., Cal.

Ore: a lenticular body of copper-iron sulphides occurs in metamorphosed sedimentary rocks, outcropping at several places.

Development: is said to indicate that these various outcrops are part of one mass, whose estimated dimensions are 90' to 100' in width, 450' in length and a proven depth of from 60 to 145'. Ores carry-3½% copper, 1½ oz. silver and \$2 in gold per ton.

Development over 2,500' of underground workings, opening up 275,000 tons of ore. Up to May 1 1917, 15,000 tons had been shipped.

LA GRANGE MINING CO.**CALIFORNIA**

Offices: Gold Fields American Development Co., 233 Broadway, New York and Weaverville, Cal. James MacDougall, sec.

Inc. March 24, 1905, in New York. **Cap.**, \$1,000,000; \$780,000 issued.

Dividends: 6% in 1910, 2% in 1911, 5% in 1912, and 9% in 1913.

Property: owns extensive gravel deposits in Trinity Co., Cal., and is probably the largest hydraulic mine in the world. Latest report states that 2,000,000 cu. yds. was sluiced in the season, yielding \$39,762, or 2c per yard. Costs were 4c per yard. By rearranging the sluice-boxes it is considered that 4,000,000 yards could be hydraulicked each season, at a cost of not over 2 cents.

Production:

Year	Gold, etc.	Operations	Interest, taxes, etc.	Dividends	Loss
1916.....	\$ 41,148	\$ 76,097	\$21,361	\$	\$56,310
1915.....	55,062	81,879	24,978	.....	51,795
1914.....	83,627	108,435	18,764	.....	43,572
1913.....	122,957	100,882	12,207	67,500	57,632
1912.....	151,443	96,556	17,845	52,500	15,458

QUINBY MINING CO.**CALIFORNIA**

Idle.

Address: Quinby, via Burnt ranch, Cal.

Property: 6 claims, on Quinby Creek, in Trinity Reserve, showing 4' vein of copper ore, developed by 2 tunnels, 100' and 400' long and 300' drifts. Oxidized surface ore was milled.

TRINITY GOLD MINING & REDUCTION CO.**CALIFORNIA**

Office: D. W. Shanks, Merchants' Nat. Bank Bldg., San Francisco. Mine office: Carrville, Trinity Co., Cal.

Officers: at last accounts, Henry W. Miller, pres.; Archibald Nesbett, v. p.; James H. Lee, sec.-treas.

Inc. Feb. 1909, in Arizona. **Cap.**, \$1,000,000; shares \$1 par; issued, \$969,220. Lincoln Trust Co., New York, registrar. Annual meeting, 2nd Tuesday in January.

Property: 498 acres, 323 patented, including the Headlight mine, in Trinity Center district. 1½ miles S. E. of Carrville. Company also owns 115 acres timber land. The mine has an orebody forming a flat shoot 40' thick but containing large dikes of disintegrated porphyry which did not show at the surface, so that the ore reserves reported by engineers do not exist and the oxidized ore has been worked out. A new orebody, found 1912, in another part of the property, is said to have developed 100,000 tons of ore, carrying ½ to 2% copper, 47% sulphur and about

\$4.50 in gold and silver. This orebody has been proved by diamond drilling and by a 200' crosscut.

Equipment: includes a complete power plant, stamp mill and concentrator, which in 1912 treated 47,600 tons of ore with a recovery of 81.88% at a cost of \$1.01 per ton. Mining costs were \$1.43 and the ore assayed \$4.36 per ton. Property was idle in 1914 and management was experimenting with a wet process for the treatment of the sulphide ore, as it cannot be roasted owing to the Government Forestry restrictions. Nothing has been reported since and the management has ignored all requests for information.

In April, 1917, company was reported to have sold its hydro-electric plant and distributing system to the California-Oregon Power Co. for \$22,000.

VALDOR DREDGING CO.

CALIFORNIA

Office: R. H. Elliott, Holbrook Bldg., 58 Sutter St., San Francisco. Mine office: G. H. Hutton, supt., Junction City, Cal.

Officers: Bulkeley Wells, pres.; R. H. Elliott, v. p.; A. D. Snodgrass, sec.-treas.; with T. D. Harris and Jafet Lindeberg, directors.

Inc. March, 1916, in California. Cap., \$200,000; shares \$100 par; all issued. Annual meeting, 3rd Tuesday in February.

Property: placer claims, near Junction City, Trinity Co., Cal. Gravel contains gold and metals of the platinum group.

Equipment: one 7 cu. ft. close connected, electric driven dredge.

Production: in 6 weeks' work in 1916 the boat dug 145,500 yards at a cost of 3.6c per yard.

Dredging started late in 1916. Costs appear to be low.

TUOLUMNE COUNTY

APP MINE

CALIFORNIA

Owned by Dutch Sweeney Mining Co., which see.

BAGDAD-CHASE GOLD MINING CO.

CALIFORNIA

J. N. Beckley, treas.; Rochester, N. Y. Is a holding company owning all the stock of the Soulsby Consolidated Gold Mining Co., Soulsbyville, Cal., also a stock interest in the Pacific Mines Corporation, Camp Rochester, Cal., and in the Boise-Rochester Mining Co., Atlanta, Nev.

BLACK OAK MINES & MILLING CO.

CALIFORNIA

Office: First Natl. Bank Bldg., San Francisco. Mine office: Soulsbyville, Tuolumne Co., Cal. Chas. E. Knox, gen. mgr., Tonopah, Nev.; R. C. Knox, supt.; F. N. Watts, mill supt.

Property: several claims 1 mile west of Soulsbyville.

Ore: quartz, containing pyrrhotite, sphalerite, marcasite and galena, in a vein in granodiorite. Vein has strike of N. 15° E., with dip 60° to 70° W., varying in width from 1' to 25', and has several branches coming in from the hanging-wall side. The ore occurs in lenses at the intersections of diorite dike crossings and also near faults. Diorite dikes have a strike of N. 55° E., vertical dip, and are 1 to 2' in width.

Development: by a 70° incline shaft sunk in the foot-wall and levels at intervals of 100'. Lowest workings are on the 1,800' level. Two ore-shoots have been developed, one north of the shaft, 500' long, average width 4', the other south of the shaft, 300' long and average width of 20'. Ore milled averages \$20 per ton.

Equipment: 100 h. p. single-drum electric hoist, Ingersoll-Rand air-compressor, and pumps.

Mill: 20-stamp, weight, 1,250 lbs. each, drop 6", 100 drops per minute, crush 3.5 tons per stamp through 10-mesh screens. Ore is crushed in 1.85% KCN solution. Remainder of equipment includes a Dorr classifier, a 5x18' tube mill, treatment tanks, and Oliver filter, capacity 100 tons per day. CaO, 0.15%, is added to batteries and agitators, and 24 lbs. PbO to the tube mill and agitators. Mill makes an extraction of 96%, consuming 1.5 lbs. KCN and 3 lbs. lime per ton of ore. Daily capacity of mill is 75

to 100 tons. Costs per ton are: development, \$1.63; mining, \$2.22; treatment, \$1.59; general and misc., \$0.56; material in mill, \$0.96; labor in mill, \$0.62; total, \$7.59. Employs 85 men. See Mineralogist's Report, Mines & Min. Res. of Tuolumne Co., p. 138.

Diamond drilling disclosed some ore on 700' level, and new work in 1916 showed 4' of high grade ore on 1,800' level.

CONFIDENCE GOLD MINES CORP'N.

CALIFORNIA

Mine, 12 miles East of Sonora, Tuolumne Co., Cal.

Directors: W. B. Hunting, New York; E. S. Bolen and W. A. Stratta of Richmond, Va.; Edward Jassen, mgr.

Inc. 1917 in Virginia. **Cap.**, \$600,000; shares \$10 par; 1,000 preferred shares and 5,000 common. Listed on San Francisco Stock Exchange.

Property: Confidence group of claims and mill site opened by 33° shaft to depth of 1,100' with good ore opened on 800' level. Mine idle for 10 years past, has produced \$5,000,000 gold.

Equipment: new hoist and air compressor installed 1917, and is putting up 100-ton roller mill.

DUTCH-SWEENEY MINING CO.

CALIFORNIA

Office: 1018 Crocker Bldg., San Francisco, Cal. Mines at Quartz, Tuolumne Co., Cal.

Officers: W. J. Loring, pres.; R. D. Allan, sec.; C. H. Fry, supt.

Property: the Dutch mine, formerly owned by the Dutch Cons. Gold Mining Co., 70 acres, and the App, Heslep and Hitchcock groups. Claims are on the Mother Lode and carry gold values. On the Dutch claim the vein splits into 2 veins about 75' apart; the east vein is irregular, breaking up into stringers running in all directions, while the west vein is more regular. General course of veins is N. 35° W., with dip 65° N. E. Both walls are of Calaveras slate.

Development: by incline shafts. Main working shaft, 1,800', is sunk on 65° incline, with levels to the 1,200' level at 100' intervals, remaining levels at 150' intervals. On the 1,650' level the orebody has an average width of 16', shaft being sunk to 2,250'.

Equipment: includes 150 h. p. double-drum electric hoist, one 450 cu. ft. Leyner and one 1,000 cu. ft. Rand-Duplex air compressor. Water is pumped from 1,000' level by a Dean triplex pump.

Mill: 40 stamps, weights 1,050 lbs., drop 6", 106 drops per min., crushing 5 tons per stamp through 20-mesh; stamps are driven by two 50 h. p. motors. Pulp from batteries flows over Johnson and Frue vanners. Extraction assay \$36 gold per ton. Total operating costs are \$2.30 per ton. Company employs about 100 men.

Ores are treated by amalgamation, concentration and flotation.

EAGLE SHAWMUT MINE

CALIFORNIA

Acquired in Feb., 1917, by the Tonopah Belmont Dev. Co., which see. To depth of 2,300' the gold yield has been \$4,500,000.

FRANCO CONTENTION MINING CO.

CALIFORNIA

Mine address: Stent, Cal.

Officers: W. D. Waldman, pres.; H. C. Brentschneider, sec.; Casper, Wyo.; C. W. Burdick, v. p.; L. S. Grant, mgr.

Property: 180 acres on Knight creek, Tuolumne Co., Cal., closed down for duration of the war.

HARVARD MINE, INC.

CALIFORNIA

Letters sent to 141 Milk St., Boston, Mass., are unanswered. W. B. Buckminster, gen. mgr.; H. W. Gould, supt.

Property: 4 claims, and a mill site, 80 acres, on the S. E. slope of Whiskey Hill, one mile S. W. of Jamestown, Tuolumne Co., Cal. Claims cover 5,000' along the strike of the veins.

Ore: 3 veins, the east, central and west, with strike N. 37° W., dip 60° N. E. and average width 10', have been explored. Central vein consists of solid quartz 6' to 12' wide, but values are, as a rule, too low to mine. The east and west veins consist of a mass of quartz stringers cut-

ting the schist and containing free gold. Main footwall is serpentine with hanging-wall of Calaveras slates. Ore occurs W. of the central vein. There are 7 distinct ore-shoots developed on the property, average length 200', width 6'. Veins are faulted on S. end of orebody between the 1,200' and 1,400' levels; and on the N. end between the 1,100' and 1,200' levels; they are faulted 8' to 25' to the S. W.

Development: 3-compartment shaft, 1,650' deep, with levels at 200', 500', 700', 800' and below this at 150' intervals; lowest level is at 1,400'. Total underground workings about 4 miles. Shrinkage stoping is used. Ore pockets, 100 to 200 tons capacity, are in hanging wall of shaft.

Equipment: includes a 300 h. p. double-drum electric hoist; 2 electrically driven Rix compressors of 1,100 cu. ft. and 800 cu. ft. capacity, and a 60-stamp mill driven by two 75 h. p. motors. Weight of stamps, 1,200 lbs. each, drops 7", 100 times per min., crush 5 tons per stamp, through 40-mesh. Mill is 600' from shaft and ore is handled by a 15 h. p. electric motor, in two 1½-ton cars. An 86% extraction is made of the pulp from stamp batteries, by 24 Johnston vanners, driven by 35 h. p. motor. Concentrates assay \$30 per ton. Company employs 116 men. See Mines & Min. Res. of Tuolumne Co., State Mineralogist's Report, 1915, pp. 149-151.

HOPE MINES DEVELOPMENT CO. CALIFORNIA

Address: Sonora, Tuolumne Co., Cal.

Officers: T. W. Whiteley, pres.; Henry Sadler, v. p.; C. W. Johnson, treas.; F. O. Horn, sec. Geo. Weston, mgr.

Statement of operations in 1916 shows: income from bullion sales, \$12,-413; cash on hand, \$15,000. Expenditures were \$30,823, which includes \$14,-600 for operating expenses, \$5,000 for new machinery and \$4,100 for property purchase.

Property: an old one, is on the Bonanza lead, ½-mile E. of Sonora, and is said to show free milling gold ore. Vein strikes N. 85° E. with dip of 23° W. and 2' average width. Has mica schist footwall and porphyry hanging. Bought 3 adjoining fractions, 1916.

Development: by tunnels, main tunnel is in 1,200'. New work in 1916 totaled 1,860'.

Equipment: includes a 25-h. p. gasoline engine and a 5-stamp mill. Eight men are employed.

Production: 400 tons in 1916. Average returns, 1917, amount to \$1,500 gross per month.

With new equipment and additional claims, 1917, operations should show a profit.

JAMESTOWN EXPLORATION CO. CALIFORNIA

Idle.

Office: 546 E. Weber Ave., Stockton, Cal.

Officers: A. K. Kirkland, pres.-mgr.; J. P. Mangante, v. p.; L. T. Freitas, sec.; J. H. Utt, treas.; with W. S. Kelly, directors.

Inc. April 19, 1913, in Cal. **Cap.**, \$100,000; shares \$1 par; assessable; 25,000 shares issued. Annual meeting, 1st Tuesday in April.

Property: 1 claim, patented, 20 acres, ¼ mile W. of Jamestown, Tuolumne Co., shows a 5' quartz vein with gold values, said to average \$14 per ton. Developed by 700' tunnel to depth of 100'. Work stopped since 1915, owing to lack of funds.

JUMPER CALIFORNIAN GOLD MINES CO. CALIFORNIA

Stent, Cal., P. E. de Caplane, pres.; W. D. Waltman, v. p.; Lester S. Grant, mgr.

Property: 120 acres at Stent, Tuolumne Co., Cal., on the Mother Lode, is developed to depth of 1,800' by an incline shaft.

Equipment: includes a 60-ton 20-stamp mill. Operated for nearly 3 years by lessees. Annual yield \$100,000. Company receives 25% royalty and charges \$1 a ton for milling ore extracted.

LOUISIANA DEVELOPMENT CO. CALIFORNIA

Office: 606 Electric Bldg., Cleveland, O.

Property: the Louisiana quartz mine, 4 claims, 50 acres, 2 miles N. W. of Tuolumne, Tuolumne Co., Cal., said to carry an 18" vein in grandodiorite, running N. 15° E, with dip 70° S. E. Ore occurs as free gold with pyrrhotite, sphalerite and galena.

Developed: by 520' shaft with N. and S. drifts of several hundred feet. Operated by lessees in 1916. Letters returned, 1917. Probably idle.

McALPINE MINES CO.

CALIFORNIA

Coulterville, Mariposa Co., Cal.

Officers: Frank R. Whitcomb, pres. and gen. mgr.; C. L. La Rue, v. p.; A. L. D. Barnard, sec.; Fannie W. McLean, treas.; with M. C. Hassett, directors. W. A. Irwin, supt.

Cap., \$1,500,000; shares \$1 par; fully paid and non-assessable.

Company was formed by California people to reopen the old McAlpine mine on the Mother Lode, Tuolumne Co., near the line between Tuolumne and Mariposa counties. The mine was a well-known producer in the 60's.

Property: 120 acres, covers 2,100' on the strike of the Mother Lode, including the water rights of Moccasin Creek.

Development: shaft-sinking is underway from 500 to 670' depth. Rich ore, said to have been opened on the 500' level for 135', then 90' in \$6 to \$25 ore.

Equipment: includes a Fairbanks-Morse hoist, a 55-h. p. motor and a 5-drill air compressor. Electric power is obtained from Pacific Gas & Electric Co. A 150-ton mill to be erected, using flotation.

NEW PROVIDENCE GOLD MINING CO.

CALIFORNIA

Office: 2041 Emerson St., Berkeley, Cal. John D. Hammond, sec.

Property: 5 claims, 90 acres, including the Providence and Consuelo, about 2½ miles S. E. of Tuolumne, Tuolumne Co., Cal., said to show 2 parallel veins, 5' wide, in black Calaveras slate, running N. 8° E., with dip 45° E. Ore is gold with galena and 2% pyrite.

Development: by 1,300' shaft with levels every 100'.

Equipment: includes 10-stamp mill. Product is a gold-silver concentrate said to run better than \$90 per ton. About 12 men employed.

NYMAN CONSOLIDATED MINES CO.

CALIFORNIA

Office: 502 Humboldt Bank Bldg., San Francisco, Cal. Mine office: Stent, Tuolumne Co., Cal.

Officers: A. L. Trowbridge, pres.; R. W. Barrett, v. p.; F. G. Mudgett, sec.-treas.; with C. P. Cutten and G. B. Gillson, directors; Fay Chadbourne, supt.

Inc. March 19, 1915, in California. **Cap.,** \$200,000; \$1 par; assessable; 161,586 shares issued.

Gross earnings from July, 1915, to March, 1917, were \$51,086, and cost of operation and maintenance, \$53,614. Cash assets at end of April, 1917, were \$8,791.

Property: 5 patented claims, 240 acres, on the Mother Lode, between Quartz and Stent, 2 miles S. of Jamestown, adjoining the Dutch-App on north and Cloudman-Jumper group on the south.

Geology: claims show a contact zone between amphibolite schist and greenstone. Three vein systems have been opened. The West or App is 20 to 90' wide, showing at N. end of Nyman claim; the Heslop or Middle is 50' long, with \$5 to \$10 ore across 7'; the Knox & Boyle shows, 2' to 8' of higher grade ore on the 700' and 800' levels. The Mascot shows shoots of high grade ore in Calaveras slate hanging wall. Considerable development is underway, 1917.

Production: in 20 months ended March 31, 1917, 8,550 tons yielded \$51,000 of gold. Mill recovery was 85 to 90% by amalgamation and concentration. Output to date is \$2,000,000. Costs with full equipment are estimated at between \$2.50 and \$3 per ton.

Development: by 15,000' of underground workings, consisting of 700' tunnel, 850' vertical shaft and 2 incline shafts, one 825' and the other 810' deep, both dipping 60° E., with levels 100' and 200' apart. Drifts have been

started on \$6 ore N. and S. of old crosscuts that apparently had not been sampled years ago.

Equipment: includes 2,000' double-drum hoist, 750 cu. ft. air compressor, pumps, electric power; 200-ton 40-stamp mill, with Frue vanners for 20 stamps and 22 buildings.

PITTSBURG-SILVER PEAK GOLD MINING CO. CALIFORNIA

Office: 912 California Bank Bldg., Pittsburg, Pa.

Officers: Wm. Flinn, pres.; Geo. T. Oliver, v. p.; T. J. Crump, sec.-treas.; Wm. A. Bradley, gen. mgr.; John Mocine, supt.; B. A. Rives, res. pur. agt.

Inc. May 25, 1906. **Cap.**, \$3,000,000; shares \$1 par; 2,793,733 shares outstanding. Annual meeting, first Monday in May. Stock is listed on San Francisco and Pittsburg Exchanges. Owns all the stock of the Silver Peak Gold Mining Co. 99¼% of the stock of the Mohawk-Alpine Mining Co., and all the stock of the Silver Peak R. R. running 17½ miles from Blair, Nev., to the Tonopah-Goldfield R. R., at Blair Junction.

Last dividend paid July 1, 1914, was 2cts. per share, with total dividends to date of \$784,800 or 28%.

Property: Company acquired the Rawhide gold mine near Sonora, Tuolumne Co., Cal., in 1915, and has moved the 120-ton mill and cyanide plant from Blair to the new property. The Rawhide mine is developed by an old 1,800' shaft, which has been unwatered. Work progressing, 1917.

Also owned 2,000 acres of mineral-bearing land at Blair, Esmeralda Co., Nev., formerly one of the largest producers of low-grade ore in the state. The orebodies became exhausted in 1914 and the property was abandoned.

YUBA-COUNTY

YUBA CONSOLIDATED GOLD FIELDS CALIFORNIA

Offices: Gold Fields American Development Co., 233 Broadway, New York; and Hammonton, Yuba Co., Cal.

Property: extensive dredging areas on the Yuba river, California, on which 14 large dredges are operating. No 16, launched a year ago, has 18 cu. ft. buckets. No. 17, of similar size, was launched on Nov. 4, 1917.

Production: in 1916, totaled 17,750,000 cu. yds. of gravel, averaging 12.02c per yard, at a cost of 4.27c. Recent yields have been 12.87c per yard, costing 3.7c. In the 1916 period the profit was \$1,374,868.

Company maintains a large machine-shop, wherein its dredges are made and repaired, and also makes them for other companies. The manufacturing concern is known as Yuba Construction Co., with works at Marysville, Cal.

COLORADO.

The mines and mining companies of this State are arranged geographically by counties, since outside of the Leadville and Cripple Creek districts, the mines are scattered over many counties and many small districts. Leadville properties will therefore be found under Lake County and Cripple Creek under Teller County.

COLORADO FUEL AND IRON CO. COLORADO

General Office: Boston Bldg., Denver, Colo.

Officers: J. F. Welborn, pres.; S. J. Murphy, v. p.; C. J. Hicks, asst. to pres.; J. Chilberg, v. p. and sales mgr.; S. G. Pierson, v. p. and gen. pur. agt.; J. A. Writer, sec.-treas.; L. B. Rogers and E. V. Cary, asst. secs.; A. D. Moss, asst. treas.; F. H. Bently, and J. B. McKennan, gen mgr

Inc. Oct. 21, 1892, in Colo. **Cap.**, \$44,200,000 com., and \$2,000,000 pfd.; of which \$34,235,540 and \$2,000,000 are issued. Funded debt outstanding: \$5,795,000 general mortgage 50-year, \$1,000 gold 5s, due Feb. 1, 1943.

Income for year ended June 30, 1917, was \$40,004,887, against \$25,626,605 in 1916. Net income was \$9,019,602.

Property: besides steel works and coal mines, company has iron mines in Colorado, New Mexico and Wyoming. Total ore mined since 1892 is about 12,000,000 tons.

Production: from the iron mines: 813,728 tons in 1912; 853,878 in 1913; 614,039 in 1914; 441,026 in 1915; 709,601 tons in 1916.

EMPIRE ZINC CO. (COLORADO)

COLORADO

Company is a subsidiary of the New Jersey Zinc Co., 55 Wall St., New York City.

Office: 703 Symes Bldg., Denver, Colo. Owns and operates the following properties:

Small Hopes Mine, Leadville, Colo. Two operating shafts; the Emmett, 800', and the McCormick, 500' deep. Produces zinc, lead and iron sulphides; also some zinc carbonate.

Eagle Mines, Gilman, Colo. Two operating mines in Battle Mountain district, formerly owned by Eagle M. & M. Co. Ore is mainly zinc-iron sulphide and is treated by a roasting and magnetic separation treatment. Mill has a daily capacity of 150 tons. Formation is very similar to that at Leadville.

Canon City Mill, Canon City, Colo. Combined magnetic and wet mill designed to treat complex sulphide ores. Ores for this mill are purchased from outside producers. A very complete ore-testing plant is also maintained.

Kelly Mine, Kelly, New Mexico. Equipped with steam power plant and 100-ton concentrator, in which is treated a complex zinc, iron, lead sulphide ore. This property has been a large producer of zinc and lead carbonates. The ores occur in irregular replacements and shoots in flat dipping limestones. The Linchburg group of claims in this camp is owned by the Empire Zinc Co. and is now being developed.

Cleveland Mine, 10 miles north of Silver City, New Mexico, in Pinos Altos district. Equipment consists of mill using raw magnetic separation of 125 tons daily capacity and 400-h. p. power plant equipped with Diesel type of crude oil engines. The mine is connected with the railroad at Silver City by a 9-mile narrow-gauge mule tram. Ore is zinc sulphide occurring in metamorphosed limestones cut by intrusive dikes.

Hanover Mines, Hanover, New Mexico. Equipment consists of mill of 125 tons daily capacity using raw magnetic separation and 400-h. p. power plant equipped with Diesel type of crude oil engines. Ore is principally zinc sulphide associated with hornblende, serpentine and other metamorphic minerals occurring as irregular-shaped masses in limestones near igneous contacts. The oxidized zone has produced a large tonnage of zinc carbonate.

San Xavier Mine, 20 miles south of Tucson, Arizona. Is still in a development stage. The oxidized zone has produced a considerable tonnage of copper, lead and zinc carbonates. The sulphide zone shows low grade zinc ore of a very complex nature.

Potosi Mine, 20 miles west of Arden, Nevada. Equipment consists of sorting house and calciner. Ore is zinc carbonate occurring in a crushed limestone zone, as very irregular replacements. The calcined ore is hauled 20 miles to the railroad in auto trucks.

The Colonel Sellers Mine is worked out and abandoned.

EXCELSIOR MINING, MILLING & ELECTRIC CO. COLORADO

Office: 401 Continental Bldg., Denver, Colo.

Officers: F. B. Wiborg, v. p.-treas.; W. F. Robinson, sec.

Cap., \$250,000; shares \$1 par, fully issued, non-assessable.

Property: includes several mines under lease in different parts of Colorado. Original property was the Excelsior Mine at Frisco, Summit, Co., Colo., now being operated under lease and bond by E. Flood of Frisco. Said to show a vein carrying lead-copper ore with gold and silver values. Developed by 2,600' tunnel and 300' shaft, to be sunk to 600'. Mill being remodeled and flotation process installed, 1917.

Company has a lease from the Stratton Cripple Creek Mng. & Dev. Co. on the Longfellow mine, consisting of 2 claims adjoining the Golden Cycle and Vindicator mines, at Victor, in Cripple Creek district, Colo. The Longfellow mine was operated through the Golden Cycle shaft until April, 1917, but company is now deepening its own shaft and expects to resume work in December, 1917. Was shipping one car of ore daily when mine was closed down.

Company has a lease on part of the Bellevue mine at Empire, Colo., and on the Polar Star group at Georgetown, Colo.

GLOBE SMELTING & REFINING CO.

COLORADO

Denver, Colo. Controlled by American Smelting & Refining Co., and described thereunder.

PRIMOS CHEMICAL CO.

COLORADO

Office: Primos, Delaware Co., Pa.

Officers: Walter M. Stein, pres.; Gideon Boericke, treas.; John J. Boericke, sec.

Operates the Colorado Tungsten Corporation property.

Inc. Aug., 1912, in Colorado. Cap., \$500,000. Is the largest buyer and producer of vanadium, molybdenum, and tungsten ores in the United States.

Vanadium Department: company owns at Vanadium, Colo., about 5,000 acres of roscoelite bearing land, locally known as the Bear Creek property. At this place company operates a 400' shaft and tunnels, mining both on its own account and through a large number of lessees who pay 25% royalty. About 65 men are employed in the mine and 40 at the mill.

The output of this property, that at Placerville, San Miguel Co., and Saw Pit, San Juan Co., Colorado, also worked for vanadium, is treated in a mill and the concentrates are shipped to the parent company, at Primos, Pa. The Saw Pit is the biggest vanadium producer in America.

Molybdenum Department: operates the Young and Lively mine, the first in America to be worked for molybdenite exclusively. It is in the Daily district, 11 miles above Empire, Clear Creek Co., Colo. Ore occurs in veins, is mined through tunnels and an open cut, the product being sacked and shipped. The mine is equipped with compressor, and employs 40 to 60 men. In Sept., 1917, a flotation plant costing \$24,000 was being erected.

Primos Exploration Co.: subsidiary of the Primos Chemical Co. Same officers. H. Boericke, gen. mgr.

Inc. Nov. 24, 1915, in Delaware, to explore for ores and minerals. Cap., \$200,000.

Primos Mining & Milling Co.: is a close corporation, controlled by the Primos Chemical Co., the largest dealers in rare minerals in the world. Same officers, with C. F. Lake, v. p., and Harold Boericke, sec. and gen. mgr.

Company owns many properties at widely scattered localities, which are operated by different departments.

Company has large and extremely valuable holdings in Boulder Co., Colo., tungsten field, adjacent to Nederland.

Property: 1,680 acres, distributed over 5 sq. miles in the northern part of the Nederland field.

Geology: rocks are gneissoid granite and a granitic schist, which grade into quartz and mica-schist. These rocks are cut by dikes of pegmatite in which the ores occur as veins and streaks carrying ferberite, black tungstate of iron, in a matrix of quartz and feldspar and crushed rock. Veins run N. and S. and usually dip steeply, rarely as little as 45°.

The Conger is the principal mine, but two others are operated. At the Conger three veins are open, the Conger, Middle and East. The first two unite on their strike on the 450' level, making a large orebody. Ore shoots are lens-shaped, and show rapid pinching and enlargement. On the 200' level the vein has been stopped for a total distance of 800', and a big ore shoot has been stoped for 250' long, 90' high, and 8' wide.

Development: the shaft is said to be 1,100' deep, making it the second deepest tungsten mine in the world, the Atolia in California coming first. Levels are about 100' apart, and shrinkage stoping is employed. A working tunnel connects with the shaft at the 150' level.

Equipment: includes a Hendrie-Bolthoff geared hoist and a Norwalk 300 cu. ft. compressor. A two-mile tramway from mine to mill hauls ore in trains of five cars of 1½-ton capacity by 3½-ton General Electric storage battery motor.

Company also operates the Reddig mine, 600' deep, the Lily, 160' deep, and the Crow. About 75 sets of lessees were working on these properties early in 1916.

The Quaker and Oregon mines, about 4 miles from Lakewood, have a relatively small output, which is delivered to the mill by wagon. The Lone Tree mine, half a mile from Lakewood, has a high-grade orebody, 100' long, stoped for 70' high and as much as 20' wide. The Quaker shaft is 325' deep.

The Primos mill, at Lakewood, treats 60 tons daily of 3 to 5% ore. It has a 100-ton bin for company ore, and six 15-ton bins for custom ore. After sampling, ore goes over 1½" grizzlies, oversize to Blake crusher, then to 10 stamps of 1,000 lbs. each; delivering 3½ to 4 tons of 20-mesh pulp per 24 hours. Battery pulp goes to No. 6 Wilfley tables, making concentrates which are sent to settling tanks above Frue vanners, whose tailings go through settling tanks, with discharge to Dorr classifiers and sand to Prosser tube mill, whose product with part of settlers goes to Frue vanners. Tailings of vanners go to canvas tables. Milling practice produces concentrates carrying from 40 to 65% tungstic acid, with recoveries ranging from 65 to 85%.

UNITED LEAD CO.

COLORADO

Controlled since 1906 by the National Lead Co., which see.

BOULDER COUNTY

ALLGROVE M. & M. CO.

COLORADO

Office: Cardinal, Colo.

Officers: K. W. Hunt, pres.-gen. mgr.; Hudson T. Morton, v. p.; G. W. Nicholas, sec.-treas. Operates a lease on the properties of the Pine Grove M. & M. Co. and the Albion group, about 200 acres, 1 mile above Nederland, Boulder Co., Colo.

Development: 300' shaft with 2,000' of levels, and the 2,400' Alton tunnel, which has reached the bottom of the shaft, thus enabling economical development at depth. The Alton mill, remodeled in 1916, includes 15 stamps, a Monel slimer, Wilfley and Card tables, 1 Sampson crusher and a 50-ton oil flotation unit. Mine, heretofore solely a gold-silver producer, is now outputting 25% tungsten product.

AMERICAN MINES CO.

COLORADO

Address: 338 Foster Bldg., Denver, Colo.

Officers: A. E. Blakesley, pres.; E. M. Howell, v. p.; J. N. Caldwell, sec.-treas.; preceding officers, W. A. Burke, L. M. Beck, directors. J. W. Kirkbride, supt.

Inc. in Wyo. Cap., \$1,500,000; issued \$1,300,000; shares \$1 par.

Company owns one claim in the Gold Hill district, 12 miles north of Boulder, Boulder Co., Colo., which management claims has a body of ore 300' wide, proven for a length of 600', and assays \$4 in gold per ton.

Development: by 300' tunnel. A 25-ton stamp mill installed, March, 1916.

BALD EAGLE MINING & MILLING CO.

COLORADO

Office: 307 Guardian Trust Co., Denver, Colo. Mine is 5 miles north of Ward, about 60 miles from Denver.

Officers: W. M. McGaugh, pres.; Clement Crowley, sec.; Chas. J. Scheurman, treas.

Inc. Sept. 20, 1916, in Colorado. **Cap.**, \$100,000; shares \$1 par, fully paid and non-assessable.

Company offered stock, 10,000 shares, Dec., 1916, at 25 cents a share, stating that the next 15,000 shares would be sold at 50 cents. The company's prospectus states that it holds an option on the claims, but does not give bond price. President in letter states the Bosser interests are owned.

Property: 3 claims, a mill site and placer claim, totaling 40 acres in the Ward district, Boulder Co., Colo. Claims are said to have two veins, one of them opened in five places and uncovered for a width of 22', the other 4' wide. **Ore:** Refractory, carries sulphides with gold.

Development: a 75' shaft with a drift at 30' depth and another 28' drift at the 75' level.

Company claims to have 1,000 tons of \$40 milling ore on its dump and to be able to treat same at a total cost of \$4 a ton, if a 50-ton mill is erected.

The development on the property is, in our opinion, insufficient to prove or disprove its value and the stock represents an equity in a blind pool, with an option to purchase unproven claims at a price not named.

BARKER TRACT

COLORADO

Address: J. G. Clark, owner and manager, Boulder, Colo. H. L. Barber, part owner, Great Northern Bldg., Chicago.

Property: 600 acres, patented, in the Grand Island mining district, Boulder Co., Colo., carries tungsten ore in many small shoots in fissure veins. Developed by several inclined shafts, 50' to 400' deep and by tunnels. Mine is worked by leasers. Electric and steam equipment.

Gross profit for 1916 is reported as \$60,100, shipments averaging nearly \$50 per ton.

BLACK CLOUD MINING CO.

COLORADO

R. H. B. Little, lessee, Salina, Colo.

Property: Black Cloud mine and mill at Salina, Boulder Co., Colo., shows quartz with gold values. Developed by shaft and equipped with air compressor, electric power and a 20-stamp mill.

BLACK METAL REDUCTION CO.

COLORADO

Office: 2009 13th St., Boulder, Colo. Is a private partnership, consisting of Prof. Ira M. DeLong, pres.; W. B. Stoddard, mgr., and John B. Ekeley.

Operates a plant for the production of pure tungstic acid from the 60% tungsten concentrates of the district. Reported to have \$35,000 invested in plant; \$25,000 in merchandise and stocks and \$9,100 cash in bank.

BOULDER TUNGSTEN PRODUCTION CO.

COLORADO

Office: Boulder, Colo.

Officers: J. G. Clark, pres.; F. A. Fair, v. p.; J. N. Williams, sec.-treas.; R. L. Alexander, supt.

Inc. in Colorado. **Cap.**, \$1,500,000, shares \$1 par. Commenced operations Jan. 1, 1912. During 1916, company sold \$400,000 worth of tungsten.

Property: 37 claims, 165 acres, in the Grand Island mining district, 2 miles from Nederland, Boulder county, said to show 4 to 10% tungsten ore in veins, a few inches wide.

Development: by tunnels; main tunnel now in over 1,400' and 400' below upper workings.

Equipment: 40-ton concentrating plant.

Company is building a refinery at Boulder, 1917, and will produce ferro-tungsten and tungstic acid from its ores.

CARIBOU MINES & MILLS CO.

COLORADO

Cardinal, Boulder Co., Colo.

Officers: F. H. Wickett, Chicago, pres.; Geo. L. Nye, Denver, v. p.; I. A. West, sec.; W. C. Russell, gen. mgr.

Inc. in 1916. **Cap.**, \$200,000. Company purchased from the trustee in bankruptcy the holdings of the Cariman Mining & Milling Co., in the Cardinal district of Boulder county.

Property: the Caribou and Poorman groups of claims, former producers. Also the Boulder County tunnel, projected as a great development, drainage and transportation tunnel from Cardinal toward the Caribou workings. The tunnel is now in about one mile. In the 80's the Caribou mine is said to have been considered the best silver producer in Colorado.

Equipment: includes the 100-ton Caribou mill and the 100-ton Cardinal mill and a cyanide plant. Management plans installation of flotation plant.

COLORADO METALS & CHEMICAL CO. COLORADO

Louis Shafer, mgr.

Controls the Fourth of July Group in Boulder Co., Colo., together with the Cons. Copper M. M. & Sm. Co., and property is described under latter title.

COLORADO TUNGSTEN, GOLD & SILVER CO. COLORADO

Address: Morton & Co., 15 State St., Boston, fiscal agts. **Mine office:** Nederland, Colo.

Officers: Theodore H. Thomas, pres.; L. V. J. Kimball, v. p.; Edmund H. Snyder, sec.; Warren B. Page, treas.; Thornton K. Thomas, mine mgr. **Inc.** Aug., 1916, in Colorado. **Cap.**, \$500,000, \$1 par.

Property: the Kentucky tunnel and Kentucky No. 2 lode claim, just west of Nederland, Boulder Co., Colo.

Development: by main drift tunnel on vein, and by new 65' shaft showing ore, but not in paying quantity.

CONSOLIDATED COPPER M., M. & SM. CO. COLORADO

Mine office: Eldora, Boulder Co., Colo.

Officers: C. C. Munson, pres.; W. H. Hoke, v. p.; M. P. Givens, sec., 325 Bannock St., Denver, Colo.; M. L. Ericson, treas.

Inc. Oct. 16, 1899, in Colorado. **Cap.**, \$2,000,000; shares \$1 par. Annual meeting, second Tuesday in September. Consolidation with Colorado Metals & Chemical Co. reported in 1914.

Property: 27 lode claims, partly patented, 150 acres known as the Fourth of July group, 3 additional tunnel claims, a placer claim and a 160-acre timber claim, giving total holdings of about 600 acres, at the southern base of Arapahoe peak, in the Grand Island district. Said to have 4 contact deposits, with phonolite on one wall, of which 1, under development, was said to average about 7' in width, and to carry up to 60' of sulphides, of concentrating grade, including galena, chalcopryite, bornite and chalcocite, all auriferous and argentiferous.

Development: by 3 shafts, deepest 360', and the Fourth of July tunnel, of 4,800' length. Has steam power, a 6-drill Leyner 2-stage air compressor and necessary buildings.

CONSOLIDATED REALTY & INVESTMENT CO. COLORADO

Office: Boulder, Colo.

Officers: T. V. Wilson, pres.; D. A. Degge, sec., with M. Maury and J. A. Webber, directors; W. W. Degge, mgr. **Transfer office:** Boulder.

Inc. Dec., 1909, in Colorado. **Cap.**, \$1,000,000; shares \$1 par value; 866,700 outstanding non-assessable.

Financial statement showed total receipts of \$25,672, with disbursements of \$25,336.

Values of about \$18 per ton are in gold in a blanket deposit.

CRUCIBLE STEEL CO. OF AMERICA (Tungsten) COLORADO

Office: 2 Rector St., New York.

Address: A. V. Echternacht, editor Nederland Tungsten Light, Nederland, Colo., a lessee. Is an iron and steel manufacturer, but owns tungsten mines near Nederland, Colo., operated by lessees, D. Waren, J. J. Allen, B. Dawson and A. V. Echternacht.

DEGGE-CLARKE TUNGSTEN MILL COLORADO

Boulder, Boulder Co., Colo. W. W. Degge, v. p. and mgr. Operated a 100-ton concentrate mill in Boulder Canyon. Company is a purchaser of custom ores. Mr. Degge has an interesting past.

At a stockholders' meeting held in July, the sale of the mill was ap-

proved. The property was reported in good condition, and lessees working it are making a large production.

DENVER-BOULDER TUNGSTEN PROD. & DEV. CO. COLORADO

Address: 514 Mining Exchange Bldg., Denver, Colo.

Officers: D. S. Young, pres. and supt.; G. P. Howard, v. p. and treas.; F. E. Wise, sec.; S. V. Coffman, mgr.

Property: 10 claims on Lee Hill, Boulder Co., Colo., containing tungsten and gold. In July, 1917, a mill was operating, and high-grade ore was being shipped.

EAGLE ROCK TUNGSTEN PRODUCTION CO. COLORADO

Eagle Rock, Colo. Operated by 40 sets of leasers.

Property: 150 acres in the Boulder tungsten district; is reported to carry ore assaying 2-3% in tungsten.

Has a 75-ton mill and sampling plant.

GOLD HILL MINING CO. COLORADO

Office: Boulder, Colo.

Officers: W. A. Jackson, pres.; U. S. De Moulin, v. p.; J. M. Page, sec.; W. W. Pollock, treas.; with A. W. Glessener, G. W. Meser, C. A. Neal and W. H. Pruyn, directors.

Inc. in Colorado. Cap., \$2,000,000; shares \$1 par; 1,000,000 issued. Bonds authorized, \$150,000; outstanding, \$83,000.

Property: 74 claims, 43 patented, in Gold Hill and Central mining districts, Boulder Co., Colo., said to carry gold-silver ore in a fissure vein in granite. Claims to have 4,000 tons ore reserves.

Development: by 4,660' of tunnels and total of 25,000' underground work to depth of 875'. Plans sinking a shaft.

Has 100-ton cyanide mill and 7 drill compressor. Is not yet producing.

GOLDEN TRIANGLE MINING CO. COLORADO

Address: Jamestown, Colo.

Officers: J. M. McGonigle, pres.; J. F. Schofield, sec.; H. F. Linnenbrink, treas.

Inc. Dec., 1916, in Colorado. Cap., \$250,000; shares \$1 par; non-assessable; \$125,000 outstanding.

Property: 2 unpatented claims on Porphyry Mountain, Jamestown, Colo., said to show a deposit described as a junction of 20 fissures in granite-porphry, dipping S. and E. Ore composed of quartz and fluorite, containing sulphides with gold, silver, copper, and molybdenum. Assays \$22 gold and 0.3% MoS₂.

Development: by 300' tunnel. Proposed to sink 200', erect hoist, and continue exploration. Assessment work only done in 1916.

A prospect.

GOOD MORNING GOLD MINING & INVEST. CO. COLORADO

Address: 1214 Elizabeth St., Denver, Colo. J. E. Bailey, pres.

Inc. Dec., 1904. Cap., \$2,000,000; shares 10c par.

Property: 9 claims in Sugar Loaf district, Boulder Co., Colo., idle for some time until middle of 1917.

Development: by tunnel. Veins said to carry telluride of gold. Suitable plant to be erected.

KEYSTONE CONSOLIDATED M. & M. CO. COLORADO

Idle. Officers at last accounts: Clifford A. Staley, mgr., Magnolia, Boulder Co., Colo.; Willis K. Howell, pres., New York; Richard Howell, v. p.

Property: the Keystone mine at Magnolia; is an old-time producer.

Development: by 400' two-compartment shaft which will be sunk to 700' and is drained by the Sylvanite tunnel driven by Wheelman tungsten people from Boulder creek.

Equipment: includes hoist, compressor and electric power. A 50-ton concentration mill with flotation equipment is reported under construction. Drifting is in progress on the 260' level and a shipment of 4 tons of \$62 ore made, 1916.

No later information.

MOJAVE TUNGSTEN CO.**COLORADO**

N. H. Brown, supt., Boulder Falls, Boulder Co., Colo.
Company and holdings described on page with California mines (San Bernardino Co.).

MUTUAL CO-OPERATIVE MINING CO.**COLORADO**

Office: 409 Exchange Bldg., Denver, Colo.
Officers: F. E. Gibson, pres.; H. R. Adams, v. p.; Frank E. Wire, sec.; L. E. Johnson, treas.; W. F. Headley, supt., with A. M. Startzell and F. E. Gibson, directors.

Inc. 1912. Cap., 2,500,000 shares; \$1 par; 1,800,000 issued. Balance in treasury, Dec., 1916, \$30,000.

Property: 10 claims in Gold Hill district, Boulder Co., including the Hoodoo and Columbus claims, $2\frac{1}{4}$ miles from Salina.

Development: by 600' of tunnels and an old shaft on the Hoodoo which was cleaned out and retimbered in 1916. Quantities of milling ore are said to exist in old workings and vein reported to be over 2' wide, carrying 2% copper with lead and gold-silver values. Driving a 140' drift S. W. on vein on the 55' level of the Hoodoo shaft. Company at last advice was developing its Kokomo mine in Summit Co., from which it reports that high-grade ore is being extracted. Shipments of 4 carloads of ore in Aug., 1917, netted \$868. Rather too much literature has been published.

NEDERLAND-BEAVER TUNGSTEN MINING CO.**COLORADO**

Office: Mining Exchange Bldg., Denver, Colo.
Officers: D. D. Shirley, pres.; W. M. Scott, v. p.; R. Woodworth, sec.-treas. To be incorporated in Colorado with capitalization \$200,000; shares 10c par; non-assessable. Pre-organization certificates offered to public early in 1916, at 3c per share, with 5% discount for cash.

Property: company claims to own 8 claims, 80 acres, in Nederland district, Boulder Co., Colo., and that, "the surface showing is excellent and orebodies should be opened with a small amount of work. The stock is to be sold to provide a development fund to open the tungsten ore." Careful investors will certainly refrain from investing in this "Tungsten opportunity."

SPRING GULCH MINING & MILLING CO.**COLORADO**

W. R. Benzie, sec., Majestic Bldg., Denver, Colo.
Officers: George M. Quigley, pres.; S. H. Dunlop, v. p.; George Lopez, treas.

Property: the Star mine and mill at Ward, Boulder Co., Colo., with a record of \$2,000,000 production. Has a 10-stamp mill.

Letters returned in May, 1917.

SUN TUNGSTEN CO.**COLORADO**

Address: J. N. Caldwell, sec., 325 Foster Bldg., Denver, Colo.
Officers: A. E. Blakesley, pres., Denver Cons. Stock Ex.; Valdo F. Wilson, v. p.; Paul Hardy, directors; Mr. Von Kueren, supt., Boulder, Colo.
Cap., \$3,000,000; \$1 par; \$2,800,000 in treasury.

Property: 2 claims, the Lucille group of tungsten mines, Sunshine district, near Boulder, Colo., held under bond and lease, and similar lease on the C. O. D. mine at Cripple Creek.

Development: at Boulder, an old tunnel reopened 1916, said to show a 6' vein. Stock offered at 5c a share, March, 1916. Is a G. R. Q. proposition and not favorably regarded.

SWARTHMORE CONSOLIDATED MINING CO.**COLORADO**

Idle. Mine near Cardinal, Boulder Co., Colo.
Officers: Chas. B. Galbreath, pres.; Harvey Hanes, v. p.; J. E. Carpenter, sec.; Paul Barriclow, treas.

Inc. July, 1907, in Colorado, as a merger of the Swarthmore Copper Co. and Enterprise Mining Co. Cap., \$3,500,000; shares \$1 par.

Property: 17 claims, 11 patented, 60 acres, about 2 miles west of Cardinal and the D. B. & W. R. R., in the Grand Island mining district of Boulder Co. Property includes the Golden Fleece mine, having fissure veins in pre-Cambrian gneiss cut by dikes. The vein thus far developed

said to average 8' wide and to carry a paystreak of 3 to 5% copper ore with occasional telluride of gold.

Development: by 5 shafts, deepest 403', and by tunnels of 800', 1,000' and 2,000'.

Equipment: includes 2 small steam plants, one having a 60-h. p. hoist and a 12-drill air compressor. There is a small concentrator with a 50-ton chlorination plant, and 4 new mine buildings.

Letters returned in May, 1917. Property leased to Consolidated Leasing Co. in July. C. E. Kahler, mgr.

TUNGSTEN EXPLORATION CO.

COLORADO

Probably dead as letters were returned unanswered in Sept., 1917. Lakewood, Colo.

Inc. April, 1916.

Officers: L. A. Ewing, pres.; Chas. Theobald (of Theobald & Knuth, Cripple Creek, Colo.), v. p.; Dr. R. W. Bailey, treas.; L. A. Tilborg, sec.; with C. M. Webb, Norfolk, Va., G. C. Stumm and Clark G. Mitchell, directors.

Property: the Bradley tract, 200 acres, 1 mile E. of Lakewood, adjacent to Primos Chemical Co.'s mines, the Cold Spring, Cross and Bonanza mines.

TUNGSTEN GIRL CO.

COLORADO

Probably dead as our letters were returned unanswered in July, 1917, from former address: 325 Majestic Bldg., Denver, Colo., and Ward, Boulder Co., Colo.

Officers: Joe Connors, pres.; S. T. Weller, v. p.; Dr. Osee Wallace, treas.; Hon. L. I. Harrington, sec.; above, with Kenneth Kennedy, A. V. Lafferty, Dorothy Weller and E. S. Connors, directors.

Inc. 1916 in Ariz. Cap., \$1,000,000; shares \$1 par.

Property: the Blue Jay and Burnt Mountain groups, 3 miles from Ward, adjoining holdings of the National Tungsten Co.

TUNGSTEN METALS CORPORATION

COLORADO

Address: T. McSherry, supt., Boulder, Colo.

Inc. April, 1916. Cap., \$550,000. Company took over property of the Tungsten Metals Co. and the Ferberite Co., including the Red Sign, Red Sign No. 2 and the Ferberite mines, and constructed a \$50,000 mill in Boulder Canyon, about 7 miles from Boulder.

TUNGSTEN MOUNTAIN MINES CO., THE

COLORADO

Offices: J. G. Clark, Boulder; and J. D. Maxwell, Tungsten, Colo.

Officers: J. G. Clark, pres.; L. R. Means, v. p.; S. A. Greenwood, sec.-treas.; with H. L. Barber and Thos. Leeke, directors.

Inc. Oct. 6, 1916, in Colorado. Cap., \$1,250,000; shares \$1 par; non-assessable; \$1,049,500 issued.

Income in 1916 was \$53,000, of which \$371 was from royalty on ore sold. Expenses were \$11,314.

Property: 40 claims, 24 patented, 360 acres, in Grand Island district, Boulder Co., Colo., contains tungsten deposits in veins.

Development: by shafts, and tunnels, latter 2,400' long. Work only started June, 1917. Lessees are producing steadily.

U. S. GOLD CORPORATION

COLORADO

Address: Boulder, Colo.

Officers: N. P. Garretson, Topeka, Kansas, pres.; J. R. Wolff, v. p. and gen. mgr.; W. T. McGinnis, sec.-treas.; J. W. Middlesworth, J. H. Howry, F. E. Campbell and C. N. Watts, directors. J. R. Wolff, gen. mgr.; T. J. Benjovsky, mine supt.

Inc. 1903, in Colorado. Cap., \$3,500,000; shares \$1 par; non-assessable; \$3,271,062 outstanding.

Property: the Klondike group, 225.93 acres, patented, Sphinx group, 22 mining claims, in T. 1 N., R. 72 W. in Boulder Co., Colo. Livingston group, 50 acres. Company also owns 50,000 shares, or entire capital stock of the U. S. Reduction Co., which owns the mill.

Development: 1914-15, totaled 1,470'. Claims show fissure veins in

porphyry, carrying gold ore. Widths, 3'-15' in different workings; mill feed varies from \$4 to \$12 per ton.

In July, 1917, company started exploring for the old No. 1 oreshoot in its Livingston claim, which is said to have yielded \$300,000 years ago.

Production: 34 tons of ore were shipped, 1915, to Denver smelters, which netted \$1,414. Company reported April 10, 1916, bullion to the amount of \$15,086 shipped to U. S. Mint, Denver, and that 7 tons ore shipped to Denver smelter Feb. 9, yielded \$1,974. Mill was treating up to 100 tons daily at end of 1916. During 1917 the yield was about \$75,000 from 15,000 tons of ore. Thirty-five men are employed.

After 13 years of intermittent development, and lurid advertising, company is at last producing. Barber & Co. said to be promoting the enterprise. The corporation is not looked upon favorably, and investors are advised to take company statements with a grain of salt.

VASCO MINING CO. (Tungsten)

COLORADO

Subsidiary of Vanadium Alloys Steel Co., Latrobe, Pa. J. A. McKenna, v. p. and gen. mgr., Voegtle Bldg., Boulder, Colo.

Acquired property in the Nederland district in Fall of 1915, and re-modeled the old Boyd mill for concentration of tungsten ores which are both mined and purchased. Ore is ferberite occurring in veins in pegmatite or granite, containing from 3 to 50% WO_3 , and averaging 10%.

Mill equipment: crusher, rolls to $\frac{1}{4}$ ", trommel, jigs, stamps for jig tails, classifiers for jig hatches and battery pulp, Card and Wilfley tables, Monell slime tables, Deister slime tables, and rag tables. Three mills have been built.

Property: includes 15 operating mines, shipping 8-10 tons concentrates weekly.

WOLF TONGUE MINING & MILLING CO.

COLORADO

Controlled by Firth Sterling Steel Co., Pittsburgh, Pa.

Address: Nederland, Boulder Co., Colo. Wm. Loach, mgr.; Wm. Todd, mine supt.; C. A. De Witt, mill supt.

Property: 593 acres, including the Cold Spring and other mines in the 75-acre Beaver group, a mile south of Nederland, and the Clyde mine of the Ranch group, 3 miles N. E.

The Clyde mine is the principal producer and has veins of from 1 to 10' wide, carrying 2 to 10% and averaging 5% tungstic oxide. The shaft is 405' deep, making it 200' below the main Clyde tunnel which connects with old shaft at 230' level. The Cold Spring mine is run by lessees and has been yielding 10% ore. The Bonanza and Orange Blossom are also producing 10% ore, as well as 11 others, mostly by lessees.

Ore: the principal ore mineral is ferberite, iron tungstate, occurring in veins in granite or pegmatite. Orebodies are commonly in the form of small lenses a few feet in length. For full description of Colorado tungsten ores see Bull. 583 of U. S. Geol. Survey by Hess & Schaller, 1914; also Bull. 652 by F. L. Hess, 1917.

The greater part of the mining is done by lessees who are paid for shaft sinking and ship their ore to the company's mill; the company receives as royalty 25% of the net proceeds, after deducting treatment charges.

In its leasing system the company supplies lessees with hoists, shaft houses, timber, rails, piping, ore cars, etc., and loans money for development when certain work is started.

The mill on South Boulder creek at Nederland treats 60 tons of 7% ore daily, 30.8% of which is from company's mines. It is described in detail by Leroy A. Palmer in Salt Lake Mining Review, Feb. 15, 1914, p. 14. The mill was improved to treat low-grade ore by adding a rag table plant of 7,200 sq. ft. Richards' jigs have also been installed. The recovery varies from 80 to 90%.

The Cold Spring mine, leased 1916 to Geo. Retallack et al., has a vein showing 6' face of ore with 18" streak of ore containing 57% tungstic acid, in a shoot 150' long on the 350' level.

CHAFFEE COUNTY

GIANT-ECLIPSE CONSOLIDATED CO. COLORADO

Address: P. O. Box 488, Salida, Chaffee Co., Colo. Clyde H. Jay, pres. and gen. mgr.; F. L. Ream, sec.-treas.

Inc. Sept. 21, 1909, in Colorado. Cap., \$800,000; shares \$10 par, fully paid, non-assessable; 69,000 issued. Annual meeting, 3rd Friday in January.

Property: 11 claims, 101 acres, in Monarch district, Colo., showing contact deposits of lead-iron, copper, and zinc ores between granite, limestone and quartzite. Deposit runs N.-S. and dips at 45°. Orebody developed for 50 to 150' width, 1,400' length and 1,400' depth, claimed to carry 12 to 35% zinc, 3 to 25% lead, 1 to 3 oz. silver and 80 cts. to several dollars per ton in gold. Zinc occurs in ore and as clean zinc carbonate. Mine has tunnels aggregating several thousand feet. Company claims to have developed 10,000 tons low-grade zinc ore.

Equipment: includes electric hoist, compressor, and aerial tram to carry ore from mine direct to railroad cars.

Production: \$1,000,000 production since 1878. Shipment resumed in 1915; 500 tons zinc carbonate carrying \$20 to \$40 per ton, shipped from July, 1916, to March, 1917. Incline shaft being sunk to water level.

GOLD QUEEN MINING CO. COLORADO

Idle. Considered a wild cat of the worst-type. Claims on Barren mountain (so called for good cause), Chaffee Co., Colo. For further information see Vol. XII.

GRANITE TUNNEL CO. COLORADO

Address: Granite, Chaffee Co., Colo. J. W. Ady, supt.

Property: about 20 patented claims known as the Yankee Blade and D. C. C. mines.

Development: by 1,815' tunnel. Ore is heavily mineralized, carrying 1.2 oz. gold and 1.5 oz. silver per ton. A 50-ton mill is on the ground. Doing development work, 1917.

HIDDEN TREASURE MINING & LEASING CO. COLORADO

Dr. Thos. E. Sample, sec., Omaha, Neb. C. W. Crawford, pres. Mine address: Salida, Chaffee Co., Colo.

Property: a lease on the Sedalia mine of the Sedalia Copper Co., 8 miles from Salida. See Sedalia C. Co.

Company is operating the mine.

MARY MURPHY GOLD MINING CO. COLORADO

Offices: 414 Boston Bldg., Denver, and Romley, Chaffee Co., Colo.

Officers: Chas. C. Parson, pres.; Geo. E. Collins, v. p. and gen. mgr.; H. W. Robinson, sec.; John W. Hudston, treas., with Louis F. Eppich, directors; Alfred Ware, mine supt.; H. L. King, mill supt.

Inc. May 20, 1909, in Colorado. Cap., \$1,850,000; shares \$5 par; Jan. 1, 1916, outstanding \$1,790,500. Bonds authorized \$350,000; outstanding \$179,000. Majority of stock and bonds are said to be held in England. Stock transferred at Company's office. Continental Trust Co., Denver, registrar. Annual meeting second Monday in March.

Income statement for year ending Dec. 31, 1916, showed net smelter returns, 1916, \$477,692; misc. earnings, \$2,740; expenses were \$387,539; depreciation, interest, discounts, \$40,350, leaving net profit, \$52,535.

Comparative general balance sheet, year ending Dec. 31.

Assets	1915	1916	Liabilities	1915	1916
Prop. & equip.	\$2,007,223	\$2,009,074	Cap. stock ...	\$1,850,000	\$1,850,000
Supplies & pre-paid ins	28,401	34,710	Bonds	227,000	179,000
Current assets.	255,943	228,420	Current liabil..	38,157	39,646
			Sinking fund..	10,507	.....
			Reserves (a)..	110,544	126,905
Total	\$2,291,567	\$2,272,204	Surplus	65,866	66,146

Total

(a) for examination, purchase and development of new properties.

Dividends: two of 7c per share each, paid in 1915, and one of 7c in 1916. There was set aside in 1915, \$110,000; and in 1916, \$15,000, for acquisition of new property.

History: the Mary Murphy mine, discovered 1874, was not extensively worked until acquired by a St. Louis company in 1880. The yearly output 1880-1885 averaged about \$300,000 net from ores sold to smelters. The gross value was about three times as much. One-third of the gross value of the ore was received by the mine, the remaining two-thirds being absorbed by smelting and refining charges, and by railway freight.

The first mill was erected in about 1886. Subsequently the property was leased and operated with varying success until about 1906. The lessees built mills at Romley and St. Elmo, and a smelter at Buena Vista. All of these plants were destroyed or dismantled, and the mine practically abandoned in 1906.

In 1909 the Mary Murphy G. M. Co. was organized; in 1910 active development work was commenced, and sufficient new ore opened up to justify the erection of a mill in 1912.

Property: 42 claims, mostly patented, 350 acres in Chalk Creek district, Chaffee County.

Ore: contains gold, zinc, lead, silver and copper, in order of value, in a complex network or system of nearly vertical fissure veins in quartz-monzonite; the Mary Murphy is the main vein. Veins vary in width from 6" to 12", and contain shoots and irregular lenses of ore. Average assay of milling ore: 0.2 oz. gold; 2.7 oz. silver; 4.4% lead; 7.9% zinc; 0.5% copper.

Development: by tunnels with a shaft connecting the tunnel levels; length of principal tunnels, No. 7, 750'; No. 14, 1,500'; Golf, 4,350'. Total underground workings over 8 miles; greatest depth of workings, 1,975' vertical from surface. In 1916 new work totaled 6,878' at an average cost of \$1.27 per ton of ore milled.

Equipment: includes small hoist, 3 air compressors, 2 aerial tramways and 175-ton concentrating mill. Steam power is used.

In the mill wet concentration is used followed by flotation of slime, using pine oil; there is a 25-ton electrostatic separation plant for the zinc-iron middlings.

Flotation did not act so well on the zinc ore in 1916, even on sulphide material. The process costs 23c. per ton of ore milled. Some interesting work has been done at this plant.

Production: in 1913, 14,428 oz. gold; 2,233,037 lbs. zinc; 3,321,313 lbs. lead; 146,606 oz. silver; 152,000 lbs. copper. Figures for 1914, 1915, and 1916 are not available.

Recent costs have been:

	Tons Milled	Mng.	Mlg.	Tram- ways	Gen'l	Total
1916.....	51,116	\$4.11	\$2.18	\$0.16	\$0.34	\$6.79
1915.....	55,880	3.20	1.99	0.12	0.25	5.56
1914.....	48,526	3.08	1.96	0.13	0.21	5.38
1913.....	34,271	3.45	2.04	0.24	0.30	6.03

Note: mining costs are distributed over a slightly larger tonnage than tons milled.

The Mary Murphy mine has seen its best days. At the beginning of 1917 available ore was estimated as 8,000 tons, and 6,000 tons in the Iron Chest mine. Much of the ground being mined would not pay under normal metal prices. Unless larger orebodies are opened, the manager, G. E. Collins, predicts a suspension of milling operations.

Crude ore shipments were only 149 tons, worth \$2,651, against 2,642 tons and \$61,076 in 1915. This ore is almost exhausted.

OHIO & COLORADO SMELTING & REFINING CO. COLORADO
Office: 822 A. C. Foster Bldg., Denver, Colo., and 61 Broadway, New York. Works: Salida, Chaffee Co., Colo.

Officers: J. C. Kortz, pres.; H. V. Putzel, v. p.; Max Schott, sec. and gen. mgr.; O. E. Cary, mgr.; J. B. Beaty, treas.; E. H. Laws, supt.

Cap., \$3,000,000. Is controlled, through stock ownership, by American Metal Co., Ltd. Company owns no mines, but owns and operates the Salida smelter of 1,000 tons rated daily capacity, doing a general custom business. The plant has a 300-ton sintering plant, a sampling mill, 4 lead blast-furnaces, 48x180", of 250-ton daily capacity, and handles mainly silver-lead ores. The only copper treated is that bought with lead ores, which is concentrated to about 40% tenor.

PEERLESS MINING & MILLING CO. COLORADO

Salida, Chaffee Co., Colo. H. F. Schnelker, pres. and gen. mgr.; I. W. Haight, sec.-treas.

Inc., Nov., 1904, in Colorado.

Cap., \$500,000; shares \$1 par; non-assessable.

Property: the North Pole group, 6 claims, 70 acres, with 10 acres timbered, on Cyclone mountain, in the Monarch district, 16 miles west of Salida, showing several fissure veins in granite. Veins have auriferous and argentiferous lead and copper sulphides, with lead values predominating. The mine has a 1,600' crosscut tunnel and a 65' shaft sunk on the vein. Idle several years.

ROCKY MOUNTAIN GOLDFIELD MINING CO. COLORADO

Offices: Denver, Colo., and St. Elmo, Colo.

Property: the Hayden, San Diego, Little Johnny and Nellie claims, at Barren Mountain, Chalk Creek district, Colo., said to carry several veins whose outcrop is owned for 4,500'. The mine is near several producers, including the Mary Murphy, credited with a \$25,000,000 production.

Development: 600' tunnel and 80' shaft on Hayden vein, and shallow shafts on others. The Nellie has made shipments of \$40 ore. A new 150-ton concentrating mill at St. Elmo treats the ore.

SEDALIA COPPER CO. COLORADO

Address: Wm. E. Humphreys, sec., 701 Colorado Bldg., Denver, Colo.

D. A. Freeman, pres., Boston, Mass.

Inc., 1899. **Cap.,** \$1,000,000; shares \$10 par.

Dividends reported paid in 1900, when shares were sold at \$10, declining to \$1.

History: Whittemore Bros., shoe polish manufacturers, originally interested. Property formerly leased to Salida Gold & Copper Mining Co., succeeded by Shawmut Consolidated Mining Co., succeeded by Salida Copper Co., all now dead. The Shawmut Co. purchased the leaching plant and remodeled it for a 50-ton ore concentration mill.

Property: 40 acres, patented, 7 miles from Salida, Chaffee Co., Colo., shows 35' ledge of pyritic copper-zinc ore carrying 2.75% to 12% copper, 500' below outcrop. Upper levels show large amount of oxidized ore.

Development: by shaft and tunnels, aggregates 4,000'. Is an old property now leased and operated by the Hidden Treasure Mining & Leasing Co.

STANDARD GOLD-COPPER MINING & MILLING CO. COLORADO

Officers: F. E. Groves, v. p. and mgr., Salida, Colo.; Hon. W. P. O'Brien, pres.; George L. Ramey, sec.; J. S. Ramey, treas.; Jas Zoeter, John Millner, Dr. S. B. McFarland, directors.

Property: 8 claims, 144 acres, in Monarch district, Pass Creek, Chaffee Co., Colo., shows fissure veins in granite porphyry that carry copper-lead ores. Values run \$4-\$16 per ton.

Development: by 900' of tunnel work with 285' back. Company has a mill with flotation equipment and was expected to operate in 1916. Examinations have been made by Clyde H. Jay and J. H. Freeman. No later returns.

TAYLOR MOUNTAIN MINING CO. COLORADO

Address: D. E. Cook, asst. sec., Chippewa Falls, Wis. **Mine office:** Garfield, Chaffee Co., Colo. W. F. Norway, pres.

Inc. Oct., 1905, in Colorado. **Cap.**, \$1,200,000; shares \$1 par. Annual meeting, in November.

Property: the Lily mine, 7 claims, 65 acres, in the Monarch district, 1½ miles from Garfield and 19 miles from Salida. The property has a nearly vertical N.-S. contact vein, between granite and limestone, carrying lead and copper ores. The mine shows copper ore which the management estimates will average 6% copper and 2 oz. silver per ton.

Development: by a 280' main shaft, with 4,000' of workings.

Equipment: includes electric power with 16-h. p. hoist and 35-h. p. General Electric air compressor. Buildings include an engine house, smithy, carpenter shop. Was shipping about 120 tons per month in 1914. No shipments reported since, as company is not working the mine at present.

CLEAR CREEK COUNTY

ACCORD MINING & MILLING CO. COLORADO

No recent returns secured from Georgetown, Colo.

Cap., \$250,000.

Property: 40 claims on Saxon mountain, 3 miles from Georgetown.

Development: by means of the 900' Cully tunnel, which company intended to advance an additional 2,100' with expectation of cutting the American Sisters and Jo Reynolds system of veins on the East and the Capital Prize system on the West.

Property not unpromising, but company was not in good financial condition at last accounts. Closely related to the Alco Mining & Milling Co.

ALCO MINING & MILLING CO. COLORADO

Idle. Address: Georgetown, Colo.

Inc. 1910, with same officials as Accord Mining Co.

Property: Group of lode claims on Saxon mountain, near Idaho Springs, Clear Creek Co., Colo., reported to show ore assaying \$30 to \$125 per ton.

Equipment: includes hoisting plant.

Company said to be out of debt and plans resumption of development work.

ALICE G. MILLS CORPORATION COLORADO

Mine office: Idaho Springs, Clear Creek Co., Colo.

Inc., 1910, as successor of Alice Development Co.

Mine is opened by a tunnel, said to show a vein upwards of 75' in width, carrying ore averaging about \$4 per ton in combined copper, gold and silver values.

Equipment: includes a 12-stamp mill. Mine and mill reported sold at sheriff sale, April, 1914, and company presumably defunct.

ALMADEN MINES CO. COLORADO

Property of the company, located in the Lower Fall mining district, near Idaho Springs, Clear Creek Co., Colo.; was sold in Nov., 1915, to satisfy a judgment of \$27,596. Purchased by Geo. Neill, of Topeka, Kan., and J. A. Greenfield, of Bellaire, Ohio, principal bondholders and stockholders, who plan to resume operations. The property is said to have been a good producer of silver ore in its day.

ARGO MG., DRAINAGE, TRANSP. & TUNNEL CO. COLORADO

Office: 79 Milk St., Boston, Mass. **Mine office:** Idaho Springs, Clear Creek Co., Colo.

Officers: Chas. C. Parsons, pres.; H. W. Robinson, sec.; R. E. Schirmer, treas. and gen. mgr.; L. S. Stewart, supt.

Inc. 1893 in Colorado. **Cap.**, \$100,000. Is controlled, through ownership of entire stock issue, by Argo Mining & Tunnel Co., Ltd.

Property: the Newhouse or Argo tunnel, described under title of Argo Mining & Tunnel Co. Balance sheet for fiscal year ending Aug. 31, 1916, shows an operating loss of \$2,151, as compared with a net profit of \$1,112 in 1915, the decrease being due to inactivity of several properties and subsequent slackening of transportation business.

ARGO MINING & TUNNEL CO.

COLORADO

Office: 79 Milk St., Boston, Mass. Mine office: Idaho Springs, Clear Creek Co., Colo.

Officers: F. A. Schirmer, pres.; Chas. C. Parsons, v. p.; Chas. G. Schirmer, sec.-treas.; with F. Hargreaves, C. P. Woodbury, J. A. Caldwell and H. W. Davis, directors; R. E. Schirmer, mgr.

Inc. 1909 in Delaware. Cap., \$1,250,000, shares \$5 par; issued, \$952,335. Debentures, \$150,000 authorized; \$135,000 issued. Company succeeded Argo Transportation & Tunnel Co., Ltd., which succeeded Argo Tunnel & Mining Co., Ltd., which succeeded Newhouse Tunnel Co., Ltd. Owns the entire stock issue of Argo Mining, Drainage, Transportation & Tunnel Co., which holds direct title to the tunnel.

The Argo or Newhouse tunnel, 21,968' long, with nearly 20 miles of workings, is perhaps the most celebrated mining tunnel in existence. It starts at Idaho Springs and passes under Russell gulch and Quartz hill, with terminus in the Gunnell vein. The tunnel has double tracks, of 18" gauge, laid with 30-lb. rails. For the first 12,000' the tunnel is 9' high and 10' wide, balance being 8' high and 6' wide. Grade is 5" per 100'. The tunnel was begun Jan., 1894, and completed Nov. 18, 1910, and provides drainage, transportation, ventilation and air service for drilling operations.

The mines under which this tunnel passes are estimated to have produced about \$75,000,000 in metallic values, and the tunnel cuts sundry veins of ore carrying gold, silver, lead and copper, and several laterals have opened various orebodies of greater or less promise. The tunnel connects with the Concrete, Tremont, Prize, Burroughs, Kansas Golden Edge, Gem, Sun & Moon, Old Town, Pozo, Saratoga and Gunnell shafts at depth of 1,600'.

During 1916 the Tremont, Burroughs and Gem mines were the sole shippers. Development work by lessees on the Concrete and Pozo-Gilpin proved disappointing and was discontinued.

Equipment: includes 5 locomotives, handling 53-ton cars each. Transportation charge for waste work through the tunnel is 17c. per ton, and on ores from 40c. to \$1.25, according to values. Ore is turned over to the Argo Mill, whose charges are from \$3.50 up, including sampling and treatment.

ARGO REDUCTION & ORE PURCHASING CO.

COLORADO

Office: Idaho Springs, Clear Creek Co., Colo. Chas. G. Schirmer, pres.; R. E. Schirmer, treas. and gen. mgr.; J. A. Pearce, mill supt.

Inc. July, 1912, in Colorado. Cap., \$150,000; shares \$10 par; fully paid and nonassessable; issued \$112,000.

Property: 2-acre mill site at the portal of the Newhouse, or Argo tunnel, on which a 500-ton mill has been erected to treat custom ores.

All ore is purchased outright on the weight and assay value. Treatment consists of stamps for crushing, followed by tables, tube mills and flotation machines. About 200 tons of ore is treated daily.

BIG FIVE MINING CO.

COLORADO

Office: Majestic Bldg., Denver, Colo. Mine at Idaho Springs, Colo.

Officers: Wm. P. Daniels, pres.; Geo. A. Benton, v. p.; H. C. Von Reimer, sec.-treas.

Inc. in Wyoming, June 1, 1912, as a reorganization of the old Big Five Tunnel Ore Reduction & Trans. Co. Cap., \$750,000, shares \$1 par; issued \$400,579. Bonds outstanding, Dec. 31, 1916, \$137,362. Cash on hand, Dec. 31, 1916, \$8,535.

Property: company's principal enterprise is the Central tunnel over 9,000' long, at Idaho Springs, developing several claims. During the year 2,047' of drifting and crosscutting was done. The Edgar vein showed up better than the others under development; receipts from Edgar ore were \$10,096. Also owns several patented claims in San Juan Co. and the Frances property, now idle, in Boulder Co., Colo.

BOSTON MINE LEASING CO.

COLORADO

Office: 60 Congress St., Boston, Mass. Mine office: Idaho Springs, Colo.

Officers: Lombard Williams, pres.; Arthur Langley, v. p.; Horace H. Stevens, sec.-treas.; preceding officers, N. W. Jordan and J. C. Hershey, directors; J. C. Hershey, mgr.; J. F. Clark, supt.

Inc. June, 1915, in Colorado. Cap., \$100,000; shares \$1 par; all outstanding, nonassessable. Gross earnings from ore sales in 1916 were \$30,000; operating expenses \$15,500, plus royalty of \$7,500. This compares with receipts from ore sold in 1915, \$30,196, of which \$12,000 was distributed in dividends. 1916 earnings used to retire company notes.

Property: a lease on a large portion of the property of the Edgar mine below level of Central (Big Five) tunnel at Idaho Springs, has options on the lease of all other property eastward owned by the Big Five Mining Co., and traversed by veins of the Edgar mine; also 47½% interest in Roy & Co. lease above the level of the tunnel. Leases are for five years.

Ore: occurs in fissure veins, in schist, strike E.-W., with dip 65° S.; consists of lead and zinc sulphides, containing gold and silver. Smelting ore, from a 2' width of the vein, said to average: gold 0.78 oz., silver 21 oz., copper 1%, lead 13.8%, zinc 5%. Orebody 350' long, ore 8" to 5' thick, averaging \$20 per ton. No ore blocked out.

Development: a 65° incline shaft, 100' deep and tunnels. The Central tunnel of the Big Five Co. cuts the main vein 2,460' from portal and 800' below surface. There is 1,100' of drifting on the vein, and 10,000 tons ore blocked out.

Equipment: hoist, pump and compressor. Power is bought from the Big Five Mining Co.

CAPITAL MINING & TUNNEL CO.

COLORADO

Georgetown, Clear Creek Co., Colo.

Property: the Ætna mine, developed by 5,200' tunnel, is said to show sulphide ores running up to 18 oz. gold, 35 oz. silver, 55% lead and 5% copper. Has electric as well as steam equipment, Leyner compressor, 200-ton concentrator and employs about 50 men. Lessees are working the mine and are reported to have struck a rich pocket of high-grade gold ore.

COLORADO CENTRAL MINING CO.

COLORADO

Georgetown, Colo.

Company plans for 1917-18 include unwatering the mine, building a 150-ton mill, a railroad to Georgetown and a new 750' tunnel from Equator tunnel to shaft.

Company has 370,000 tons of dump ore, assaying \$4.40 per ton, and 276,000 tons of \$10 ore in stopes.

COLORADO PAYROCK SILVER MINES CO.

COLORADO

F. F. Tyson, sec.-treas., 304 Symes Bldg., Denver, Colo.; Ernest Le Neve Foster, supt.

Cap., \$250,000; 50c. par.

Property: the Payrock mine at Silver Plume, Colo.; an old mine "that has produced millions."

Shares advertised at 20c., 1917.

CONSOLIDATED MINES DEVELOPMENT CO.

COLORADO

Office: 717 Majestic Bldg., Oklahoma City, Okla. Mine at Alice, Colo.

Officers: L. T. Samuelson, pres.; J. A. Best, v. p.; W. C. Bickford, sec.-treas., with W. G. Harper and W. G. Luckenga, directors. W. G. Harper, mgr.

Inc. in Colorado. Cap., \$1,500,000; shares \$1 par; \$850,000 outstanding. Annual meeting second Monday in October.

Property: 10 claims, 2 patented, 102 acres, in Upper Clear Creek and Argentine districts, Clear Creek County, said to show a quartz vein in granite, 6' wide, running N. E.-S. W. and assaying \$18 in gold, silver, and copper per ton.

Development: by tunnels, 1,100' and 400' long, said to prove 200,000 tons of ore. Operations during 1916 consisted of 800' of crosscutting, 300' of drifts and 180' upraise. Total operating expenses were \$26,000.

Equipment: includes 7-drill compressor, electric power and a flotation unit. A 100-ton mill being installed, 1917.

CONTINENTAL MINES, POWER & REDUCTION CO. COLORADO

Office: 401-2 First National Bank Bldg., Denver, Colo. Mine office: Lombard, Clear Creek Co., Colo.

Officers: Henry L. Seemann, pres. and gen. mgr.; K. R. Seemann, v. p.; Cyrus Locher, 2nd v. p.; Wm. H. Warrinner, sec.-treas.; preceding, with E. J. Weinand, and Chas. E. Brown, directors.

Inc. Nov. 7, 1905, in Colorado. Cap., \$5,000,000; shares \$1 par, non-assessable; issued \$4,341,550. Annual meeting, first Wednesday in November.

Property: 182 claims, 2,000 acres, in the Lincoln mining district, said to show 75 fissure veins and contact deposits, ranging in width from 2' to 75'. Country rock is gneiss, schist and granite, with porphyry dikes. Vein system claimed to be proven to depth of 1,000' and traceable 4 miles. Ores are sulphides, reported by management to carry 1 to 7% copper, 1 to 35% lead, from a trace to 6% zinc, 1 to 200 oz. silver and \$5 to \$500 gold per ton.

Development: by shafts of 135', 150' and 200' and a number of tunnels of 100' to 2,000'. The Seemann tunnel, now idle, is about 4,000' long. The mine has approximately 4 miles of workings, with about 1 mile in ore, estimated by management to show 300,000 tons of ore in sight. Most of the work is now being done on the Lombard vein and through 4 tunnels, 800', 1,500', 1,600' and 3,800' long.

Equipment: includes electric power, 150-h. p. at mine and 150-h. p. at mill, 25-h. p. hoist and 7-drill Sullivan air compressor. There are about 20 buildings.

The mill has 20 quick-drop gravity stamps, one 8x12" Blake crusher, 3 Card tables, 3 Wilfey tables and 2 sizers, capacity 100 tons per day. Company plans continuous development, is now adding an oil flotation plant to the mill, increasing its capacity to 200 tons per day, and selling commercial current. Claims production will be started in 1917.

CROWN PRINCE CONSOLIDATED MINING CO. COLORADO

Office: 934 Gas & Electric Bldg., Denver, Colo. Mine office: Empire, Clear Creek Co., Colo.

Officers: M. H. Block, pres.; J. E. Rinehart, v. p.; Thos. Williams, sec.; Wm. G. Krape, mgr. and treas.; with Daniel Erickson, directors.

Inc. June 9, 1910, in Arizona. Cap., \$3,500,000; shares \$1 par; outstanding, \$3,433,014.

Property: the Mint mine, 17 claims, 85 acres, near Empire. Gold-silver ore occurs in veins and is claimed to average from \$6 to \$12 per ton.

Development: by 75' shaft and tunnels, longest 1,025', with total underground workings of 7,000'. Equipment includes electric hoist.

Production claimed to have been \$200,000 in the past. Operations in 1916 consisted of 562' of drifting.

DENBIGH SILVER-LEAD MINES CO. COLORADO

Office: c/o Allen Arnold & Co., 85 Devonshire St., Boston.

Inc. 1916, in Colorado. Cap., \$1,000,000; shares \$5 par.

Acquired property of Terrible Dunderberg M. & Power Co.

Property: a consolidation in 1913 of two old properties worked for 40 years, comprising 43 patented claims, about 300 acres, at Silver Plume, Clear Creek Co. The company controls a number of old-time producing mines, and the dump from the Seven-Thirty, Mammoth, Brown and Dunderberg workings, known as the "Big Slide in Brown gulch."

Ore: carries gold, silver, lead and zinc occurring in a fissure vein in granite and schist. Vein dips 70° N. and strikes N. E. The sulphide pay ore occurs in shoots and streaks of varying size.

Development: by a working tunnel with 7 levels above it and 7 below it, reached by a 70' shaft, 480' deep. Method of working, stulls and stope filling. Total extent of workings, about 5 miles. A winze 70' below deepest working is in \$50 ore the entire length.

Equipment: includes hoist, compressor and pumps. Both water power and steam are used. The 100-ton mill contains crushers, rolls, jigs and

tables. A 100-h. p. Ingersoll-Rand compressor was installed, 1917.

Recent operations consisted in remodeling and enlarging the mill, and introducing flotation treatment to handle the low-grade and zinc ores left in the old stopes or on the dump piles. Development to lower levels was in progress, this work in 1915 having yielded an income of \$3,000.

Owners claimed that the mine has a production record of \$10,000,000, all from high-grade ore, and that the property now has 100,000 tons of \$10 ore left. This includes 200,000 tons in the Big Slide, a great pile of ore carried down-hill by a snow slide, whose net value is figured at \$300,000.

Management was to expend \$50,000 to enlarge mill to 300-ton capacity, so as to handle 200 tons per day of low-grade ore from the dumps. The Big Slide ore is said to average 40c gold, 3.7 oz. silver per ton with 0.45% lead and 1.22% zinc.

H. C. Bonnevie has reported on both the mine and the treatment of the Big Slide ore. Property has attractive possibilities in depth and in virgin ground, if funds are provided for the plans outlined above.

DUBUQUE MINING & TUNNEL CO.

COLORADO

Idle. Office: Colburn Bldg., Denver, Colo. Mine near Idaho Springs, Clear Creek Co., Colo.

Officers: E. A. Colburn, pres.; W. W. Kirby, v. p.; J. A. Wright, sec.-treas.; preceding with B. L. Gorich and D. C. Waugh, directors.

Inc. Dec. 4, 1905, in Colorado. Cap., \$2,000,000; shares \$1 par.

Property: 2 claims, known as the Dubuque mine, opened by a 460' tunnel, said to show a 6' vein with a 3' paystreak carrying copper carbonates and melaconite, with good gold values.

DUMONT MINING & MILLING CO.

COLORADO

Dumont, Colo.

Officers: George Wight, pres.; Ernest Wight, v. p., both of Denver; C. W. Sercher, sec. and mgr., Dumont, Colo.; Simon Batterman, treas., and Robbie B. Sercher, director.

Inc. Jan. 27, 1917, in Colorado. Cap., \$100,000; shares \$1 par; \$51,000 issued.

Property: 6 patented claims, 30 acres, known as the Syndicate property; also the Kokomo Pioneer mill at Dumont and the Pioneer Gold mining property and mill at Empire, Colo.

Ore: lead-bearing quartz in fissure vein in granite schist. Vein is 4' to 14' thick, runs E.-W. and dips at 15° to 45°. Ore has an average value of \$7.45 per ton.

Development: by McClelland and other tunnels, 100' to 900' long, with total of 4,500' of work, and a depth of 1,000' said to block out 30,000 tons of ore.

The 50-ton Pioneer mill started work in the summer of 1917.

GEM CONSOLIDATED MINES CO.

COLORADO

Address: W. E. Renshaw, or Richard White (receiver), at Idaho Springs, Clear Creek Co., Colo.

Inc. Jan. 1, 1907, in Colorado. Cap., \$5,000,000; shares \$1 par.

Property: 10 claims, patented, and a mill-site, showing a vein traceable 3 miles, carrying sulphide ores said to assay 10 oz. silver and \$18 gold per ton, with a little copper. Mine has about 5 miles of workings. A 550-h. p. hydro-electric plant supplies 350-h. p. to the mine and 200-h. p. to the mill. There are 4 hoists, good for 3,000' depth, and an 18-drill Ingersoll-Rand air compressor. Buildings include a machine-shop, carpenter shop, smithy, etc., and a 100-ton stamp mill. Several sets of lessees reported developing and producing at a profit in 1917. One lessee is opening \$50 ore.

Ore from this mine is being treated at the Newton mill, Idaho Springs, operated by W. E. Renshaw. Flotation is part of the process.

GEORGETOWN TUNNEL & TRANSPORTATION CO. COLORADO

Officers: C. A. Basse, sec., 608 Dearborn St., Chicago, Ill., and Georgetown, Colo.

Officers: C. G. Breitenbach, pres. and treas.; Geo. W. Talmage, v. p.;

H. Robeson, cons. engr., Denver; J. J. Keating, local mgr.; H. S. Parks and Alex Williams, directors.

The company is a transportation project. Its purpose is to provide power, drainage, light, ventilation, and an outlet for the ore and waste rock of the many mines within the working zone of its course, similar to the Argo, or Newhouse tunnel at Idaho Springs, Colo. The tunnel, when completed, will cut at great depth the veins and ore deposits that traverse Democrat, Columbia, Republican, Brown and Sherman mountains at Georgetown. It is being driven under contract, and was 1,200' long, May, 1917.

GILPIN TUNGSTEN PRODUCTION CO. COLORADO

Address: 1712 Champa St., Denver. C. M. Kittredge, mgr.

Cap., 1,000,000 shares, 800,000 unissued.

Property: the Empress claims in Idaho Springs district, Colo., and Sternberger tract in Gilpin Co., Colo. Company was operating in the tungsten belt of Boulder Co.

The Empress is opened by a 500' tunnel to depth of 300'. A lessee has opened good gold-silver-copper ore. Near the Sternberger the company has claims that contain silver and tungsten ore.

GILT EDGE MINES & SMELTING CO. COLORADO

Office: 402 First National Bank Bldg., Denver, Colo.

Officers: Henry I. Seemann, pres. and gen. mgr., P. O. Box 1375, Denver, Colo.; Wm. H. Warrinner, v. p.; A. W. Craig, sec.-treas., with E. M. Kirton, directors.

Inc. July 24, 1913, in Colorado. Cap., \$1,500,000, to be increased later to \$2,500,000; shares \$1 par; outstanding Dec. 20, 1915, 1,002,750 shares. Annual meeting 4th Thursday in July.

Property: 46 claims, about 300 acres, mostly patented, in Lincoln mining district, Clear Creek Co., Colo.

Ore: gold-silver-copper in fissure veins in schist and porphyry, said to assay from \$9 to \$200 per ton. The Gilt Edge mine is said to have produced some rich gold ore.

Development: the Aurora tunnel is being driven to develop the property at a depth of 1,000'; in Dec., 1916, this tunnel was in 450'. Total underground workings, 2,000'.

Equipment: includes a 20-stamp mill and electric power.

Output in 1915, which was small, said to assay over \$200 per ton. Company plans adding an air compressor to equipment this year.

GOLDEN EMPIRE MINING CO. COLORADO

Address: Empire, Colo.

Officers: A. W. Tefft, pres.; B. F. Richards, v. p.; E. D. Payne, sec.-treas. and gen. mgr.

Is a reorganization of an Arizona corporation, with Colorado holding company. Cap., \$300,000; shares 10c par; non-assessable; 2,000,000 shares issued. Transfer office: Empire, Colo. Annual meeting 1st Thursday in October.

Property: 31 claims, 20 patented, comprising the Denver City, Tennessee, Harrison and Breckenridge groups in the Upper Union mining district, Clear Creek Co., Colo. Also has 2 mill sites and water rights.

Company owns the Denver City group outright; has a 10-year lease on the Tennessee with an additional 10-year privilege; owns half interest in 2-year bond and lease for \$3,000 on the Harrison group, at 10% royalty, to be applied on purchase price; has half interest in 3-year bond and lease on the Breckenridge.

Ore: mines produce principally copper iron sulphides, but the Breckenridge group is said to carry lead-silver-gold-copper-zinc values. Assays are given as \$3-\$20 for mill dirt and \$20-\$200 for shipping ore.

Ore reserves: estimated at 5,000 tons blocked out.

Development: by 9 tunnels.

Equipment: includes 10-stamp amalgamation-concentration mill with capacity for 40-60 tons per 24 hours; extraction is 85-92%. There is also

a compressor with electric gasoline power.

Started producing, September, 1917. Employs 11 men.

HOOSAC TUNNEL & MINING CO.

COLORADO

Reorganized 1916, as New Life Tunnel & Mining Co., which see. Company has been in hands of receivers for a number of years.

IDAHO BRIDE MINING & MILLING CO.

COLORADO

Officers: E. D. Payne, sec. and gen. mgr., 227 Temple Court Bldg., Denver, Colo. H. A. Miller, pres.; R. A. Kramer, v. p.; A. A. Ancoine and H. Angerman, directors.

Cap., \$100,000; shares \$1 par, fully paid, non-assessable.

Property: about 150 acres near Idaho Springs. Company organized to take a lease on the Bride vein, worked through the Idaho tunnel, and supposedly has lease and bond on the Seaton mine, opened at depth by 300' drift in the Newhouse, or Argo, tunnel, 800' lower than the Idaho. Company took over Foxhall property, 1914. Work was resumed on Bride vein in March, 1917.

Ore: mostly galena with silver-gold content, from 1,300' level, said to have run \$9 to \$20 per ton.

Equipment: includes a concentrator. Recovery on \$4.65 ore is given as \$4.08, or 88%. Net smelter returns to Jan. 1, 1916, advertised as \$25,000.

Management stated that upward of \$500,000 has been expended in development work.

Mill has been leased for custom business to E. J. Jones. The company contemplates taking over some lead-silver-gold mines in the upper Union district of Clear Creek Co., Colo.

IDAHO MINING, REDUCTION & TRANS. CO.

COLORADO

Wm. E. Renshaw, mgr., at last accounts, Idaho Springs, Clear Creek Co., Colo.

Property: the Silver Age, Gem and Freightons Friend mines (formerly the Gem Cons. Mines Co.), showing veins with gold-copper ores.

Development: by several shafts and extensive tunnel workings. Is now operated by lessees.

Equipment: includes electric-driven compressor and hoist, and a 200-ton concentrator with 20 stamps.

IMPERIAL CONSOLIDATED MINING CO.

COLORADO

Office: 725 Colorado Bldg., Denver, Colo. **Mine office:** Georgetown, Clear Creek Co., Colo. Edw. J. Wilcox, pres. and mgr.; Henry Butler, supt.

Inc. as a reconstruction of the Waldorf Cons. Mining Co.

Property: 600 acres, patented, including the Tobin mine, in the East Argentine district, shows a strong fissure vein with 3' paystreak of gold-bearing copper ore.

Development: includes the Tobin and Wilcox tunnels, with 7 miles of workings. A 3' vein of high-grade copper was intersected, April, 1915, at depth of 500'.

Equipment: includes a 125-ton mill at the portal of the Wilcox tunnel. After an idleness of several years, operations were resumed in 1915.

A 42-ton trial shipment said to have averaged 10% copper, 8% lead, 1.53 oz. gold and 66 oz. silver per ton. Main development work was carried on by lessees in 1916 on the Commonwealth vein.

KENNEDY GOLD M. & M. CO.

COLORADO

Georgetown, Clear Creek Co., Colo. David Kennedy, mgr., at last accounts.

Property: the Centennial mine, 640 acres, shows cupriferous gold and silver ores in a 30" paystreak, assaying up to 24% copper, 5 to 50 oz. silver and 3 to 5 oz. gold per ton. Has steam power.

KITTIE LANE GOLD MINING CO.

COLORADO

Office: 507 Exchange Bank Bldg., Colorado Springs, Colo.

Officers: Marx Lorig, pres.; B. F. Webster, v. p.; Arthur Cornforth, sec.-treas. Is a reorganization of the Gould Mining Co.

Inc. in 1912. **Cap.**, \$2,000,000; shares \$1 par; 265,000 shares in treasury.

Company had no debts and \$2,000 cash and bills receivable, Jan. 1, 1917. Stock listed on Colorado Springs Exchange. Owns about 30 acres on Raven hill, adjoining the Elkton. Inactive.

LAKE MINE

COLORADO

Owned by Hal and Robt. H. Sayre. Robt. H. Sayre, Central City, Colo., mgr.

Property: 5 patented claims, in Virginia mining district, Clear Creek Co., Colo., show pyrite, chalcopryite, gray copper, zinc and lead. Ore occurs in fissure vein running N. 80° E. with dip 65°, in granite-gneiss formation.

Development: by 2 tunnels, 600' and 2,000' long to vertical depth of 2,400', with a total of 15,500' of underground workings.

Production: from Aug., 1915, to Aug., 1916, was 10,848 tons of ore, averaging \$8 per ton, yielding a gross return of \$125,000 and a net return of \$96,727. Dividend distributed among the owners for the fiscal year ending Aug. 1, 1916, was \$10,000. Mine is worked by lessees.

LINCOLN GROUP MINES CO.

COLORADO

Office: 1726 Broadway, Denver, Colo.

Officers: H. A. Wimbush, pres.; Peyton Hugh, v. p.; H. G. Wimbush, treas.; R. R. Moodie, sec., with Harry J. Newton, directors.

Inc. 1914, in Arizona.

Property: 10 claims at Idaho Springs, Clear Creek Co., Colo., said to carry streaks of ore assaying 7.8 oz. gold and 8.1 oz. silver. Developed by tunnels, crosscuts and drifts. Operated by lessees in 1916.

LITTLE GIANT GOLD M. & M. CO.

COLORADO

Lawson, Colo.

Officers: L. H. Mumbrue, pres.; F. F. Chady, v. p.; H. E. Minier, sec-treas. and mgr., with R. L. Dear, F. L. Collom, Ira Spencer and F. P. Koontz, directors. Martin T. Michel, supt.

Inc. in Colorado. **Cap.**, \$500,000; shares \$2 par.

Property: 58 patented claims, 350 acres, in Downieville mining district, Clear Creek Co., Colo., carries gold-silver-lead ores in quartz veins, running E. W. with dip 60°. Country rock is granite.

Development: to depth of 900' by 2 tunnels, 3,500' and 1,000' long.

Equipment: includes steam hoist, compressor and drills.

Mine has been worked by lessees but company planned resumption of operations and installation of 50-ton concentration and flotation mill at last accounts.

The Little Giant is credited with a past production of \$4,000,000.

MARSHALL & RUSSELL GOLD M. M. & T. CO.

COLORADO

Out of business; property at Empire, Clear Creek Co., Colo., sold at receiver's sale July 9, 1917. See full description in 1916 edition of this book.

MEMPHIS & IDAHO SPRINGS GOLD M. & M. CO.

COLORADO

Idle. Mine near Idaho Springs, Clear Creek Co., Colo., J. J. Williams, pres.; Wm. M. Slack, sec-treas., at last accounts.

Inc. in Colorado. **Cap.**, \$1,500,000; shares \$1 par, non-assessable.

Property: 14 claims, patented, carry veins with lead, copper and zinc sulphides. Mine is developed by shafts of 125', 250' and 460' and is tapped at depth of 2,350' by the Newhouse tunnel.

Equipment: includes 22-h. p. electric hoist and air compressor. Was leased to John Kuykendall of Denver at last accounts.

MID-COLORADO MINES CO.

COLORADO

Georgetown, Colo.

Officers: Abraham Plank, pres., Wooster, Ohio; O. H. Kniffen, v. p.; L. A. Lang, sec., Denver; I. E. O'Hail, treas., Wooster; preceding, with Geo. B. McFadden, directors.

Inc. March, 1915, in Colorado. **Cap.**, 600,000 shares; \$1 par; 400,000 outstanding. Annual meeting, 2nd Tuesday in July. Operating expenses in 1915, \$1,200 monthly. Indicated earnings in 1915, 10c per share, used for development work.

Property: 13 claims, 11 patented, on Republican Mt., ½ mile W. of

Georgetown, including the Mineral Chief mine, was purchased in 1915.

Ore: gold, silver, lead, zinc in fissure vein in porphyry, said to assay .09 oz. gold, 16 oz. silver, 18% lead, 7% zinc.

Development: by 7 shafts ranging in length from 140' to 1,100', with total workings of 1½ miles.

Ore reserves: said to be 50,000 tons. Company has a 50-ton mill equipped with crusher, rolls, jigs, tables and flotation plant. Electric power is used.

Production: previous to 1915 said to be 190,000 tons. The output in 1915 came from development work and had an average value of \$15 per ton. Company intends driving a new tunnel 100' below the 6th level.

NEW ERA MINES

COLORADO

Office: 31 State St., Boston, Mass. **Mine office:** Idaho Springs, Clear Creek Co., Colo.

Officers: Benj. A. Howland, pres.; E. M. Sanger, sec.; Robt. H. McLaughlin, treas.; W. A. Gilman, mgr.

Inc. Nov. 8, 1915, in Maine. **Cap.**, \$500,000; shares \$1 par; 100,000 shares held in trust for treasury. Stock listed on Boston Curb. Paul Revere Trust Co., Boston, transfer agents. Annual meeting 2nd Monday in January.

Property: 15 claims, 3 patented, about 75 acres, and a millsite, 5½ miles from Idaho Springs, formerly owned by the Trail Mining Co., and worked during 1913-14 by the Calumet-Corbin Mining Co.

Ore: consists of a mixture of coarse galena, chalcopyrite and pyrite, containing gold-silver values, with a quartz gangue and much siderite. Gray copper is abundant, while zinc blende is occasionally found. Five veins have been developed, with main workings on the Great Western and New Era veins. Selected smelting ore averages from \$50-\$60 per ton, mainly in gold and lead values.

Mine is said to have the extension of the Lamartine and Oneida veins, and is credited with a lead and gold-silver production of 2,361,000 lbs. and \$650,000 respectively. Developed by 4,000' of tunnels, crosscuts and shafts. Benj. F. Hall in 1914 estimated 64,330 tons of ore in sight, valued at \$415,382, based on an 85% extraction. Property reported on by Forbes Rickard in 1914.

Equipment: includes 15-h. p. electric hoist and a 50-ton 10-stamp mill. **Shipments:** from Nov., 1910-1913, amounted to 4,219 tons of net value \$84,558, or \$20 per ton. About 40 men employed in 1916.

NEW LIFE TUNNEL & MINING CO.

COLORADO

Office: Idaho Springs, Colo.

Officers: H. C. Perks, pres. and gen. mgr.; E. D. Quigley, treas.

Inc. 1916 as a reorganization of the Hoosac Tunnel & Mng. Co., which company was in receiver's hands for many years. **Cap.**, 1,000,000 shares; 463,994 issued.

Company is using the proceeds from stock sales for paying off debts, notes, etc., of the old company and will again start mining operations when out of debt.

Property: 16 patented and 1 unpatented claims, 81 acres, in Spanish Bar mining district, Clear Creek Co., Colo., about 1½ miles west of Idaho Springs.

Ore: is quartz impregnated with iron and copper pyrites, also some lead and zinc. It requires milling and concentration, as the gold-silver values are closely associated with the pyrites. Veins vary from 6" to 4' in width, about ¼ being of high-grade material, the balance milling ore.

Development: by 200' incline shaft said to show a vein carrying \$10-\$14 ore. Shaft is flooded below 50' in depth. Main working is the Hoosac tunnel which has been driven 1,015' on the Rising Sun vein. There are a few stopes, crosscuts and a 60' winze, all said to show ore.

Equipment: includes compressor and drills; hoisting equipment has been removed. Has a 10-stamp mill with classifier and 3 Wilfley tables.

Management seems to be earnestly trying to rehabilitate company, but appears to need more capital to put mine on a paying basis.

NEWHOUSE TUNNEL CO.

COLORADO

See Argo Mining and Tunnel Co.

ONEIDA-STAGG MINING & MILLING CO.

COLORADO

H. T. Rogers, mgr., Idaho Springs, Colo.

Inc. 1914, as a consolidation of the Oneida and Stagg Mining companies. Mine at Freeland, 5 miles from Idaho Springs.

Development: by 1,000' tunnel and a 150' raise from the tunnel level, which cut a 5' vein of gray copper ore, said to assay as high as 4% copper, 10 oz. silver and .52 oz. gold. A 50-ton cyanide mill was erected in 1914 to treat the ore by the continuous decantation system, but was remodeled in 1915 to use the oil flotation process. Milling costs are placed at 85 cts. per ton of ore treated. Production from development work pays all operating expenses.

No 1917 returns.

ONONDAGA MINES CO.

COLORADO

Office: 717 Onondaga Bank Bldg., Syracuse, N. Y. **Mine office:** Georgetown, Clear Creek Co., Colo. Arthur H. Osborne, mgr.; T. Kyner, supt.

Property: the Onondaga and Colorado Central-Aliunde group on Leavenworth Mountain, Georgetown. In the Onondaga, the Ruler vein 18" wide, showing gold-silver-lead ore, is under development through the Capital tunnel. Drifts are being run eastward on the vein at 3 different points. The Aliunde group has about 30 miles of underground workings, including the Hall and Doric tunnels; the latter will be advanced to intersect the Ruler vein of the Onondaga. The Aliunde is reported to have produced milling ore which yielded 275 oz. silver per ton in former years.

Equipment: includes compressor, hoist and power plant.

Production: from the 180' and 100' levels. Shipping 20 tons of ore daily to the Hudson mill at Idaho Springs, 1917. Employs 30 men.

PENNSYLVANIA MNG., POWER & REDUCTION CO. COLORADO

Wm. Wright, pres., Boynton, Pa. Leopold Sternberger, business mgr. and supt. P. O. Box 972, Denver, Colo.

Inc. in Colorado. Cap., \$2,500,000; 600,000 shares in the treasury. Is a close corporation owning entire stock issue of the Fall River Hydro Electric Power Co.; also owns the Lotus group of mines and property formerly owned by Lucania Tunnels & Mines Co.

Property: at Idaho Springs, Clear Creek Co., Colo., the Pennsylvania group, 374 patented claims, including several millsites and placers, covers about 2,000 acres. Shows fissure veins with complex lead-zinc-copper ore, containing silver and gold, also uranium, molybdenum and tungsten. None of the mines are producers excepting the Lotus group which is reported to have shipped some ore until closed down by water.

Development: by shafts and tunnels, including the Lucania tunnel, over 8,000' long. Total workings, about 8 miles.

Equipment: includes steam and water-power plants, air compressors. a new 10-stamp mill and 2 Wilfley tables.

POZO GILPIN MINING CO.

COLORADO

Mine near Idaho Springs, Clear Creek Co., Colo., has lead-copper ore mined for its gold and silver contents, by shaft and tunnel work. Company was idle during 1915, but the Engineering Mining Co., operating a lease on the property, sank a 100' shaft below the tunnel level. Work was suspended in Oct., 1915, pending addition of electric power to handle the water encountered in this work.

Equipment: includes steam power plant with Ingersoll-Rand compressor.

PRIZE MINING CO.

COLORADO

Address: Schafer Bros., 55 Wall St., New York. **Mine office:** O. B. Willmarth, Idaho Springs, Colo.

Officers: W. H. Gibson, pres.; M. J. Katz, sec.; A. S. Schafer, treas.; with De Witt C. Cohen, H. F. Dawes, Fred Rothschild, Edward Schafer and Henry Sidenberg, directors.

Inc. in New Jersey. Cap., \$50,000; shares \$1 par; non-assessable; all issued. Annual meeting, April 25th, at Jersey City.

Operating expenses in 1916 were \$25,000.

Property: 9 claims, 6 patented, 15 acres, in Gilpin Co., Colo. Examined by E. E. Chase. Claims show a 4' N. W. S. W. fissure vein in granite. Ore is a sulphide containing gold and silver.

Development: by 1,500' shaft with 6,000' of workings.

Equipment: 37-h. p. electric hoist.

PURITAN MINE

COLORADO

Geo. R. Stuart, owner, Alice, Colo.

Property: 78 claims, 46 patented, 330 acres, in Lincoln mining district, Clear Creek Co., Colo., said to show contact and quartz fissure veins, up to 26' in width, in granite and schist.

Ore: is a sulphide, high in silica, from 20-30% sulphur, with gold, silver, copper and iron, gold predominating. Pay shoot said to be 400' long.

Development: by 4 tunnels, 1,320', 500', 190' and 135' long; also shafts 85', 40' and 35' deep. Total workings, 3,825'.

SANTIAGO CONS. MINING, MILLING & TUNNEL CO. COLORADO

Office: 413 (Mining) Exchange Bldg., Denver, Colo. Mine office: Georgetown, Clear Creek Co., Colo. Llewelyn Jones, sec. and mgr.

Mine has a 5,000' tunnel showing gold and silver-bearing copper ores. Work on the 4th level opened up a 3½' ore body said to give smelter returns of \$70 per ton. The 7th level is now being extended 800' into new ground.

Equipment: includes steam power and a 50-ton concentrator. Shipments: in 1916, mainly from the 6th level, said to run 5 oz. gold; 27 oz. silver, and 10% copper. Mine is worked both by lessees and on company account.

SARATOGA MINING CO.

COLORADO

Office: Union Trust Bldg., Detroit, Mich. Mine office: Idaho Springs, Clear Creek Co., Colo.

Officers: F. L. Colby, pres.; Chas. R. Dunn, sec.; E. W. Pendleton, treas.; with Edwin Lodge, directors. John Owen, gen. mgr.

Inc. Nov. 18, 1911, in Colorado, as the successor of the Clear Creek Mining & Reduction Co. Cap., \$300,000; shares \$10 par; non-assessable; issued, 20,024 shares.

Property: the Saratoga-Gaston group, and the Cyclops claim, at Russell Gulch, opened through the Newhouse tunnel.

Equipment: includes steam power. The smelter, at Golden, has been disposed of. Idle 1914-1915.

In Aug., 1917, lessees were treating dump ore, but can only operate a few months on account of scanty water supply.

SEATON MINING & MILLING CO.

COLORADO

Address: Cincinnati, O. H. E. Machol, supt., Idaho Springs, Colo.

Property: the old Seaton mine on Seaton Mountain, near Idaho Springs. Mine reopened 1916 through Argo tunnel and 650' raise to be put through from west drift on Seaton vein to connect with Foxhall tunnel. The Seaton vein is cut at 6,007' from entrance to the Argo tunnel.

SHAFTER MINING CO.

COLORADO

Office: 1 Broadway, New York. Mine office: Idaho Springs, Clear Creek Co., Colo. M. S. Payton, pres.; Chas. D. Ross, sec.-treas.

Inc. 1880, in New York. Cap., \$100,000; shares \$100 par.

Lands carry copper ores with values mainly in gold.

Development: by an 800' shaft and a 5,500' tunnel. Has been idle for several years.

SILVER PLUME CONSOLIDATED MNG. CO.

COLORADO

Address: W. H. Stevens, supt., Georgetown, Colo.

Cap., \$3,000,000.

Property: the Buxton, 3 miles from Silver Plume, Clear Creek Co., Colo. Being developed by tunnel, 700' long, started in May, 1917. A 12' vein was reported cut in August.

SILVER PLUME REDUCTION CO. COLORADO

Operated the Burrell mill near Silver Plume, Colo., and had a lease on Seven-Thirty mine. Installed an Edison plant and oil flotation, 1915.

Letters returned unclaimed in 1917.

SPECIE PAYMENT GOLD MINING CO. COLORADO

Mine purchased in June, 1917, by C. A. O'Leary & Co., of St. Paul, Minn., who organized the Consolidated Specie Payment Mng. Co.

Address: Idaho Springs, Colo.

Property: shows gold-silver-copper ore, developed by 2,800' tunnel. The vein was intersected 2,800' from the portal of the tunnel and 1,000' of drifting has been done to the west.

Equipment: includes electrically driven air compressor and a 20-stamp mill. Recently worked by lessees.

STANLEY MINES CO. COLORADO

Office: 1023 First National Bank Bldg., Denver, Colo. **Mine office:** Idaho Springs, Clear Creek Co., Colo.

Officers: J. J. Fisher, v. p.; J. W. T. Gray, sec.; J. P. H. Cunningham, treas.; H. J. Wolf, mgr.; preceding officers are directors.

Inc. 1904 as successor of the Consolidated Stanley Mining & Milling Co. **Cap.**, \$750,000; shares \$5 par; 128,025 shares issued. Annual meeting in June.

Property: 89 claims showing gold and silver-bearing lead and copper ores.

Development: 641' main shaft, and 5 others from 60' to 680' deep; 24 crosscuts, total 1,050'; Hukill tunnel, 380'; adits and drifts, 22,790'; raises, 3,460'; winzes, 570'; a total of 30,181'. Vein area stoped is 635,000 sq. ft. Past production is \$3,500,000.

Property was sold in Aug., 1916, to Fisher, Cunningham & Johnson. Reorganization was planned and more development.

SUN-MOON LEASING CO. COLORADO

Address: B. G. Jacobs, Idaho Springs, Colo.

Officers: J. C. Hershey, pres. and treas.; R. E. Schirmer, v. p.; G. L. Nye, sec.; with Paul Weiss, directors.

Inc. Feb., 1917, in Colorado. **Cap.**, \$10,000; shares \$1 par; non-assessable; 7,000 issued.

Property: 14 patented claims, 60 acres, on Seaton Mountain, in Clear Creek and Gilpin counties, near Idaho Springs, Colo.

Geology: quartz vein in monzonite porphyry and granite schist, dipping 61° N. and pitching N. 60° E. Ore contains gold, silver, copper, lead, and iron.

Development: operated through the Argo tunnel, at 9,000' from portal. Greatest depth of workings is 2,000'. A 300' raise is being driven from tunnel level.

Property at one time employed 150 men, but was closed for 2 years until early in 1917.

TEK MINING, MILLING & LEASING CO. COLORADO

Idaho Springs, Colo.

Property: an old mine with dumps estimated to contain 150,000 tons of complex gold-silver-lead ore averaging \$4 per ton.

Late in 1916 the main tunnel is said to have cut 3½' of 3 oz. gold and 7 oz. silver ore, also from 3 to 12% copper. Manager Weber appears, however, unduly reticent about development.

No 1917 returns.

TENNESSEE MINING & MILLING CO. COLORADO

Office: care J. W. Thaver, sec., 677 Roscoe St., Chicago, Ill. **Mine office:** Empire, Clear Creek Co., Colo.

Officers: J. W. Loofbourou, pres.; S. B. Anderson, v. p.; J. F. Kidnell, treas., and H. J. Fersdick, directors; E. D. Payne, supt.

Inc. Feb. 11, 1911, in Colorado. **Cap.**, \$400,000; shares \$1 par; non-

assessable; issued 260,000. Annual meeting, Aug 13. Company is a re-organization of the Gold Bug Mining Co.

Property: 6 claims, 2 deeded, in the Colorado district $1\frac{1}{4}$ miles from Colorado Southern railroad. Claims have veins which show gold and silver ore with traces of copper. Property has been leased and development work planned.

Development: by 1,300' of tunnels, a shaft and several drifts. Reported in June, 1917, that property was ready for large and steady production.

TERRIBLE DUNDERBERG MINING & POWER CO. COLORADO

Company being liquidated; entire assets sold to the Denbigh Silver-Lead Mines Co., which see.

VINDICATOR MINES & TUNNEL CO. COLORADO

Property near Idaho Springs, Colo., leased May, 1915, to Gold Standard Leasing Co., financed by Casper, Wyo., and San Francisco capitalists. Mine said to carry the Tom Tuck vein, 6' wide, with porphyry hanging-wall.

CONEJOS COUNTY

TEPEE MINING & DEVELOPING CO. COLORADO

Letters returned in May, 1917, from Alamosa, Colo.

Officers: J. F. Reynolds, pres. and mgr.; C. L. Cunningham, v. p.; W. W. Platt, sec.; B. P. Middleton, treas.; with J. F. Reynolds, W. W. Platt, T. L. Connolly, directors.

Inc. 1914, in Colorado. **Cap.**, 1,000,000 shares; \$1 par; non-assessable; in treasury, 95,000 shares.

Property: 21 claims, about 400 acres, at Alamosa Forest Station, Forest Reserve, Conejos Co., Colo. Pay ore occurs in shoots in veins in diorite. Veins vary from vertical to 45° dip, and from 8" to 2' in width, with strike N. E.-S. W. Ores are both oxidized and sulphide and contain gold-silver values.

There is one 90' shaft worked by windlass. It was proposed to cut vein by tunnel 1,500' long.

CRIPPLE CREEK DISTRICT (See Teller County)

CUSTER COUNTY

MARION MINES & MILLS CO. COLORADO

Office: 850 Equitable Bldg., Denver, Colo. **Mine office:** Rye, Colo.

Officers: Henry E. McElwain, pres.; John H. McElwain, v. p.; Jos. Giedlartz, sec.-treas.; preceding, with John S. McElwain, Frank Bulkley and Clarence A. Brandenburg, Denver, directors.

Cap., \$300,000, increased from \$200,000, fully paid by \$100,005 cash, balance in property. Outstanding debts, Feb., 1917, \$118,389.

Property: the Greenhorn group, 19 claims, 6 patented, together with one millsite claim, total 65 acres; also 120 acres held by location, making 185 acres mineral land in the Hardscrabble district, Custer Co., Colo.

Development: by tunnel showing a vein of zinciferous copper and lead ore with small gold and silver values. Has water power, compressor and 100-ton concentrating mill. Erected a 100-ton flotation plant to treat tailings, 1915. Is a small producer.

PEERLESS CONSOLIDATED COPPER CO. COLORADO

Offices: 430 Symes Bldg., Denver, Colo.

Officers: J. B. Tiffany, pres.; W. H. Bishop, sec.-treas.

Property in Custer Co. is operated intermittently.

DOLORES COUNTY

McINTYRE MINING CO. COLORADO

Address: John W. Prout, mgr., Rico, Colo.

Property: the Puzzle mine at Rico, Dolores Co., Colo., credited with past production of silver ore worth \$300,000.

Development: by 135' shaft with 2,315' of workings. Present owners have not shipped any ore, but have been looking for a vein lost 30 years ago. This was found, 4½' to 5' wide, but after driving 400' no commercial ore was developed. Work is to be continued.

RICO ARGENTINE MINING CO. COLORADO

Office: Mackintosh Block, Salt Lake City. **Mine address:** Wm. McCullough, supt., Rico, Dolores Co., Colo.

Officers: Charles Read, pres.; A. E. Rykert, v. p.; J. H. Woodmanse, sec.-treas.; S. A. King, L. O. Hoffmann and Fred W. Price, directors.

Inc. 1911. Cap., \$100,000; shares 10c par; 963,136 issued; assessable; assessment No. 6 of 1c per share levied Jan. 4, 1917. Company is its own transfer agent and registrar. Listed on Salt Lake Exchange.

Property: the Black Hawk and Argentine groups, 21 claims, 145 acres, mostly patented, adjoining the Rico-Wellington Mining Co. property.

Geology: alternating strata of limestone and sandstone, dipping at angle of about 30° and cut by almost vertical fissures of great extent and persistence. Where these fissures cross the soluble limestone they contain flat replacement deposits of sulphide ores, carrying copper, zinc, and lead, with gold and silver values. The ore shoots or bedded deposits are from 3-30' thick. These fissures and the limestone are identical both in character and occurrence with those which are producing in the Rico-Wellington property.

Development: a new tunnel, 200' lower than former workings, cut a strong shoot of marketable ore carrying copper, lead and zinc, with good gold and silver content. This opening drained the main shoot through to a connection with upper workings and assures a continuous shoot of good shipping ore for 340' on the slope, which is now yielding 20 tons daily. Lessees in the upper workings are producing an equal quantity.

Production: in August, 1917, 44 carloads of 25 to 30 tons each. By October this was to be doubled.

RICO CONSOLIDATED MINES CO. COLORADO

Owned by Jesse Knight interests of Provo, Utah. G. Garren; supt., Rico, Dolores Co., Colo. Listed on Salt Lake City Exchange.

Property: adjoining the Rico Argentine on the N. E., is said to show a vein of copper-silver-lead ore 35' wide in the upper workings. Company is driving a tunnel to gain 140' depth; in April, 1918, this tunnel was in over 300', with only a short distance to drive. Company has been making shipments, but they are not reported. A long tunnel was driven in 1917 from Silver Creek to cut the vein on its downward extension.

RICO MINING CO. COLORADO

Office: 9 Wall St., New York. **Mine office:** Rico, Dolores Co., Colo.

Officers: Henry Godet, pres.; Wm. R. Sainsbury, sec.; Geo. E. Hicks, supt.

Inc. Oct. 25, 1911, in Colorado. Cap., \$3,500,000; outstanding, \$260,000 preferred, \$1,750,000 common stock and \$480,000 first mortgage bonds; shares \$10 par. Company owns properties of the Pro Patria Mining & Milling Co. and the United Rico Mines Co., both dead.

Property: 156 claims, 1,110 acres with 20 acres mill site and 320 acres coal land, in the Pioneer district of Colorado. Ore occurs in fissure veins as replacements of lime. Claims are reported to show veins averaging from a few inches to 18' in width, a mile long and proven to a depth of 700'. Ores in one mine carry 4% copper, 10% lead, 10% zinc and 10 oz. silver, the copper ore occurring as chalcopryite associated with pyrite, sphalerite and galena in fluoritic gangue.

Development: by tunnels, 1,000 to 3,000' long. Equipped with 125 hydro-electric power at mine and 100-h. p. at mill. There are two 75-h. p. hoists, 2 compound air compressors, 10 air drills and 1 air electric drill; two 9x15 Blake crushers, 18 Wilfley tables, etc.

Production: to date estimated at 1,200,000 lbs. copper. Operating in a small way through leasing. Early in 1917, the Potter tunnel was completed and another was to be driven in the Syndicate mine.

RICO-WELLINGTON MINING CO.**COLORADO**

Address: Jesse Knight, pres., Provo, Utah.

Officers: Jesse Knight, pres.; Chas. Read, v. p.; W. L. Mangum, sec-treas.; K. S. Jordan, asst. sec-treas.; J. W. Knight, gen. mgr., with J. C. Jensen and C. R. Bates, directors. Albert Lofquist, supt.

Inc. August, 1911, in Utah. Cap., \$1,000,000; shares \$1 par; 51% of stock owned by Knight Investment Co.

Treasurer's report for year ended Dec. 31, 1916, shows assets \$252,070, which includes mining property, \$234,708; cash and accounts receivable, \$4,727; liabilities, \$5,957. Receipts totaled \$108,420 from ore settlements and expenditures \$105,329, leaving a net gain for the year's operations of \$3,081, and a total gain to date of over \$146,112.

Since the property was taken over by its present owners it has earned over \$400,000, has invested \$50,000 in a mill and expended \$100,000 in development work. The debt of \$150,000 advanced for this equipment and work was paid off in 1916.

On April 25, 1917, No. 1 dividend of 1½c. per share was paid, followed by similar amounts in May and June. On July 25, 4c. was paid. The total is \$39,000.

Property: the Wellington mine, at Rico, which contains ore-shoots formed by replacement and contact metamorphism in the limestone beds of the middle member of the Hermosa formation. In 1914 a flat deposit of zinc-lead ore was cut, 400' long on the dip, 50' wide along the strike and 7 to 8' thick. It lies parallel to the Black Hawk fault. To the north the orebody is cut off by a cross fault parallel to the Nellie Bly fault, the orebody north of the fault being 170' below. Across the Black Hawk fault a copper deposit, replacing limestone and broken by several faults, has been opened, the ore carrying good copper and silver values.**Development:** consists of about 22,000' of underground work, reported to expose large amounts of lead-zinc and copper ore. Development for 1916 amounted to 7,062'. Exploration is now devoted to the Black Hawk and Iron fissures, two great ore-bearing formations traversing the property N. W. and S. E. In these the ore makes in lime beds almost like coal deposits, and as many as 5 and 6 beds, one above the other, have been opened. Other virgin ground is being explored.**Equipment:** includes a 2,500' tram to the Rio Grande railroad, handling 50 tons per hour at a cost of 23 cts. per ton. The 100-ton mill, formerly belonging to the Pro Patria Co. and leased for 5 years, has been remodeled at a cost of nearly \$30,000. A tube mill, 5 Deister tables, 6 Callow tanks, 2 Callow screens and electrical equipment have been installed.**Production:** for 1916 was 4,989 tons copper-lead ore, netting \$101,034, or \$19.09 per ton, and 292 tons of iron sulphide ore, netting \$1,187, or \$4 per ton.

Property is a good one and, being managed by Jesse Knight, the company is assured of skillful, economical and up-to-date operation.

EAGLE COUNTY**COPPER KING MINES PRODUCTS CO.****COLORADO**

Office: Copperbow, via McCoy, Eagle Co., Colo.

Officers: Wm. Kelly, pres., Hutchinson, Kan.; Andrew B. Crichton, v. p., Johnstown, Pa.; J. R. Wood, sec-treas., 2140 S. University Ave., Denver, Colo., preceding with E. E. Lloyd and J. N. Wyman, directors; W. H. Wagner, mgr.

Inc. in 1914.

Company has a deposit of copper oxide ore reported at 50,000 tons on which they are experimenting with a 50-ton electrolytic mill.

EAGLE MINING & MILLING CO.**COLORADO**

Property sold to Empire Zinc Co., of Colorado, which sec.

PINE MARTIN MINING CO.

Office: 934 Gas and Electric Bldg., Denver, Colo.

COLORADO

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Officers: E. P. Young, pres.-supt.; B. F. Bachman, v. p.; Chas. B. Bovier, sec.; Wm. G. Krape, mgr.-treas., with G. B. Kemp, directors.

Inc. March 27, 1915. **Cap.**, \$250,000; shares 10c. par; 1,139,400 shares issued. Annual meeting, 1st Wednesday in March.

Property: 10 patented claims, about 50 acres, held under bond and lease, at Red Cliff, Eagle Co., Colo., said to show a blanket quartz vein in porphyry-granite formation, carrying gold and silver values. The orebody strikes N. and is almost flat.

Development: by 8,000' of old workings, mainly tunnels. Management estimates 300,000 tons of ore developed and on dumps. Company built 100-ton amalgamation-concentration and flotation mill in 1916; also a dam with 2,000' pipe line supplying mill with its own power. Started operations August, 1917.

EL PASO COUNTY

GOLDEN CYCLE MINING & REDUCTION CO. COLORADO

Colorado City, El Paso Co., Colo.

Officers: A. E. Carlton, pres.; E. P. Shove, v. p.; I. T. Snyder, sec.-treas.; with Spencer Penrose, Richard Roelofs, H. McGarry and L. G. Carlton, directors.

Inc. in West Virginia. **Cap.**, \$1,500,000; shares \$1 par; all issued. No bonded indebtedness or preferred stock. Listed on Colorado Springs Exchange.

Besides owning 50% of capital of East Colorado Springs Land Co., company controls Pikes Peak Consolidated Fuel Co., which has lands containing 15,000,000 tons of marketable coal. The Golden Cycle also holds 1,515,000 shares out of 4,000,000 in the United Gold Mines Co. of Cripple Creek.

Balance sheet of Dec. 31, 1916, shows: Assets, \$2,562,705, which included mill, plant and equipment, \$1,113,272; cash, gold and bullion, \$670,504; notes and accounts receivable, \$28,302; stocks and bonds, \$235,947. Liabilities: Accounts payable, \$157,315; surplus and reserves, \$90,851. Net earnings for 1916, \$471,725. Above earnings do not include those from the coal properties, at present about \$100,000 per year.

Dividends: to date, \$7,833,300; rate 36% per annum, payable monthly.

Property: 400 acres in the Cripple Creek district. In March, 1915, the Golden Cycle mine was sold to the Vindicator Cons. Gold Mining Co. for \$1,300,000. At Colorado City the Golden Cycle operates a cusom mill treating up to 40,000 tons monthly of Cripple Creek ore. Plant includes rolls, roasting furnaces and cyanide equipment.

Net earnings of mill have been as follows: \$571,108 in 1909; \$687,689 in 1910; \$571,047 in 1911; \$670,333 in 1912; \$583,292 in 1913; \$672,191 in 1914; \$682,990 in 1915; \$643,004 in 1916.

FREMONT COUNTY

COLORADO MINING LAND & INVESTMENT CO. COLORADO

Idle. **Office:** Walsenburg, Colo. Mine near Hillside, Fremont Co., Colo. E. L. Neely, pres. and mgr.

Inc. 1911, in Colorado. **Cap.**, \$750,000; shares \$1 par.

Lands: 110 acres, owned partly in fee and partly leased, are said to show gold, silver, copper and lead assaying up to \$30 per ton.

U. S. REDUCTION & REFINING CO. COLORADO

After several forced sales in 1916, the entire assets (1,500 acres of land, etc.) were sold to the Golden Cycle Mining Co., Colo., which in turn sold the extensive machinery to Morse Bros., of Denver. The plants contained 15,000 tons of machinery, 5,000 tons of structural steel and buildings, 12,000,000' of lumber, etc.

GILPIN COUNTY

AMERICAN METALS PRODUCING CO.**COLORADO**

Office: Central City, Colo. E. S. Moulton, pres.-mgr.; G. Whitney Adams, supt.-treas.

Cap., \$100,000; shares \$10 par, in 30,000 preferred and 70,000 common shares.

Operates a reduction plant at Blackhawk, Gilpin Co., equipped with Moulton-Adams system to handle low grade refractory ores. Plant treats custom ores.

ARAPAHOE MINING & MILLING CO.**COLORADO**

Last address: Colorado Bldg., Denver, Colo.

Officers: Thos. B. Everett, pres., treas. and gen'l mgr.; Chas. J. Jordan, v. p.; Harry A. Stewart, sec.; Will McLeod, mgr.

Inc. in Colorado. Cap., \$1,000,000; shares \$1 par; non-assessable. Treasury stock offered to the public at 3c. a share in blocks of 300 shares with a bonus of 20% and guarantee of refund out of initial earnings.

Property: 4 mining claims near Idaho Springs, 2 mill sites and water rights in Wisconsin mining district, Gilpin Co.; a contract with miners of Wisconsin district for daily supply of 50 tons of ore at \$3 per ton and a long lease on Rocky mountain concentrating mill at Blackhawk, Gilpin Co. Rocky mountain mill has daily capacity of 75 tons, fully equipped and reported in operation June 15, 1914. Management will "take no chances in the mining business," but intends sub-leasing mining claims and doing only a custom-milling business with expected net earnings of \$150 per day, to be divided among the stockholders in return for their confidence in the management.

AZTEC MINES CO.**COLORADO**

Property is the O. K. mine at Central City, Colo. A. H. Frost, pres., and J. R. Hastings, sec., Winona, Ont., Canada. Operated in a small way, 1915, by Henry R. Eilmann, lessee. Mine shows narrow fissure vein, carrying gold and copper values.

BATES LEASING CO.**COLORADO**

Address: Central City, Colo. Is not incorporated.

Property: Bates mine in Chase Gulch, Gilpin Co., Colo., which had been idle for 28 years.

Ore: occurs as pyrite and chalcopyrite in shoots about 3' wide, carrying gold, silver and copper. Milling concentrate averages 1.23 oz. gold and 7.80 oz. silver; smelter returns average 2.50 oz. gold, 14 oz. silver and 2.94% copper. The ore is treated at the Polar Star mill, leased by the company at Blackhawk and concentrate shipped to Globe smelter at Denver.

Development: consists of 100' winze sunk from the 400' level and drifting from it.

BEZANT GOLD MINING CO.**COLORADO**

Office: Central City, Colo.

Officers: O. J. Duffield, pres.-mgr.; G. H. Putman, v. p.; L. A. Duffield, sec.; C. C. Hendrie, treas., directors.

Inc. August, 1908, in Colorado. Cap., \$500,000; shares \$1 par; 435,000 outstanding. Dividends to date, 50c. per share.

Property: 3 claims, one patented, 14 acres, has a quartz fissure vein in granite and porphyry.

Development: by a 300' shaft and about 6,000' of drifts and crosscuts, is said to have cut 3 veins all showing gold, silver and copper values.

Equipment: includes complete electrical plant, 50-h. p. electric hoist, etc. Plans building a mill. P. R. A'sford will be in charge.

Management claims to have a large tonnage of pitchblende-uranium ore blocked out.

Mine being reworked October, 1917, prior to resumption of operations.

CALHOUN CONSOLIDATED MINES CO.**COLORADO**

Probably dormant. See Vol. XII. Mine at Central City, Colo.

CASHIER GOLD MINING & REDUCTION CO. COLORADO

Office: P. O. Drawer 46, Warren, Pa. **Mine office:** Central City, Gilpin Co., Colo.

Officers: Wm. Muir, pres.; F. M. Lockwood, sec.; E. E. Allen, treas.-mgr.; with H. P. Stone, M. A. Bliss, J. T. Meals, E. J. Lesser, W. P. Volgamore and F. L. Bensinger, directors. Wm. Auger, supt.

Cap., \$1,000,000; shares \$1 par; 555,843 issued. Report issued August 1, 1915, showed monthly earnings of \$3,428. Dividends paid during fiscal year amounted to \$36,696.

Property: includes the Pittsburgh, Meeker and Brooklyn mines, carrying chalcopyrite and tetrahedrite, principal values being in silver, running up to 700 oz. per ton. The Pittsburgh mine is developed to depth of 1,000', by shafts, drifts and upraises. Equipped with boiler, pump, hoist and drills. Stopping method is used.

Production: 1,276 tons in 1914 and 1,800 tons in 1915, netting \$40,106. Average assays run 3.64 oz. gold, 7 oz. silver and 6.10% copper. Plan sinking shaft 100' and installing electric power. Has been a small but steady producer, partly from work of lessees.

COLORADO-GILPIN GOLD & RADIUM MINING CO. COLORADO

Office: 517 Drexel Bldg., Philadelphia, Pa.

Officers: Wm. Wright, pres.-gen. mgr.; Hon. Edw. Hart, v. p.; R. R. Grumer, sec.-treas.

Property: the Wood mine, at Central City, Gilpin Co., developed to depth of 350' and reported to carry a vein, from 18" to 2' thick, containing gold and pitchblende.

Equipment: includes power plant, compressor, etc. A notable shipment of 112 tons of ore, valued at \$85,000 and estimated to contain 715 milligrams of radium, was sent to the Colorado School of Mines for the U. S. Bureau of Mines in 1916. Is a close corporation and refuses to give information of its operations.

DRUID GOLD MINING CO. COLORADO

Office: 420 Equitable Bldg., Denver, Colo.

Officers: W. N. Vaile, v. p.; C. A. Chisholm, sec.-treas.; Geo. E. Collins, E. M., mgr., with H. N. Berry, directors.

Inc. in Colorado. **Cap.**, \$1,000,000; shares \$1 par; nonassessable; all issued.

Property: 11 claims, 95 acres, in Russell mining district, Gilpin Co., Colo., has a complex system of fissure veins, carrying gold, silver, lead and copper in Archean schist. Developed by 1/4 miles of underground workings, including 1,200' tunnel and several shafts, deepest 650'. Equipped with steam hoists.

Production: in 1914, 457 tons smelting ore and 369 tons crude milling ore; in 1915, 259 tons smelting ore and 220 tons crude milling ore. Gross earnings for 1916 were \$11,569 from ore sales, and operating expenses were \$11,953, resulting in a loss of \$384 to the company. Property operated continuously since 1904.

EVERGREEN GOLD & COPPER MINES CO. COLORADO

Reorganized as the Evergreen Mines Co., which see.

EVERGREEN MINES CO. COLORADO

Office: 409 Empire Bldg., Denver, Colo. **Mine office:** Apex, Gilpin Co., Colo.

Officers: J. L. Tapp, pres.; Geo. E. Bell, v. p.; Wm. C. Hollister, sec.-treas.; preceding with W. J. Tapp, E. F. Krewinghaus, M. C. Shaffer, Edwin Ettinger, J. C. West and A. M. Roth, directors. Etienne A. Ritter, cons. engr. and mgr.; Shad Reid, supt.

Inc. Sept. 17, 1914, in Colorado. **Cap.**, \$2,000,000; shares \$1 par; non-assessable; outstanding a little over 1,000,000 shares. Notes authorized, \$75,000, with \$35,000 outstanding. Annual meeting third Tuesday in August. Company is a reorganization of the Evergreen Gold & Copper Mines Co.

Property: the Evergreen mine with 9 claims, 3 patented, 60 acres, in the Pine mining district.

Geology: the property shows Archæan gneiss and crystalline schists, cut by pegmatite, with an eruptive rock called "evergreenite." This dike is 3 to 12' in width, bounded on either side by ore-bearing contact zones of about 50 to 80' width. The ore deposit is unusual, carrying secondary bornite disseminated irregularly through monzonite.

Development: by tunnel and 350' shaft. Two ore shoots were found on the 100' level, 1 on the 200' and a new one south of this on the 350' level. Main orebody is 15' to 18' thick. There are 4 known ore shoots, carrying chalcopyrite, bornite and covellite, estimated by management to average 3.5% copper, 2 to 8 oz. silver and 50c. to \$4 gold per ton. The upper workings show some malachite and tetrahedrite. Underground work amounts to 3,400'.

Equipment: includes electric power with a 45-h. p. hoist and 4-drill Leyner air compressor. A 100-ton mill has one 9x15" Blake crusher, Marcy mill, Dorr classifier and 2 Card tables.

Flotation plant installed and began operations August, 1916. Concentrates give an average value of \$110 a ton from crude ore showing a value of \$5 a ton.

GILPADO MINING CO.

COLORADO

Office: 512 Equitable Bldg., Denver, Colo.

Mine address: Harry T. Willis, supt., Central City, Gilpin Co., Colo. Forbes Rickard, pres.; W. C. Wright, sec.-treas.

Property: the Chase mine, said to show a vein of gold-silver bearing copper ore developed by 500' shaft. Equipment includes steam power.

In October, 1916, the company resumed work, unwatering the Running Lode mine below Blackhawk. In Sept., 1917, company reported to have opened an 8" streak of \$165 gold ore on the 6th level, 300' E. of shaft. Shipments made, 1917.

GILPIN-EUREKA MINES CO.

COLORADO

Address: Central City, Gilpin Co., Colo. Is a reorganization of the Gilpin-Eureka Mining & Milling Co., financed by Block & Platt, of Cincinnati, Ohio. E. L. Clark, gen. mgr., and N. E. Isbell, cons. metallurgist.

Development: main shaft 650' deep to be sunk to 1,000'. In reopening old workings good gold-silver-lead ore has been encountered. The property is considered to be well situated.

Equipment: includes 10-stamp mill and concentrators, motor driven, mill capacity to be doubled, 1918.

GILPIN MINES & REDUCTION CO.

COLORADO

Idle. Address: 1712 Champa St., Denver, Colo.

Officers: Albert Wagner, pres.; F. McLaughlin, v. p.; C. H. Yardly, sec.-treas.; C. T. West, asst. sec.

Inc. in Arizona. Cap., 2,500,000 shares. Has no debts.

Property: 100 acres in Pine Creek district, northern Gilpin Co., Colo. Owing to lack of funds, mine has not been worked for some years.

Development: to a depth of 700' by shaft. Suitable machinery erected.

GILPIN-ORION GOLD MINING CO.

COLORADO

Merged late in 1916 with Combination Mining & Milling Co., of Denver, which has property in Grand Co., Colo.

The Gilpin-Orion operated 40 acres on Bob Tail hill, Gilpin Co., which will be worked under the new arrangement.

GOLD CUP MINING CO.

COLORADO

Office: 27 State St., Boston, Mass. H. K. Dean, mgr., Central City, Colo.

Officers: H. L. Winchester, pres.; W. D. Drake, v. p.; L. F. Richmond, sec.; H. K. Dean, treas.; preceding officers, W. J. Troth, S. H. Hayden, and L. M. Fobes, directors.

Inc. July 24, 1914, in Colorado. Cap., \$500,000; shares, \$1 par; 415,264 outstanding, nonassessable.

Property: 10 claims, 6 patented, in Quartz Valley district, Gilpin Co., Colo., 1 mile from Central City, said to show a fissure vein in porphyry, with

N. dip and E.-W. course. Ore occurs as shoots from 2 to 8' wide. Ore averages 2 oz. gold, 10 oz. silver, 50% lead, 4% copper.

Development: by shaft following vein to 220'. Workings total 1,200'. Property still being opened, but 1917 should show fair shipments of high-grade ore. By June, 1917, 5 tons daily was being hoisted; while exploration had opened rich ore.

Equipment: steam hoist, compressor and drills; new hoist, shaft-house, electric power, and perhaps a mill to be added.

HAMPTON CONSOLIDATED MINES CO. COLORADO

Mine at Russell Gulch, near Central City, Gilpin Co., Colo.

Inc. in Colorado. **Cap.**, \$3,000,000; shares \$1 par. Company reported without funds and indebted to Chittenden estate for taxes, etc. The widow of W. H. Chittenden, organizer and moving spirit of the company, is practically the owner.

Property: 4 claims, patented, very close to the War Dance gold mine and believed to carry an extension of the ore shoot of that mine. The western, or 80' shaft of the Hampton, might strike this ore at 250'. The ore has bornite, tetrahedrite, pyrrargyrite, pyrite and marcasite, said to assay 2.7 to 35% copper, 6 to 35 oz. silver and 0.16 to 5.4 oz. gold per ton. The mine has a 250' tunnel, and shafts aggregating 300', with about 3,000' of workings.

Equipment: includes a 16-h. p. gasoline engine. Development work was resumed March, 1915, and electric hoist, compressor and 10 drills installed. Shipping gold-lead ore in August, 1917. Property believed to have merit.

INGALLS LEASING CO. COLORADO

Operates the Ingalls mine on Quartz hill, Gilpin Co., showing gold-silver-copper ore in veins. Developed to depth of 430' by shaft and cross-cuts.

Last shipments made to Chamberlain Ore Co., Blackhawk, Colo., in April and May, 1917, yielded 0.5 to 0.8 oz. gold, 10 to 20 oz. silver, and 9 to 11.83% copper. Operated by a pool and has no officers.

Idle since May 5, 1917.

OLD TOWN M., M. & TRANSPORTATION CO. COLORADO

Idaho Springs, Colo.

Officers: Wm. L. Bush, pres.; Geo. K. Kimball, sec., treas. and mgr., with R. J. Davies, J. Ramsey Speer and J. B. Phillips, directors.

Inc. 1910 in Colorado. **Cap.**, \$1,000,000; shares \$1 par; 738,302 shares outstanding. Gross earnings in 1915 were \$53,628. Annual meeting, 1st Monday in February. Company succeeded the Old Town Consolidated Mining Co., which itself was the successor of the Old Town Mining & Milling Co., both defunct. Property had not been profitable and was sold for a debt of \$60,000 at sheriff's sale, June 15, 1910.

Property: 22 claims, patented, 39,877 acres, in Russell mining district, Gilpin Co., Colo., has the Old Town vein, carrying a paystreak of 4' average width, with gold and silver-bearing copper ore.

Development: 2,205' incline shaft with 4,326' tunnel; over 5 miles of workings. Management estimates 150,000 tons of \$6 ore blocked out.

Equipment: includes hoist, pump, steam and electric power and Leyner air compressor.

Production: about 6,760 tons of ore, averaging \$8.40 per ton, were treated in 1915, yielding 3,298.11 oz. gold, 5,684.61 oz. silver and 9,992 lbs. copper. Total production to 1916 under present management, \$218,467.

Idle, 1917.

OPPORTUNITY CONS. GOLD MINING CO. COLORADO

Letter returned, 1917, from 318 Century Bldg., Denver, Colo. Arthur Park, Jas. R. Hayes, L. W. Partridge, Francis B. Choate and D. L. Cubberly, directors, at last accounts.

Inc. 1915. **Cap.**, \$500,000; shares \$1 par.

Has a 3-year lease and bond on the London mine, comprising 12 claims, in Pine or Wisconsin district, Gilpin Co., Colo., said to show well defined veins of gold-silver ore. Developed by 204' shaft with 3 crosscuts, 140', 250' and 132' in length.

Equipment: includes a 10-stamp, 50-ton amalgamating and concentration mill and boarding house. Probably closed down, 1917.

PIONEER MNG., MILLING, POWER & TUNNEL CO. COLORADO

Address: Fred H. Thompson, supt., Central City, Gilpin Co., Colo.

Property: 7 claims, 5 patented, said to have 4 small veins showing gold-silver, copper and tungsten values, with porphyry hanging-wall and granite footwall.

Development: by 665' tunnel and 400' drifts, reported to have cut the Martin vein, in May, 1916.

Equipment: includes stamp mill, compressor, etc. Company also owns 3¼ miles of patented placer ground and water rights on Pine and Clear creeks to generate electricity.

PITTSBURGH MINE COLORADO

Central City, Gilpin Co., Colo.

Owned and operated by Cashier Gold Mining Co., which see.

RARE METALS CO. COLORADO

Officers: G. S. Wood, pres.; Irving T. Snyder, v. p.; Geo. A. Stahl, sec.; Nelson Franklin, mgr., Rollinsville, Colo. S. B. Tyler, supt.

Is a subsidiary of the Vindicator Consolidated Gold Mining Co. of Cripple Creek. Owns and operates a 75-ton custom tungsten mill at Rollinsville, Gilpin Co., on the D. & S. L. R. R., 4 miles from Nederland, Colo. The mill is equipped with crusher, rolls, ball mill, jigs, Wilfley and Deister tables, classifiers and Callow tanks. The concentrates produced average 60% in tungstic acid content.

Company is reported Sept., 1917, to have taken an option on the Little Melvin tungsten mine on Silver Creek, 3 miles from the mill, and said to show a 16' fissure vein.

SQUARE DEAL GOLD MINING CO. COLORADO

Central City, Colo.

Officers: R. J. Foster, pres., 424 Wyoming St., Scranton, Pa.; Max Frank, v. p.; E. H. Lawall, treas., with J. K. Griffith and L. F. Hueblein, directors. Harry J. Wolf, mgr., Golden, Colo. Thos. Martin, supt. Capitalization and financial statement not reported.

Property: 3 patented claims, near Central City, said to show gold, silver, copper and lead ore in quartz vein. Vein strikes E.-W., dips 65° N.

Development: 850' incline shaft, with 4 miles of workings. Ore reserves and production not given.

Reported in Dec., 1915, that property is tied up in litigation, but is being operated by a lessee who places his royalties in trust pending the outcome of the suit.

TOPEKA CONSOLIDATED MINING CO. COLORADO

Central City, Gilpin Co., Colo.

Officers: at last accounts, Henry P. Lowe, pres., treas. and gen. mgr.; C. A. West, sec., with Sir Chas. Allen, Arthur Firth and M. A. Lowe, directors.

Inc., July 30, 1909, in Colorado, as successor of Topeka Mining Co. Cap., \$1,000,000; shares \$5 par; nonassessable; fully issued. Annual meeting, June 30.

Property: 7 claims, patented, 16.46 acres, in the Russell district, shows schists and metamorphic gneiss, cut by 3 veins with N.-E. strike and dip of 45°. One vein of 4' average width, traceable 1,300', carries chalcopryrite and sphalerite estimated to average 0.5% copper, 2% zinc, 2 oz. silver and \$10 gold per ton.

Development: by shaft 1,500' deep, with a second 510' shaft and a total of 11,640' of workings, estimated to show 50,000 tons of ore. The mine was discovered 1862, and worked at intervals until 1900, when closed by operation, until reopened August, 1909.

Equipment: includes steam plants, with a 250-h. p. hoist at No. 1 shaft, and a 60-h. p. hoist at No. 2 shaft. There is a 7-drill Rand Imperial 2-stage air compressor and 15 hammer drills. The mine was closed down again in 1914, leaving workmen unpaid. Reputation of management was capable of much improvement.

U. P. R. MILLING & MINING CO. COLORADO

Robt. L. Martin, agent, 310 Quincy Bldg., Denver, Colo.

Property: the Gregory-Buell group of mines at Central City and the Buell concentrator. Mines have vein with gold and silver-bearing copper ores, developed by 700' shaft, equipped with steam hoist and air compressor. The mill has 45 stamps and handles about 130 tons daily. Operating at last accounts.

GRAND COUNTY

MOLLIE GROVES MINING & MILLING CO. COLORADO

Office: 328 New York Life Bldg., Kansas City, Mo. Operating office: 420 Ernest & Cranmer Bldg., Denver, Colo. Mine near Parshall, Grand Co., Colo.

Property: was not regarded favorably by the late Horace J. Stevens, owing to its alleged preposterous claims. Letters neither answered nor returned. Fully described Vol. XI, Copper Handbook.

GUNNISON COUNTY

AUGUSTA METAL MINING CO. COLORADO

Address: C. L. Arzeno, 9 E. 5th St., Covington Ky.

Officers: C. L. Arzeno, pres.; Harry Levi, v. p.; Alf. E. Reinauer, sec-treas.; preceding officers, G. T. McDuffie, Chas. H. Adams and B. S. Oppenheimer, directors.

Inc. in Colorado. Cap., \$2,000,000; shares \$1 par; issued 1,953,000 shares.

Property: about 300 acres, patented, on Augusta mountain, 10 miles north of Crested Butte, Gunnison Co., Colo., at an elevation of 12,625', shows a fissure vein containing gold, silver, lead and zinc, with general average said to be \$10 per ton. Vein is in diorite. Has been worked spasmodically since 1880.

Development: 320' vertical shaft and several tunnels, longest over 3,000'. The property has been idle for several years and surface equipment, including a 60-ton mill, has been destroyed by snowslides. Company in process of reorganization, preparatory to resumption of operations.

BLISTERED HORN MINE. COLORADO

Owned by C. J. Carpenter, John Waldron and Andrew Lejune, supt., Tin Cup, Gunnison Co., Colo.

Property: shows several veins of gold-silver-lead ore developed by 2,900' tunnel, drifts and raises. The veins are from 2-12' wide and ore of good milling grade. Developing at last accounts.

BRANT INDEPENDENT MINING CO. COLORADO

Office: Pitkin, Gunnison Co., Colo.

Officers: R. B. Anderson, pres.; R. J. Edwards, v. p.; A. P. Nelson, sec-mgr.; M. J. Ostergard, treas.; preceding officers, M. Woolley, J. W. Hickman, A. T. Hammer, G. E. Crowell and Geo. Zapf, directors.

Inc. April 12, 1906, in Arizona. Cap., \$5,000,000; shares, par value \$1; fully paid, non-assessable; 4,635,000 shares issued. Bonds, \$150,000, 8% authorized, \$87,000 issued. Dividends to date, \$8,174. Annual meeting, 2nd Tuesday in January.

Property: 96 claims, partly patented, of about 1,056 acres, in Box Canyon and Quartz Creek districts of Gunnison Co., Colo. Four mines, the Camp Bird, I. X. L., Gold Ridge and Roosevelt, opened up and proven by Camp Bird shaft 200' deep; I. X. L. shaft 60' and 90' crosscut and the Gold Ridge tunnel, which follows vein for 130'. Ore occurs in fissure veins 6 to 20' wide in diorite and granite, said to carry 8% copper and \$20 gold per

ton. The Camp Bird mine has been operated under lease by other parties.

Crosscut tunnel, started in April, 1911, to drain and open up the entire territory at depth, had been driven 2,000' October 1, 1917.

Equipment: includes hydro-electric plant of 400-h. p. capacity, completed in 1915, 4-drill air compressor, 50-h. p. motor and drills. Quartz creek runs through the property. Mine is only a few feet from D. & R. G. R. R. and county road.

CAMP BIRD MINING, LEASING & POWER CO. COLORADO

Office: Pitkin, Gunnison Co., Colo.

Officers: T. R. L. Doughtrey, pres.; F. E. Gilbert, v. p.; O. C. Gilbert, sec.; G. R. Calhoun, treas.

Inc. in August, 1914, to operate the Camp Bird mine, located between Pitkin and Bowerman. The mine is said to have produced high-grade gold ore. Present management at last accounts was sinking a shaft with intention of crosscutting 80' to the old mine workings at a depth of 230'. Company refuses to furnish information for publication.

DAY STAR MINES CO. COLORADO

Office: Pitkin, Gunnison Co., Colo.

Inc. 1912, in Colorado. **Cap.**, \$1,000,000; shares \$1 par; 700,000 shares outstanding. Annual meeting in August.

Officers: Isaac R. Wagoner, pres.; Edwin Caldwell, sec.; J. H. Deakin, treas.; John E. Clark, gen. mgr., all of Marion, Ind.

Property: 19 lode mining claims, 40 acres of placer ground and a mill-site in Quartz Creek, about 9 miles from Pitkin.

Ore: gold, silver, copper and zinc in veins in limestone.

Property: is 2½ miles from the Mary Murphy mine, but company claims to own 8,000' of the Mary Murphy vein. Management reports 68' of tunnel work and 30' of shaft work done in 1916. Plans disposing of sufficient treasury stock to carry on development work, and perhaps build a concentrator. Property still in the prospect class.

HAHNEWALD LEASING CO. COLORADO

Has a lease on the Abe Lincoln mine in Poverty Gulch, near Pitkin, owned by the Brant Gold & Copper Co., which see. Reported shipping about 100 tons of fair grade ore per week in 1916. No later returns.

JEWELL MINES & REDUCTION CO. COLORADO

Idle. R. A. Schwab, sec., Century Bldg., Denver, Colo. W. E. Hager, v. p.-gen. mgr.

Property: the Pandora mine and mill site, 231 acres, partially patented, 7 miles E. of Pitkin, Gunnison Co., Colo., said to carry 8 fissure veins.

Development: by 1,800' tunnel.

Equipment: includes air compressor, machine drills, water power. No returns securable.

RAYMOND CONSOLIDATED MINES CO. COLORADO

Dexter T. Sapp, pres., Gunnison, Colo.

Property: about 600 acres, includes the Raymond mine in Gold Creek district, about 5 miles N. of Ohio City, said to have 2 ore-bearing veins.

Development: by 2,700' tunnel and drifts.

Equipment: includes compressor, steam plant and concentrating mill. Idle.

VULCAN MINES & SMELTER CO. COLORADO

Office: 302 Century Bldg., Denver, Colo. C. H. Mace, supt., Iola, Colo.

Officers: Robt. G. Ainsworth, pres.; C. H. Mace, v. p.; Chas. P. Mety, sec.-treas.; above with W. W. Mace, Geo. E. Bermond, John R. Rowland and F. J. Greenwald, directors.

Inc. Nov. 3, 1915, in Colo. **Cap.**, \$100,000; shares \$1 par; 75,000 issued. Stock transferred at company's office. Annual meeting in November.

Property: 9 patented claims, 95 acres, in Domingo mining district, Gunnison Co., said to show gold-silver-copper ore in fissure veins. Ore is a sulphide occurring in sericitic schist. The orebody strikes E.-W. and dips N.

80°. Old workings and dumps said to have a considerable tonnage of ore averaging 1 oz. gold, 4 oz. silver, and 2½% copper.

Development: by 700' vertical shaft with 5,000' of underground workings.

Equipment: includes steam power, hoist, and 50-ton hot blast copper matting furnace, installed in 1916. Mine credited with production of \$200,000 under former ownership.

HINSDALE COUNTY

COLORADO & CONNECTICUT GOLD MINING CO. COLORADO
Main office: Meriden, Conn. **Mine office:** Lake City, Hinsdale Co., Colo.

Officers: Geo. S. Wilcox, pres.; Hubert Little, v. p.; R. F. Dossin, sec.; B. F. Barnes, treas.

Inc. 1903 in South Dakota. **Cap.,** \$400,000; shares \$5 par, changed later to \$1,200,000, shares \$1 par.

Property: 3 claims, 21 acres, known as the Dolly Varden mine, in the Galena district, carrying three 2' fissure veins, opened by a 150' shaft and a 738' tunnel, with 1,900' of workings. Ore is chalcopyrite, tetrahedrite and occasional argentite, giving assays of 9 to 19% copper, with occasional silver values, and test shipments have given returns of 141 to 479 oz. silver and as high as \$11 gold per ton. Management expects to have force working in 1917. Property was idle in 1915 and 1916.

COLORADO-UTAH MINES OPERATING CO. COLORADO

Officers: Arthur S. Larsen, pres.; A. B. Smith, supt.

Inc. in Utah. **Cap.,** \$100,000 shares 5c. par; increased Sept. 15, 1917, from \$30,000.

Property: the Golden Fleece mine, near Lake City, Colo. Equipped with new 100-ton mill which was expected to operate in August, 1917. Company deepened shaft to 800' and cut stations on Nos. 6, 7 and 8 levels.

FANNY FERN MINING CO. COLORADO

Lake City, Hinsdale Co., Colo. See Vol. XII.

FRANK HOUGH MINING CO. COLORADO

Office: 830 Equitable Bldg., Denver, Colo. **Mine:** Lake City, Hinsdale Co., Colo.

Inc. 1907, in Colorado.

Mine: on Engineer mountain, has a 2,500' tunnel, developing a large body of copper sulphides, including bornite, with assays up to 27% copper, 47 oz. silver and \$5 gold per ton. Mine shipped several hundred tons of high-grade silver-copper ore, under former ownership.

Equipment: includes 800-ton shipping bins.

Production: estimated at 250,000 lbs. fine copper in 1909, and 600,000 lbs. in 1910. Property considered promising, but was closed down in 1912 because of destruction by fire of its surface equipment. Presumably idle, 1916-17.

HANNA MINING & MILLING CO. COLORADO

Capitol City, Hinsdale Co., Colo. Has copper-lead ores, with steam and electric power and a 100-ton concentrator. Letters returned in 1916. Probably dead.

HINSDALE TUNNEL & REDUCTION CO. COLORADO

Is a reorganization made in 1907 of the Henson Creek Lead Mines Co.

Property: at Lake City, Hinsdale Co., Colo., known as the Bonanza group, is said to carry complex lead and copper ores. Has water and electric power and a 50-ton concentrator. Letters neither answered nor returned.

PELICAN MINING & MILLING CORPORATION. COLORADO

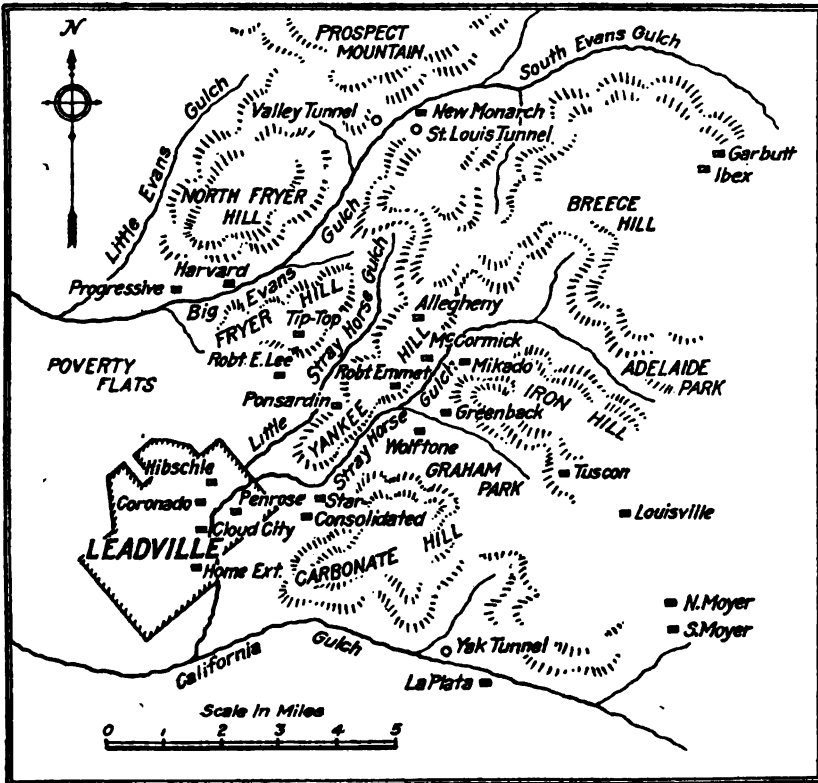
Office: 141 Milk St., Boston, Mass. **Mine office:** Lake City, Hinsdale Co., Colo. Mine is developed by tunnel and has electric power and air compressor.

LAKE COUNTY
LEADVILLE DISTRICT

- A. Y. & MINNIE M. & M. CO.** **COLORADO**
Leadville, Colo. Is a subsidiary of the Western Mining Co., which is controlled by the American Smelters Securities Co. S. D. Nichol森, gen. mgr. Produces lead-zinc sulphide ore, which is shipped to Sand Springs, Oklahoma, and to Pueblo, Colo. Developed by shaft, and employs about 50 men.
- BENGAL TIGER-GORDON MINE.** **COLORADO**
Operated by Twin Lake M. & M. Co., which see.
- COLONEL SELLERS MINE** **COLORADO**
Controlled by Empire Zinc Co.
Property: in California gulch, near Leadville, Lake Co., Colo., has been worked out and operations discontinued in 1917.
- COLORADO MINERAL SEPARATION CO.** **COLORADO**
Office: Room 1110, 137 S. La Salle St., Chicago, Ill.
Officers: C. S. Funk, pres.; Jos. Weatherby, v. p.; E. R. Winn, sec.-treas., with Chas. C. Shedd, T. I. Crane, E. J. Gardner and W. J. Souderback, directors.
Inc. July 20, 1914, in Delaware. **Cap.**, \$500,000; shares \$100 par; all outstanding.
Company operated several leases on mine dumps at Leadville, Colo., and is reported to have made a recovery of 97-98% in zinc concentrate. In August, 1917, the secretary reported that leases had expired and company was preparing to treat custom ores.
- DERRY MINING & LAND CO.** **COLORADO**
R. F. Lafferty, gen. mgr.
Inc. March, 1915, in Colorado. **Cap.**, \$100,000.
Owns placer land near Leadville, on which the Derry Ranch Gold Dredging Co. (which see) operates a dredge.
- DERRY RANCH GOLD DREDGING CO.** **COLORADO**
Office: 2 Rector St., New York. Operating office: R. F. Lafferty, mgr., Leadville, Colo.
Officers: A. C. Ludlam, pres.; R. F. Lafferty, v. p.; George Sommer, sec.-treas.; with John Nisbet and N. D. Wanless, directors.
Inc. in Colorado. **Cap.**, \$100,000; shares \$100 par; non-assessable; all issued. Gross earnings in 1916 were \$208,615 and expenses \$103,421. Dividends in 1916 were \$75 per share.
Property: 125 acres of placer ground near Leadville, Colo., owned by the Derry Mining & Land Co., and under lease to the Dredging company.
Development: drilling proved an average depth of 30', containing 25c per yard.
Equipment: modern 5½ cu. ft. dredge, digging 75,000 yards per month, using electric power.
- DOLD MINING CO.** **COLORADO**
Address: C. J. Dold, Leadville, Colo.
Property: the old Northern mine of 8 acres, adjoining the Coronado on the north, and idle for 15 years; held under a 10-year lease from the Leadville Basin Mines Co., which see.
Development: by 640' shaft. There are three ore horizons at as many contacts, which are porphyry and limestone. Reopening under way, 1917.
- DOWN TOWN MINES CO.** **COLORADO**
Offices: Chemical Bldg., St. Louis, Mo., and Leadville, Colo.
Officers: J. L. Goff, pres.; H. Mann, v. p.; Chas. J. Walker, sec.-treas., with C. W. Chamberlain, W. T. Nardin, directors. Jesse F. McDonald, mgr.
Inc. March, 1914, in Colorado. **Cap.**, \$400,000; shares \$10 par. Company has 20-year leases on several of the Down Town mines at Leadville.

Property: 400 acres, includes a number of old mines which have produced several millions. The mines have been idle for a number of years; it was thought that all the valuable ore had been extracted, but in former mining no zinc ore was taken out. The present company was formed to unwater the mines and resume mining operations. As underground workings are estimated to be 30 miles in extent the task of unwatering is a large one.

Pumping, which started in May, 1915, was done at the Penrose shaft with 4 electric vertical, centrifugal pumps. Property was drained to the 875', or lowest level, in summer of 1916, and a 4-stage centrifugal pump installed which handles 2,000 gals. per minute.



MAP SHOWING PRINCIPAL PROPERTIES IN LEADVILLE DISTRICT, COLORADO

Development: work is underway and daily shipments of 400 tons of zinc carbonate and iron manganese ore continued through 1917. Production is expected to increase steadily with development.

The Horrigan lease opened a large body of 35% to 50% manganese ore on the 440' level of Bohn shaft, Sept., 1917.

EDNA MINING CO.

Operating the Carbonate mine at Leadville, Colo., 1917, through Hagerman shaft. Said to show large bodies of silver-bearing iron pyrite ore. Mr. Jarbeau, mgr.

FANNY RAWLINGS MINING CO.

Office: 6 N. Nevada Ave., Colorado Springs, Colo.

COLORADO

COLORADO

Officers: John A. Himebaugh, pres.; Thomas S. Brigham, v. p.; Walter C. Frost, sec.-treas.; R. W. Coates, mgr.

Cap., \$1,000,000; shares par value \$1; cash in treasury, July, 1917, \$2,000. Has \$5,000 loaned at 5½% and secured by lien on first-class improved real estate, stock, 5,551 shares. Last stockholders' meeting held June 29, 1912. Listed on Colorado Springs Exchange. Total amount of dividends paid to date, \$50,000; last dividend, \$3,000, paid Dec. 29, 1908. All taxes paid and company has no debts.

Property: the Fanny Rawlings lode mining claim, about 10 acres, on Breece Hill, near Leadville.

Development: on south half of claim said to have cost \$255,000, and plant cost about \$13,000. Property is leased to Charlestown, W. Va., parties, who are operating on the 600' level.

Shipments in 1917 said to run 4.25% copper and 1 oz. silver, having a net value of \$55.81 per ton. The Fanny Rawlings company receives 35% of the net value of all shipments made by the lessees.

FIDELITY GOLD MINING CO.

COLORADO

Controlled by Chas. J. Fox, Philadelphia.

Property: in the Lackawanna gulch section, Leadville, developed by several tunnels. A 4' vein of smelting ore was opened up on the 1,200', or lowest tunnel level, reported to assay \$200 per ton in gold, with silver and copper values. Management said to have expended \$75,000 in development work to end of 1916.

FORTUNE MINE

COLORADO

John McNeece, mgr., Leadville, Colo. The mine is an old-time producer in Evans Gulch, developed by 2-compartment shaft, which connects with the Yak tunnel at depth of 1,000'. Ore carries mainly lead-zinc, with slight gold-silver values.

Six sets of lessees reported operating and shipping, April, 1917, to the smelter at Salida.

GARBUTT LEASING CO.

COLORADO

John Cortellini, mgr., Leadville, Lake Co., Colo.

Property: adjoining the famous Little Jonny mine on Jonny Hill, has 1,000' shaft, producing copper with good gold-silver values. Report that a large body of ore, assaying \$15 gold per ton, was found in 1915.

Equipment: includes a steam hoist and 15-drill air-compressor. A 200-ton mill was designed during 1916, but whether erected or not is not known. Company is a close partnership and does not care to divulge results of its operations.

IBEX MINING CO.

COLORADO

Office: 929 Equitable Bldg., Denver. **Mine office:** Leadville, Colo.

Officers: A. V. Hunter, pres.-treas.; John A. Ewing, v. p.; Chas. Caven-der, sec.; J. F. Campion, mgr., with W. W. Davis, Wm. Byrd Page and J. J. Brown, directors. Geo. Becker, supt.

Inc. March, 1891, in Colorado. Cap., \$100,000; shares \$1 par; non-assessable; all issued. Annual meeting 1st Monday in June. Company is operated as a close corporation.

Property: 10 claims, patented, 52 acres, on Breece Hill, Lake Co., Colo., includes the Little Jonny claim, which has produced about \$25,000,000 worth of ore. Ore occurs in blanket deposits carrying silver, lead, copper and zinc values. Bodies of contact metamorphic ore encountered at depth were low-grade and not valuable. Vein structure is very complicated, owing to faulting.

Development: by 4 vertical shafts to depth of 1,250'. On the 900' level an oreshoot, opened for 2,000', is reported to be 70' wide and 55' high and to run from 0.80 to 1.30 oz. gold per ton.

Equipment: includes 18 machine drills, breaking about 350 tons of ore per day. Mine is worked by lessees, the Garbutt and C. D. G. being the largest operators, employing 100 men jointly. Operations in 1917 were curtailed by labor strike, but work resumed in August.

IRON SILVER MINING CO.

COLORADO

Offices: Room 926, No. 52 Broadway, New York City, and 615 Stevens Bldg., Detroit, Mich. Mine near Leadville, Lake Co., Colo.

Officers: W. R. Cobb, pres.; Henry G. Stevens, v. p.; Homer A. Hoit, sec.; Fremont Woodruff, treas.; preceding, with Bruce G. Broad, R. H. Webber, Isaac J. Meyer, Eber W. Cottrell, H. C. DuVal, Samuel E. Reinhard and Chas. E. Hilton, trustees. Geo. O. Argall, gen. mgr.; Philip Argall & Sons, cons. engr.

Inc. March, 1880, in New York. Cap., \$10,000,000; shares \$20 par. Net earnings were \$267,034.64 in 1904; \$515,127 in 1906; \$65,366 in 1907; \$6,960 in 1908; \$183,121 in 1909; \$138,308 in 1910; \$187,639 in 1911; \$274,322 in 1912; \$123,927 in 1913; \$174,629 in 1914; \$184,199 in 1915; \$210,595 in 1916.

Dividends: \$400,000 in 1906; \$300,000 in 1907; none in 1908; \$50,000 in 1909; \$200,000 in 1910; \$100,000 in 1911; \$200,000 in 1912; \$200,000 in 1913; \$100,000 in 1914, 1915 and 1916, with total dividends, to Jan., 1917, \$5,150,000. Stock listed on N. Y. Consolidated Stock Exchange and the Detroit Exchange. Farmers Loan & Trust Co., New York, registrar. Annual meeting, first Tuesday in March.

In 1916 company mined 43,474 tons of ore of a net value of \$522,622. Total income for year was \$465,419, and total expenses \$254,823. Balance sheet Dec. 31, 1915, showed cash surplus of \$368,187.

Property: the Moyer, Tucson and Blind Tom mines, on Iron hill, about 2 miles E. of Leadville. Also controls through stock ownership, the Nisi Prius Cons. Mining Co. and the New Marian Cons. Mining Co., which see. In 1915, company purchased an undivided 1/2 interest in the Proserpine and Cumberland lode mining claims, U. S. Survey No. 5214, which secured for the Iron Silver Co. a 1/8 interest in these claims, consisting of 9.9 acres, adjoining the company's property on the N. W.

The Moyer mine yielded 17,269 tons of ore in 1916, net value of \$156,015. The mine has over 2 miles of workings and contains large orebodies of very low-grade complex lead-zinc ore from which large tonnages have been extracted for several years past. The "East" orebody opened and stoped in 1912, 18' thick, 70' wide and 360' long, was completely exhausted in 1915, and ore production was secured from older workings, abandoned in former years because the ore was considered too low-grade to pay. Development in the Moyer totaled 4,138'.

The Tucson yielded 17,495 tons of ore, worth \$270,625 net. Exploration amounted to 2,692'.

Lessees mined 6 classes of ore totaling 8,654 tons, valued at \$94,433 net.

To drain and develop an old area in the Graham Park basin of Leadville, Colo., the company in 1916 erected a plant costing \$500,000 at the Mikado shaft. This shaft was re-timbered to 1,200' depth. Like other old workings that have been recently unwatered at Leadville, it is hoped to mine ore that will pay under present conditions.

In 1916, six leases were operated on the upper workings of the Iron mine and lessees produced 6,008 tons of zinc carbonate, 1,674 tons of lead carbonate, 772 tons of iron oxide, 34 tons of zinc sulphide, 138 tons of zinc-lead sulphide and 28 tons of silicious sulphide.

The Tucson has a 1,200' aerial tram, of 12 tons hourly capacity, from the shaft to the railway siding, costing \$7,855, which has cut the cost of ore transportation from 60 cts. to about 12 cts. per ton.

Recent production: of the mines as a whole:

	Copper lbs.	Gold oz.	Silver oz.	Lead lbs.	Zinc lbs.	Iron lbs.
1916....	1,420,713	134.5	336,277	2,401,089	12,994,318	5,597,605
1915....	33,694	575.	136,674	4,205,616	16,674,848	2,957,235
1914....	12,751	923.1	327,976	10,608,734	17,396,362	5,247,433
1913....	7,230	509.	391,603	12,105,921	25,658,913	2,745,511
1912....	58,543	323.92	470,403	12,874,099	21,601,428	2,816,079

Property is well equipped and well managed. The company's future operations are expected to disclose silver ore, though at present the Mikado mine yields only zinc ores.

JULIA MINING CO.**COLORADO**

Address: Clarence Jarbeau, mgr., Leadville, Colo.

Property: the Home Extension and Cloud City mines in the Down Town area of Leadville, from which 50 to 100 tons daily of manganese-iron-silver ore is being shipped.

KATINKA GOLD MINING CO.**COLORADO**

Owns property at Guyot Hill, Leadville, Lake Co., Colo., operated under lease 1915, by Progressive Gold Mining Co. Chas. Warden, mgr. Work stopped Jan., 1916, by threatened apex litigation.

LEADVILLE BASIN MINES CO.**COLORADO**

Address: S. M. Carleton, Leadville, Colo.

Officers: J. K. Carleton, pres.; S. W. Eckman, treas.; S. M. Carleton, sec.; with I. B. Humphreys, directors.

Property: the Northern mine (leased to Dold M. Co.) and Capitol, Clipper, Congress and Castle claims at Leadville, Colo.

Development: will be by deep work to explore the porphyry-lime contacts. Rich silver bearing lead carbonate has been mined by former owners.

LILIAN MINE**COLORADO**

Officers: J. Clarence Hersey, mgr.; R. J. Hughes, supt.

Property: on Printer Boy Hill, between Iowa Gulch and head of California Gulch, Lake Co., Colo.; developed by a tunnel, $\frac{1}{2}$ mile long and much drifting. Ore carries gold-silver-lead and zinc values.

Worked by lessees and output estimated at 250 tons per month. Oxide ore from the Lovejoy claim containing lead-gold values, is shipped to the Ohio-Colorado smelter at Salida. Zinc carbonate ore from the Lilian is sold to the Western Zinc Oxide Co., and Oklahoma.

LUEMA MINING CO.**COLORADO**

Leadville, Colo. Warren F. Page, mgr.

Property: the Valley and Forest Rose mines, on Prospect Mtn., developed by a 450' shaft and 2,000' tunnel, said to show silver-bearing copper and lead ores. On the 1,500' point in the bore, drill holes down to 200' have proved valuable orebodies and management plans sinking interior shaft on the course of the drills. Has electric power, hoist and all necessary machinery. Surface buildings, destroyed by fire in 1914, were rebuilt the following year.

MT. CHAMPION MINING CO.**COLORADO**

Address: 55 Congress St., Boston, Mass., and Leadville, Colo.

Officers: C. H. Huff, pres.; C. Q. Adams, v. p.; W. E. McKee, sec.; H. A. Wentworth, treas.; all of Boston. Lucien W. Smith, mgr. Company is a close corporation, inc. in Maine, 1910.

Property: 12 patented, several unpatented claims, in Lackawana and Half Moon gulches, near Leadville, and 4 miles from Malta, the railway and loading station. The Colorado Power Co.'s transmission-line connects with mine and mill. The Ozark mine is under lease to company and possibilities are considered good.

Geology: ore zone is a granite intrusion in gneiss, accompanied by an alaskite dike with several branches passing through the granite, the latter being mineralized and faulted. Ore contains gold, a little silver, and an occasional shoot carrying some copper and lead. About 30% of the gold is amenable to amalgamation. Values are mainly in the sulphides, which assay \$200 per ton. Mill ore averages \$8.42, other ore \$75.25.

Development: by tunnels, mostly in ore. Total workings, 10,000'.

Equipment: 1,000 cu. ft. compressor 6,600' aerial tram, and 75-ton mill using breaker, Hardinge and tube mills, and concentrators.

NEW MARIAN CONSOLIDATED MINING CO. COLORADO

Company dissolved and property taken over by Iron Silver Mining Co. of Leadville Colo. See Vol. XII for description of mine.

NEW MONARCH MINING CO. COLORADO

Office: c/o J. C. Kortz, pres. Cuyahoga Bldg., Cleveland, O. Mine office: Leadville, Lake Co., Colo. Frank Fuller, supt., at last accounts.

Property: the New Monarch and Cleveland mines carrying lead and zinc sulphides. Developed by shafts and crosscuts. A crosscut to the N. E. is being driven in virgin ground at the bottom of the Monarch shaft.

Equipment: includes a steam plant, compressor, etc. Operated by lessees since 1914 and producing over 1,000 tons of ore per month, averaging \$20 in gold, silver, lead and zinc.

NISI PRIUS CONSOLIDATED MINING CO. COLORADO

Controlled through stock ownership by Iron Silver Mining Co.

Officers: J. B. Grant, pres.; J. A. Ewing, v. p.; Fremont Woodruff, sec.; G. O. Argall, treas.

Property: at Leadville Colo., worked by two sets of lessees in 1916.

Development: in 1916 amounted to 482'. Output was 2,656 tons yielding \$1,390 net. Surplus at end of 1916 was \$1,431.

ONTARIO, TIGER & GREEN MTN. LEASING CO. COLORADO

E. A. Smith and Hector McDonald, of Leadville, Colo., lessees. Inc. 1916.

Property: near the head of Iowa Gulch, was discovered in 1878 and is credited with past production of \$80,000. Strong flow of water caused shut-down.

Reopened 1916 and 300' lower tunnel was extended to 700' where a 4' vein was cut carrying \$20 to \$40 ore. Values are silver-lead-gold and copper. A raise being driven to upper tunnel, is reported in ore for 30'. Shipping, 1917.

PONSARDIN MINE COLORADO

W. E. Bowden, mgr., Leadville Colo.

Property: on Yankee Hill near Leadville. Lessees reported to have uncovered a body of sulphide ore, 70' long and 15' high, on the 430' level, containing 23-31% zinc, 19% lead, 6 oz. silver, and to be shipping at the rate of 50 tons daily in 1916.

PROGRESS MINING & MILLING CO. COLORADO

Address: R. D. McCausland, mgr., Frawley, Colo., and Equitable Bldg., Denver, Colo.

Officers: P. S. Smith, pres.; M. E. Peters, sec., with Wm. B. Brook and Martin Barber, directors.

Inc. in Colorado. Cap. \$2,500,000; shares \$1 par. No balance sheet issued.

Property: 26 claims, patented, including the Wilson mine, Robinson group and Felicia Grace, Champion and New York leases, all at Robinson, Colo., 16 miles from Leadville. Ore carries lead and zinc. Reserves estimated by T. H. Teal at 878,644 tons.

Development: by Robinson tunnel 3,000' long, which attains depth of 1,200' and exposes 4 ore shoots in 6' to 10' contact vein with incline shaft to open ground below tunnel. There are also 3 shafts, East, 650', El Dorado, 650' and the 1,200' Wilson shaft opening ore at 1,040' depth. Exploration work in progress, 1917.

Equipment: 300-ton Wilson mill not in operation at present.

The company is not, strictly speaking, a mining company, but rather an ore treatment enterprise, specializing in the separation of the complex zinc-lead-iron-silver-gold ores of Colorado in its 300-ton custom concentrator at Robinson. It controls, by contracts, the outputs of a large number of mines in the Kokomo district. However, the company also has mines of its own upon which it can rely in case of necessity. The company's first twelve carloads of lead-iron concentrates shipped gave average smelter returns of \$33.73 per ton. When promotion was brought out in 1916, P.

S. Smith, pres. of the company, estimated profits on lead-iron concentrates at \$52,350 per month, promoters claiming 6,000,000 tons of ore blocked out that varied from \$20 to \$40 per ton.

Property: believed to have merit but ore treatment is not as easy or as cheap as estimated. Has been much touted in newspapers and brokers' circulars.

RUBY MINING & MILLING CO.

COLORADO

Weston Pass, Leadville, Colo. Is a new company holding a 5-year bond and lease on the Erie Mines Co. property, comprising the Ruby & Lafayette mines on Bull Hill. Mines show much ore in old workings, whose value has been tested in the Wild Horse mill. Company has erected a cyanide plant, known as the Worcester mill, near the Ruby dump. Shipments of calamine ore were made early in 1916.

ST. LOUIS-COLORADO MINING CO.

COLORADO

Address: D. W. Almond Leadville, Colo.

Officers: D. W. Almond, pres.; S. Davies, v. p.; F. D. Allen, sec.-treas.; with E. Saunders, directors.

Inc. March 3, 1915, in Colorado. **Cap.,** \$500,000; shares \$1 par; non-assessable; 300,000 issued.

Property: 16 patented claims, 320 acres, in Lake, Pitkin and Chaffee counties 15 miles S. W. of Leadville.

Development: by 3 tunnels, 50', 125' and 300' long, opening a vein carrying gold, silver, copper and lead values.

SMALL HOPES-BOREEL MINING CO.

COLORADO

Property: the Robert Emmet mine at Leadville, a great producer of lead-zinc ore, is now owned by the Empire Zinc Co. (See New Jersey Zinc Co.)

THIRD VENTURE MINING CO.

COLORADO

W. A. Palmer, pres.-mgr., Leadville, Lake Co., Colo. Company owns a lease on the St. Louis mine which has a vein with complex sulphide ores carrying copper-lead and zinc with gold-silver values.

Development: by 1,450' tunnel.

Equipment: electric with Leyner air compressor. Shipments reported to have been 25 tons a day during 1915. No recent returns.

WESTERN MINING CO.

COLORADO

Address: S. D. Nicholson, mgr., Leadville, Colo.

Subsidiary of the U. S. Smelting, Refining and Mining Exploration Co. Is an important producer of zinc carbonate ores from Big Chief, Maid of Erin, and other mines through the Wolftone shaft, Carbonate Hill, Leadville, Lake Co.

Production: in 1915 was 500 tons daily. In January, 1916, shipments had been reduced to 6,000 tons monthly, owing to the depletion of ore reserves, but reported July, unwatering shaft to 1,000' level to get into sulphide orebodies. This work will also drain the Greenback mine and open up rich ground, idle for some years past.

In Sept., 1917, was producing 200 tons daily. Carbonate ore was recently opened in the upper contact, and sulphide in the drained areas.

WESTERN ZINC OXIDE CO.

COLORADO

Office: C. H. Collins, pres.; W. A. Young, sec.-treas., Leadville, Colo. Formed in 1915 to take over and operate the 50-ton plant of the Western Zinc Mining & Reduction Co., west of Leadville.

Employs the Wetherill process of producing zinc oxide by volatilization and collecting fume in flues. Plant operated continuously.

YAK MINING, MILLING & TUNNEL CO.

COLORADO

Office: Marbridge Bldg., W. 34th St., New York. Mine office: Leadville, Colo.

Officers: Myron T. Herrick, pres.; Harry C. James, v. p.; Walter W. Davis, v. p. and gen. mgr., Leadville and New York; J. C. Mitchell, sec.-treas., Denver Natl. Bank, Denver. Hugh C. Watson, supt.

Cap., \$1,000,000; shares \$1 par; all outstanding and assessable.

Comparative General Balance Sheet:

	Assets:			Liabilities:		
	Tunnel & Prop.	Equip.	Other Current	Total	Capital Stock	Undiv. Profits
1915.....	\$977,543	\$66,386	\$724,383	\$1,768,312	\$1,000,000	\$768,312
1914(a)...	1,087,013	81,139	181,678	1,626,401	1,000,000	530,070
1913.....	1,000,611	85,582	93,889	1,439,787	1,000,000	410,765

(a) Last issued.

Comparative Income Account:

	Mng. Co. Acct.	Total Net	Div.
1915	\$268,264	\$398,242	\$160,000
1914	217,949	306,545(a)	110,000
1913	154,928	210,985	80,000
1912	69,247	120,216	80,000

(a) Except certain charges in profit and loss account.

No statement is available for the past two years.

Dividends: quarterly, commenced March 31, 1904, have been continuous. Total \$1,877,685 to July 1, 1916, including a stock dividend of 12½% declared Oct. 31, 1904. Reported that \$780,000 was paid in 1916.

Property: owns 249 acres and controls an additional area of 1,817 acres at Leadville. Also holds agreements covering several hundred additional acres, under which agreements company has the right to drive the Yak tunnel into such ground at its option.

The Yak Tunnel is a 4-mile transportation and drainage tunnel which drains an important part of the Leadville camp, including the White Cap and Cord properties on Iron Hill. The portal of the tunnel is in California Gulch, about 1 mile from Leadville; the breast, Jan., 1916, was in the Vega group, 1,200' from surface. In Sept., 1917, extension of the tunnel in Vega ground was contemplated.

The ores developed by the tunnel are chiefly complex sulphides containing gold, silver, lead and zinc. For geology of the Leadville District see U. S. G. S. Bull. 320, by S. F. Emmons and J. D. Irving.

Company employs 140 men, has electric power and haulage.

In Nov. 1917, shareholders at Denver decided to sell a half interest in the property to the A. S. & R. Co., which will also direct operations. Development and pumping equipment absorbed most of the 1917 profits.

LA PLATA COUNTY

BOREN GULCH GOLD MINING CO. COLORADO

Office: 518 Denham Bldg., Denver, Colo. Mine at La Plata, Colo.

Officers: Dr. Robt. Scrimgeour, pres.; E. M. Walker, sec.; S. N. Francis, v. p.-gen. mgr.

Property: 22 claims operated through 3 tunnels, longest over 807', driven on veins in porphyry. Ore contains sylvanite.

BOREN GULCH MINING CO. COLORADO

Reorganized, 1916, as Boren Gulch Gold Mng. Co.

COLUMBUS MINES CO. COLORADO

Office: 905 First Natl. Bank Bldg., Denver, Colo. Jas. Doyle, pres.

Inc. in Colorado. Cap., \$50,000.

Property: 3 claims in California district, La Plata Co., Colo.

In 1916-1917, development work was in progress and power, compressor plant and houses put up.

DURANGO SMELTER COLORADO

Owned by San Juan Smelting & Refining Co., which is controlled by the American Smelting & Refining Co., at Durango, La Plata Co., Colo.

EAGLE PASS MINING & MILLING CO. COLORADO

Address: M. S. MacCarthy, mgr., 728 First National Bank Bldg., Denver, Colo. Mine 3 miles from La Plata, Colo.

Inc. May 6, 1913, in Colorado. **Cap.**, \$250,000; shares \$1 par.

Property: 3 claims, 1 patented, 30 acres, said to show ore carrying gold, silver and lead values in fissure veins in limestone and porphyry. Developed by 1,000' tunnel. Only assessment work being done. Is a prospect. **PARAGON MINING CO.** **COLORADO**

Idle. Henry C. Demming, gen. mgr., 15 N. 3rd St., Harrisburg, Pa. Is successor of Tirbircio Gold Mining Co.

Property: 400 acres of lode and placer claims near La Plata, La Plata Co., Colo., is developed by 1,500' of adits.

Equipment: includes 1,000-ton rock crusher, a 50-stamp and a 10-stamp mill. Efforts made in 1916 to finance the company and resume work, appear to have been unsuccessful.

LARIMER COUNTY

COLDWATER COPPER MINING CO. COLORADO

Office: Encampment, Wyo. Mine near Pearl, Larimer Co., Colo.

Officers: Z. L. Baldwin, pres.; H. N. Backus, v. p.; Walter Phipps, sec.; Burr Lobdell, treas. and gen. mgr.

Inc. May 18, 1900, in Wyoming. **Cap.**, \$1,000,000; shares \$1 par.

Property: 5 claims, 52 acres, in the Pearl district of Larimer Co., Colo., known as the Wolverine mine. Claims have 3 fissure veins in granite and diorite, of which 1, of 20' estimated width, shows oxidized ores and native copper, with sulphides at a little depth, estimated to carry an average of 6% copper and 2.6 oz. silver per ton, opened by shafts of 90' and 170', bottom of principal shaft showing massive chalcocite and a little disseminated chalcopyrite, of high average grade. Has steam power. Idle several years.

LEADVILLE DISTRICT (See Lake County)

MESA COUNTY

NATIONAL RADIUM PRODUCTS CO. COLORADO

George Kunkle, pres., Grand Junction, Colo. Reported in July, 1915, that carnotite holdings in Paradise Valley would be developed. Enlarging its experimental plant to 200 milligrams of radium per month.

SCHLESINGER RADIUM CO. COLORADO

Address: K. L. Kithil, Box 1316, Denver, Colo. **Mine offices:** J. Cardoner, Gateway, Colo., and B. J. Manning, Paradox, Colo.

Officers: W. A. Schlesinger, pres.; K. L. Kithil, v. p. and gen. mgr.; V. C. Thorne, sec.-treas.; with S. B. Thorne and W. V. Hodges, directors.

Inc. 1915, in New York. **Cap.**, \$150,000; \$125,000 outstanding; shares non-assessable.

Property: 8 claims on Rock creek, in Paradox and Gateway district, Colo., said to show horizontal beds of disseminated ore in sandstone. Ore occurs as pockets and lean layers, varying greatly in each claim. Ore is carnotite, containing uranium (2 to 5% U₃O₈), vanadium (1 to 9% V₂O₅), and radium.

Development: surface work mostly with small underground stopes. Total workings, 500'.

Equipment: concentrator of 2 tons daily capacity in chemical plant at Denver. This is to be enlarged.

Production: 500 to 600 tons of carnotite ore per year, averaging \$100 to \$200 per ton in 1916. The recovery is 75% of metals contained, at cost of \$70 per milligram of radium extracted.

WESTERN SLOPE COPPER MG. & SM. CO. COLORADO

Formerly operated in Unaweep district, Colo. Out of business, bondholders having taken over property. For description, see Vol. XII.

MOFFAT COUNTY

DOUGLAS MOUNTAIN COPPER CO. COLORADO
 Craig, Colo. R. G. Morris, Denver, pres. Company installed new hoist, compressor, etc., 1917.

MONTEZUMA COUNTY

DOYLE CONSOLIDATED MINES CO. COLORADO
 Mine office: Mancos, Montezuma Co., Colo.

Officers: Hon. Jas. Doyle, pres.; Earl P. Hopkins, v. p.; E. R. Marden, sec., 1426 You St., Washington, D. C.; D. T. Thompson, treas.; preceding, with Wm. W. Fry and J. J. Butler, directors; R. J. Doyle, mine supt.; R. C. Morrison, mill supt.; C. F. Doyle, engr.

Inc. Oct. 21, 1907, in Arizona, as consolidation of the Mancos Mining & Development Co., the Cliff Dwellers Gold Mining Co. and the White Quail Copper Co. **Cap.**, \$10,000,000; shares \$1 par; non-assessable; issued about \$3,000,000.

Property: 31 claims, in 3 groups of about 300 acres in Rush basin, part of the California mining district, Montezuma and La Plata counties, in southeastern Colorado. Claims are in a high part of the Sierra La Plata, 3½ miles from La Plata city and 4 miles from the Colorado Southern railroad. The White Quail group shows a copper-bearing "dike" of monzonite, porphyry, said to be 150' across and to average 2½% copper and \$4 gold across its entire width. Other claims cover about a mile of the apex of the Sundown (or North Star) vein, a flat, dipping fissure in red quartzite, carrying milling ore with gold and silver values. Company developed properties for several years, through Columbus tunnel. Had 10-stamp mill in 1910 and erected a new 150-ton mill, operated July, 1912. Company advertised for lessees in 1914.

Property has thus far failed to fulfill the extravagant claims and promises of the White Quail promoters or their successors.

MONTROSE COUNTY

LA SAL COPPER-SILVER MINING CO. COLORADO
 Paradox, Montrose Co., Colo. J. Ensign Fuller, pres.; John B. Overton, sec., at last accounts. Is a reorganization of Consolidated La Sal Mining & Smelting Co., which succeeded La Sal Copper Mining Co.

Property: the Cashin mine, 7 claims, patented, and 3 mill sites, 150 acres, some distance from a railway. The mine has a 1,540' tunnel, showing carbonate and sulphide ores, assaying up to 35% copper and 18 oz. silver per ton. Lands are also said to carry coal.

Equipment: includes steam power and a Leyner air compressor. Development resumed in 1915 after long idleness. No recent returns.

NATIONAL RADIUM INSTITUTE COLORADO
Officers: Dr. Howard A. Kelly, pres., Baltimore, Md.; Dr. Jas. Douglas, 99 John St., New York, sec.

Inc. 1913, in Delaware. Company has a lease on 16 carnotite claims in Paradox Valley, Montrose Co., Colo., owned by a subsidiary corporation of the Crucible Steel Co. of America, on a 15% royalty basis.

RADIUM COMPANY OF AMERICA COLORADO
Property: at Tidwell, 15 miles from Green river in Paradox Valley district, Montrose Co., Colo., comprises a number of claims covering carnotite bearing sandstone cut by quartz stringers. Carload shipments carry 2.24% uranium oxide and 3.87% vanadic acid. Described in U. S. Geol. Survey Bull. 530-K, p. 163.

STANDARD CHEMICAL CO. COLORADO-UTAH
 Operating in Colorado and Utah, mining radium and vanadium-bearing ores in Paradox Valley, Colo. Company gives out no information. Stated

late in 1916 that company was employing several hundred men and shipping ore.

See U. S. Bureau of Mines Bull. No. 1:25, p. 944.

OURAY COUNTY

AMERICAN MINING CO. COLORADO

Property: American Nettie mine, near Ouray, Ouray Co., Colo.

Ore: gold in broad, flat shoots, in quartzite, about 7' thick and proven for 700' in length. These orebodies believed to be the northerly continuation or downward faults of the Wanakah orebodies, which intersect the great monzonite porphyry dike running due east through the Nettie ground.

Development: 700' tunnel and upraise.

Equipment: Compressor, drills, and machinery.

Production: In gold since 1889. \$1,500,000.

AMERICAN NETTIE MINE. COLORADO

See American Mining Co.

ATLAS MINING & MILLING CO. COLORADO

Office: Ouray, Colo. C. H. Austin, pres.; C. C. Carson, v. p.-sec.; A. B. Shipman, treas.; with C. H. Wagner, Wm. Story, Jr., and Chas. D. Loper, directors. Jas. A. Lannon, supt., Sneffels, Colo.

Inc. Feb., 1904, in Colorado. **Cap.**, \$2,000,000; shares \$1 par; 1,921,000 shares outstanding. Authorized bond issue \$50,000; all outstanding. Annual meeting in August.

Property: 28 claims, patented, 204 acres in Mt. Sneffels district, Ouray Co., Colo., includes the Atlas & Crown Point mines. Ore, which occurs in 3' fissure vein in andesite, is a complex sulphide, carrying grey copper, gold, silver and lead. Average assays are reported to run 9 oz. silver and 0.05 oz. gold per ton. The vein is developed by a 2-mile tunnel to depth of 1,500', with a total of 20,000' of underground workings.

Equipment: includes electric power, air compressor, tramway and 150-ton 20-stamp mill with table and flotation (Min. Separation Co., Ltd.) concentration, giving a 90% recovery of ore values. Management expects to further solve treatment of complex ores and increase recovery to 95%. Employs 75 men.

Production: 30,000 tons in 1913, 35,000 tons in 1914 and 40,000 tons in 1915. Management estimates 50,000 tons of ore blocked out.

BACHELOR KHEDIVE MINES CO. COLORADO

P. O. Box 1,139, Denver, Colo.

Officers: Henry A. Dubbs, pres.; Henry Lyne, v. p.; J. S. Williams, sec.; W. A. Johnston, treas.; with W. J. Kirsher, T. J. Hyland and W. B. McDonald, directors. L. G. Eakins, gen. mgr., Denver.

Inc. in Colorado. **Cap.**, \$1,000,000; shares \$1 par, all outstanding. Annual meeting 1st Monday in October.

Property: 11 claims, patented, 83 acres at Ouray, is a silver producer. Operated by lessees. Ore sales, 1916, totaled \$9,365, with net receipts of \$3,200. Reported producing 1,000-1,500 tons of ore per month in 1917.

BARSTOW MINE. COLORADO

Office: 42 Broadway, New York. **Mine office:** Ouray, Ouray Co., Colo. Works at Ironton, Ouray Co., Colo. J. H. Fennessy, trustee. Property under bond and lease to C. R. Wilfley, 1917.

Property: 27 claims, patented, 199 acres mineral land with 5 acres mill site, in Red Mountain district. Ore found in fissure vein in andesite with N. W. strike and dipping 75°, is reported as 8' wide and carries 0.75% copper, 2.5% lead, 4% zinc.

Developed: by 2 shafts, 425' and 145' deep, and 2 tunnels, 3,200' and 3,300' long. Total length of underground workings 10,300', reported to have developed 17,000 tons of ore with 8,000 tons in sight.

Equipped: with 2 hoists, electric compressor, 6-drill capacity, frame stamp mill and concentrator with 2 Blake crushers, 9x15", 40 stamps, 20 Wilfley tables, 2 slime tables and buddles. Mine has 115-h. p. mill 175-h. p.

Mine is 11 miles from D. & R. G. R. R. and the Silverton R. R., operating in the summer, is 1 mile away.

The "spar" vein of this property, leased Sept., 1916, to Engineers Corporation of Boulder, Colo., who will work it for fluorspar. This vein, carrying 3' of fluorspar, cuts across the Barstow vein.

BENACK MINING CO.

COLORADO

Address: M. Fleming, 700 Fleming Bldg., Des Moines, Iowa.

Company formed to operate the Ouray group of claims, 50 acres, 7 miles S. E. of Ouray, Colo.

Development: by tunnel, said to have opened up an orebody for 400' and to have developed 17,967 tons of shipping ore and a larger tonnage of milling ore, ranging in value from \$10 to \$25 per ton.

Shipments to date total 29 cars sent to the Salida smelter, which are reported to have averaged 57 oz. silver, 13% lead, 2% copper, 5% zinc and to have yielded \$42 per ton.

BROWN MOUNTAIN SMELTING CO.

COLORADO

T. B. Crawford, sec.-treas., 403 Wyoming Block, Denver, Colo. Mine office: Ouray, Ouray Co., Colo.

Officers: W. E. Kreamer, pres.; P. J. York, v. p.; A. E. Ackerson, mine supt.

Inc. 1911 in Colorado. Cap., \$300,000; shares \$1 par; issued, 280,000.

Property: the Hill, or Ouray smelter and the Guadalupe mine with 432 acres mineral land and 25-acre mill site in the Red Mountain district. The Guadalupe mine is reported to show an 18' vein of copper ore averaging 3% copper, 5 oz. silver and \$5 gold per ton in sulphide ore.

Development: totals 3,000', including a 2,000' tunnel and a 500' crosscut blocking out 50,000 tons of ore.

Equipment: at mine, 350-h. p. water power.

The 250-ton smelter, 6 miles from Ouray, has 2 blast furnaces of the Loder type, turning out 40% matte, which is shipped to the Garfield smelter for further treatment. It was blown in Oct., 1913.

CADIZ MINING CO.

COLORADO

Office: 220-2 1st Nat'l. Bank Bldg., Denver, Colo.

Officers: F. C. Wood, pres.; B. H. Graves, v. p.; J. H. Bender, sec.; S. M. Walker, treas.-gen. mgr. Mines are at Rico, Ouray Co., and at Black Hawk, Gilpin Co.

Inc. Sept., 1916, in Colorado. Cap., \$100,000; shares, par \$1, full paid, non-assessable; \$31,000 outstanding.

Property: at Rico, A. B. G., Sydney, D. V. G. groups and Wabash and No. 7 claims, comprise 38 claims in all, aggregating 460 acres. It is reported that 6,000 tons of ore are blocked out, running 18% lead, 15% zinc and 15 oz. silver. At Black Hawk, Gilpin Co., the company has the Polly group. Work is being done through a 700' tunnel, which is reported to have cut veins of fair grade ore.

CALLIOPE CONS. MINING CO.

COLORADO

Office: 410 Foster Bldg., Denver. Mine office: P. O. Box 493, Ouray Colo.

Officers: S. W. Schroder, pres., 503 Downing St., Denver; L. J. Ford, v. p.; C. A. Larson, sec.-treas., Denver; preceding, C. F. Ogram and A. A. Durson, directors. R. W. Davis, Jr., supt.

Inc. Feb. 9, 1914, in Colorado. Cap., \$100,000, par \$1; outstanding 49,525 shares. No bonds. Annual meeting Feb. 9.

Balance sheet for 1916 showed net sales from ore as \$10,743; operating expenses, \$24,252. Income account, \$29,574.

Property: 10 patented claims at Dexter Creek, Ouray, Colo. Is being developed by 2,800' tunnel. The ore deposit is a quartz vein carrying gold, silver, lead, copper, and zinc. Production for 1916, 482½ tons.

GOLD CROWN MINING CO.

COLORADO

Address: J. C. Ingersoll, mgr., Ouray, Colo.; B. G. Brinkman, owner of mine, Lafayette Bank, St. Louis, Mo.

Property: 45 claims, 40 patented, 450 acres, at Ouray, Colorado, is being worked under option.

Ore: is a mixture of quartz, calcite and ferro-manganese silicates, carrying iron pyrite with gold and copper, mainly as chalcopyrite.

Development: by 1,400' shaft with 4,000' of workings.

Equipment: includes 300-ton mill using flotation.

HARPER-LARSON DEVELOPMENT CO.

COLORADO

Name changed, 1917, to Calliope Cons. M. & M. Co., which see.

HUMBOLDT MINES CO.

COLORADO

Telluride, Colo.

Officers: Bulkeley Wells, pres. and gen. mgr., Telluride; F. N. Watriss, v. p.; Thos. J. Regan, sec.-treas., 120 Broadway, New York; preceding, with C. N. Bell and E. B. Adams, directors. C. N. Bell, supt.

Inc. 1915, in Colorado. **Cap.**, \$500,000; shares \$100 par; outstanding, \$382,000.

Property: 25 patented claims, 180 acres, in Mt. Sneffels mining district, Ouray county.

Ore: gold, silver, lead and iron, in a 2' quartz fissure vein in andesite with N. W.-S. E. strike and dip of 76°.

Development: 680' vertical Humboldt shaft with 7 levels and the mile-long Sheridan tunnel connecting with lowest level of the Humboldt shaft. Greatest depth of workings, 840'.

Equipment: includes a 50-h. p. electric hoist, Ingersoll-Rand compressor and a tramway. Power is electric.

Production: started Jan. 1, 1916. Producing 150 tons daily, 1917. Ore is milled by Smuggler Union Mining Co.

MOUNTAIN TOP MINING CO.

COLORADO

Address: Ouray, Colo.

Officers: Windsor Morris, pres.-treas.; G. H. Beebe, v. p.; G. H. Barnhart, mgr.-treas., with E. C. L. Bartow, Carl Larger, W. E. Hopton and J. A. Mathews, directors.

Inc. Aug. 11, 1911, in Colorado. **Cap.**, \$750,000; shares \$1 par, non-assessable; \$500,000 issued. Bonds authorized, \$250,000; \$146,000 issued.

Property: 12 claims 10 patented, 114 acres, in Mt. Sneffels district, Ouray Co., Colo., 6 claims covering 9,000' along the N. extension of the Smuggler-Union vein.

Geology: fissure-vein in andesite, showing ore with galena and gray copper, and carrying gold, silver, lead and copper values. Shoot is from 6 to 36" wide and 500' long. Mill ore reported to assay \$30 and shipping ore over \$200 net per ton.

Development: by crosscut tunnel 2,500' long, with total of 8,000' of workings, to depth of 1,000'.

Ore reserves: given as 30,000 tons.

Equipment: includes compressor and 50-ton mill employing 2 pneumatic flotation units. Plant is unique in that ore-treatment is all done underground in order to prevent snow-slides damaging mill. Extraction is 89%. All machinery is motor-driven.

NATIONAL BELL MINE.

COLORADO

Property at Red Mountain, near Ouray, Ouray Co., Colo., is a small producer of copper-silver ore. Operated by 3 sets of lessees in 1916.

OURAY SMELTING & REFINING CO.

COLORADO

Office: Hayden Bldg., Ouray. Thos. B. Crawford, pres.; Wm. E. Kreamer, sec.-treas.

Inc. in Colorado. **Cap.**, \$750,000; shares \$1 par; divided into 185,000 7% preferred shares, 82,000 outstanding, and 562,500 common stock, 150,000 shares outstanding.

Property: 435 acres, patented, on the Uncompahgre river, 4 miles from Ouray, Colo.

Development: by 250' shaft and 3,500' of tunnels and drifts. The company became financially embarrassed in 1914, and the mine was closed down. Reopened, 1917. The 350-ton smelter at Ouray is operating and a new 75-

ton custom mill has also been erected. Management has offered to run 1-ton sample lots of ore for local producers at \$1 per ton, in order to secure tonnage for the plant.

SAN ANTONIO MINING CO.

COLORADO

Office: 312 Century Bldg., Denver, Colo. Mine office: Red Mountain, Ouray Co., Colo.

Officers: M. T. Chestnut, pres. and gen. mgr.; Otto Koehler, v. p.; Wm. L. Stephens, sec.-treas.; J. F. Roper, supt.

Inc. Feb. 5, 1908, in Colorado. Cap., \$500,000; shares \$1 par.

Property: 37 claims, patented, about 200 acres, a 20-acre mill site and 10 acres miscellaneous lands, 1 mile from a railway, in the Red Mountain district of Ouray and San Juan counties. Lands, including the Carbon Lake mine, show porphyry, carrying several orebodies, estimated at 20' to 30' width, traceable for more than 3,000' and reported by the company to show enargite ore carrying 12% copper, 10% lead, 10 oz. silver and \$3 gold per ton, which is from a narrow paystreak.

Development: by shafts of 37' and 200', the Camp Robber tunnel of 625', and the Koehler tunnel of 2,800', with a back of about 500'.

Equipment: includes a 5-drill air compressor and 10 mine buildings and dwellings. Idle several years.

Letters returned in 1917.

SLICK BROS. MINING & MILLING CO.

COLORADO

Address: B. B. Slick, Ridgway, Colo.; W. B. Slick, pres., Boise, Idaho, Inc. 1909 in Nevada. Cap., \$1,500,000; \$1 par.

Property: 10 claims 100 acres, patented, on Mt. Hayden, Uncompahgre district, Colo., shows fissure vein in andesite. The vein runs N. E.-S. W., dips at 45°, which for 2,400' long shows 3' of sulphide copper ore carrying gold-silver values, and reported to average \$35 per ton in all three metals. The shoot is said to carry ore for 600'x600'x3'.

Development: by 3 tunnels, aggregating 1,200' and having back of 350'. Property reported on by F. M. Kilmer, of Boston Inst. of Technology.

Company was to install machinery and power, expending \$60,000 for this and development work in 1916.

VERNON MINING CO.

COLORADO

Office: W. L. Fleming, 50 Broad St., New York. Mine office: A. G. deGolyer, mgr., Ironton, Colo.

Officers: W. L. Fleming, pres.; C. L. Horton, v. p.; N. L. Young, sec.-treas., with W. P. Ward, A. G. deGolyer and F. D. Armstrong, directors.

Inc. July, 1916, in Delaware. Cap., \$1,000,000; shares \$1 par; 800,000 outstanding; 490,000 issued to syndicate subscribers.

Balance sheet for the term, July 13 to Dec. 31, 1916, shows receipts totaling \$75,865, \$70,500 being from sale of shares. There was spent at the mine \$57,681, and \$2,855 for miscellaneous, leaving \$14,928 cash on hand.

Property: 21 claims, 2 patented, 325 acres, located at timber line (11,000'), in the Red Mountain mining district of Western Colorado, about 7 miles from Ouray.

Geology: 3 well-defined fissure veins in altered andesite. The Beaver vein has not been prospected. The South Dakota vein, lying between the Vernon and the Beaver, is traceable for several thousand feet and shows an outcrop that is 50' to 80' wide. This vein is parallel to and about 150' from the Vernon; the dip being opposed the two veins should unite at about 300' in depth. The veins carry gray copper ore with high silver-copper values, in well-defined ore shoots. The South Dakota vein has a shoot 175' long that will average 5' in thickness opening to a width of 20' in stopes above the tunnel level where the ore averaged 12% copper, 44 oz. silver and \$2.80 per ton in gold. The Vernon vein shows a width of 3' of high-grade silver-copper ore in a drift at the bottom of a 48' shaft.

Development: on the South Dakota vein an incline shaft, 450' to 500'. Reserves are estimated as worth \$200,000.

Equipment: includes machine drills, electric hoist, compressor and 70-ton flotation plant.

Property meritorious; management good, but the president's office issues an immense quantity of circulars.

WANAKAH MINING CO.**COLORADO**

Address: John T. Roberts, Jr., gen. mgr., Ouray, Colo.

Directors: G. H. Beebe, J. A. Matthews, J. T. Roberts, Sr. and Jr., S. McCurdy, L. P. Smith and S. F. Hancock.

Property: the Bright Diamond, Ironclad and Memphis groups, north of Ouray, Ouray Co. Operations have been intermittent, the 200-ton matting furnace having a capacity far in excess of the ore supply of the district. Opened as a custom smelter March 1, 1914; only 1,489 tons of ore was received during the remainder of the year. The smelter was sold late in 1916 to the Ouray S. & R. Co., a reorganization of the Brown Mountain S. Co., original owners.

Reported in June, 1916, that the Wanakah mine was being reopened preparatory to 6 months' development work. It is claimed that mine is not more than 25% worked out.

In June, 1917, company was reorganized by Syracuse, N. Y., people.

PARK COUNTY**BIG TOAD MINING & MILLING CO.****COLORADO**

Office: 237 First Natl. Bank Bldg., Denver, Colo.

Officers: A. E. Chapman, pres.; W. J. H. Miller, v. p.; C. L. Dickinson, sec.; J. L. Hunter, treas.-mgr., preceding with Victor Neuhaus and Emil Affolter, directors.

Inc. Oct. 12, 1916, in Colorado. **Cap.**, \$500,000; \$1 par, non-assessable; 240,000 shares outstanding.

Property: 17 claims, 300 acres near Alma, Colorado, held under bond and lease covering 5 years. Purchase price, \$50,000, to be paid at the rate of \$10,000 yearly, first payment due Sept., 1917. Claims are on the eastern slope of Mt. Bross and are said to show 2 veins on the surface carrying gold, silver and lead values.

Development: consists of 250' tunnel to be driven 500', and an old shaft.

Equipment: includes "mill building" and 4,200' aerial tram, which have been bought by company. Treasury stock being sold, 1917, to equip a 100-ton mill.

Advertising of the Denver promoters is unfavorably regarded. Development of "orebody" considered insufficient to tell public there will be \$180,000 earnings per year, etc.

GREAT WESTERN MINE.**COLORADO**

Armstrong and Vanetta, lessees. Mine near Lake George, Park Co., Colo.

Property: shows vein with gold-copper ore, developed by 218' vertical shaft, 800' of crosscuts and drifts. Equipped with steam power and air compressor. Development work continues and small shipments of sulphide ore have been made.

LAKE GEORGE DEVELOPMENT CO.**COLORADO**

Office: 22 E. Columbia St., Colorado Springs, Colo. A. J. Kiser, sec.-treas., writes, 1917, that property has been sold and company is in receiver's hands. Fully described, Vol. XII.

LONDON MINING & REDUCTION CO.**COLORADO**

Controlled by the Story, Jewett and Packard estates. Mine office: Alma, Park Co., Colo. Chas. Aicher, mgr.

Property: the London mine on London mountain, 7 miles W. of Alma, and about the same distance from Leadville, opened in 1875, is an old-time producer of gold-lead-silver ore.

The ore deposits are replacements of blue limestone at its contact with eruptives or are true fissure veins in quartz porphyry. The main London vein, 3-12' wide, runs N. 37° W., with dip 65° W. The gangue is pure quartz with small amounts of calc-spar and barite. Assays reported to average 3 oz. gold, 4 oz. silver, 8% lead. This vein is credited with all

but 10% of the total production of the mine to date; but there is another vein with same grade of ore.

Development: by 2 adits, one 300' below the other, opening the London vein for 2,980' and exposing backs of 150' to 650'. Company is driving a new tunnel 600' below the old workings which will be 2 miles long.

PITKIN COUNTY

HOPE MINING, MILLING & LEASING CO. COLORADO

Address: Aspen, Colo. Chas. O'Kane, pres.; H. W. Clark, sec.; J. B. Stitzer, treas.

Property: a group of claims, about 400 acres, includes the Little Annie mine in the Roaring Fork mining district. Ore is a sulphide of lead, silver and zinc, with a considerable quantity of barite.

Development: by 6,000' Famous tunnel, being driven to reach the Little Annie vein. Work in 1916 amounted to 1,252' at a total cost of \$16,169.

Several of the company's claims have been leased on a royalty basis.

SMUGGLER LEASING CO., THE. COLORADO

Address: C. E. Anderson, Aspen, Colo.

Officers: D. M. Hyman, pres.; E. M. Rogers, v. p.; J. L. Tilton, sec.; A. B. Simon, treas., with Mark Hyman, Edw. Kuhn and W. P. Arms, directors.

Inc. May, 1911, in Maine. Cap., \$500,000; shares \$1 par; all issued, non-assessable.

Property: the Smuggler mine at Aspen, Colo., shows contact deposits in lime and shale, containing silver, lead and zinc ores.

Development: by 5,000' and 15,000' tunnels, and 1,500' shaft, opening ground to 1,800' depth.

Equipment: includes 2,250-h. p. electric plant, hoist, compressor, and 500-ton concentrating mill.

No returns available. Water is troublesome, 3,500 to 4,000 gal. per min. being pumped.

PUEBLO COUNTY

EQUITY CREEDE MINING CO. COLORADO

Office: 107 W. 3rd St., Pueblo, Colo. Mine office: J. W. Whitehurst, supt., Creede, Colo.

Officers: Frank Taylor, pres.; Geo. D. Weston, v. p.; B. E. Watkins, sec.; E. E. Withers, treas., above with A. V. Tobor and E. H. Morse, directors.

Reorganized March 6, 1915, in Colorado.

Cap., \$600,000; shares \$1 par; outstanding, \$375,000. Annual meeting second Wednesday in March.

Property: 20 claims, 216 acres, unpatented, 7 miles N. W. of Creede, in the King Solomon mining district. Claims are on the Nelson Mountain vein, which is said to show gold-silver ore in a contact vein in rhyolite and porphyry. Shipments made are said to have averaged \$24.65 net per ton.

Development: by tunnels, 225', 350' and 725' long; greatest depth of workings, 700'; total underground workings, 1,300'.

Total production to 1915, 43 cars netting \$18,555.

Equipment being installed, 1917.

GIBSON HILL MINING & MILLING CO. COLORADO

Address: Pueblo, Colo.

Inc. Oct., 1916, by B. M. Gill and C. R. Morris, of Pueblo, to operate the New York, S. Lambert, and L. C. Owens claims near Breckenridge.

Development: by tunnels. New York group said to contain large veins of gold, silver, and lead ore. Some zinc ore also mined.

PUEBLO SMELTER. COLORADO

Is owned by the American Smelting & Refining Co., which sec.

UNITED STATES ZINC CO.**COLORADO**

All stock owned by the A. S. & R. Co., which see. Plant at Pueblo, Colo., has 2,320 retorts.

RIO GRANDE COUNTY**BOWEN GROUP.****COLORADO**

E. T. Elliot, mgr., Del Norte, Colo.

Property: 8 patented claims, 200 acres at Summitville, Rio Grande Co., Colo., is said to show fissure veins in porphyry; ore contains gold, silver and copper, averaging about \$10 per ton. Developed by drifts and tunnels, longest 600'. Management plans resumption of development work in 1917.

ROUTT COUNTY**BOSTON-SIERRA MADRE MINE INDUSTRY CO.****COLORADO**

Property sold for taxes in 1914 to L. E. Armstrong. Fully described, Vol. XI, Copper Handbook.

FARWELL MOUNTAIN COPPER CO.**COLORADO**

Probably dead. Described in Vol. XII. Mine in Routt Co., Colo.

HAHN'S PEAK GOLD MINING & MILLING CO.**COLORADO**

Office: Room 3, Algoma Bldg., Oshkosh, Wis. Mine at Hahn's Peak, Routt Co., Colo.

Inc. Jan. 29, 1906, in Colorado. **Cap.**, \$1,000,000; shares \$1 par; 956,000 shares outstanding.

Officers: H. O. Granberg, pres.; C. A. Spencer, v. p.; Chas. Olson, supt.; E. E. Meeleus, sec.-treas., preceding with Dr. H. A. Wolter, M. A. Rasmussen and W. E. Brown, directors. C. A. Arkins, cons. engr.

Receipts for year ended August, 1917, were \$17,000; disbursements, \$16,533.

Property: 25 claims, 248 acres, patented.

Development: 460' incline shaft and a 950' tunnel on Royal Flush claim, said to cut 5 veins; also the 2,200' Conundrum tunnel 430' lower, cutting 12 veins, values being principally gold and silver. Average assays, \$15 to \$21 per ton.

Equipment: includes gasoline engines, compressor, air drills, blower and 400-ton concentrating mill, which is to be rearranged for the oil flotation process. Development work has been going on since Sept., 1915.

Reported on by Arthur Lakes, Etienne Ritter, H. C. Beeler and others.

SAGUACHE COUNTY**BACA MINING CO.****COLORADO**

Property known as the Baca Land grant originally belonged to Senor Don Luis Mana Baca as a gift from a King of Spain. The present owners opened the land to prospectors in July, 1914. B. T. Tipton, mgr., Crestone, Saguache Co., Colo.

Property: 35,000 acres of mineral land, including 23 partially prospected mines near Crestone, Saguache Co., Colo., on the D. & R. G. R. R. The largest mines of the group are the Eastern Star, Sunset, Julia D., Queen Esther, Von Moltke, Great Western and Independent, the latter being the only one developed by the company.

Geology: Ore occurs in 8 well-defined contact veins, along dikes and in true type fissure veins, in pockets and shoots; country rock is altered granite and schistose gneiss, cut by intrusive dikes of porphyry, phonolite and iron stained quartz, containing gold, silver, lead, copper and zinc. Mother Lode said to be traceable for 12 miles on surface. Smelter assays ran \$18 gold, 500 oz. silver and 8% zinc.

Development: considerable amount of old workings, shafts and cross-cuts. There is an unlimited water supply. Ore is shipped to the Pueblo smelter. Property worked by prospectors and lessees under 2-5-year leases. Miners receive free timber, water and assay services and pay 10-15% royalty on ore extracted. At last accounts were planning new Edison type mill.

GOLD HILL UNITED MINES CO.

COLORADO

Idle. Office: Bailey Bldg., 1218 Chestnut St., Philadelphia, Pa.

Inc. June 1, 1910, in Delaware. Cap., \$2,000,000; shares \$1 par.. Registrar & Transfer Co., New York, transfer agent. Listed on New York Curb.

Properties: in the Kerber Creek, Manitou and Hull mining districts, Saguache Co., Colo. Inactive for several years, doing assessment work only.

RAWLEY MINING CO.

COLORADO

Office: 25 Madison Ave., New York. Chas. E. Beckwith, mine supt., Bonanza, Saguache Co., Colo.

Officers: A. Filmore Hyde, pres.; Eugene G. Foster, v. p.; E. V. Cox, sec.-treas.; preceding, with John L. Cox, W. Hodges, Elmer Z. Burns and H. O. Hall, directors; Simons & Burns, cons. engrs.

Inc. 1901 in Colorado. Cap., \$2,500,000; shares \$1 par, non-assessable; 1,903,679 shares outstanding. Annual meeting 3rd Monday in January.

Property: 64 claims, 400 acres, shows fissure veins in andesite, running N.-S., nearly vertical and of 5' to 6' width; they carry argentiferous galena, bornite and chalcopryrite, in a heavy sulphide smelting ore on the 12th level. The mine has 15,000' of workings, estimated to show 97,000 tons concentrating and 225,250 tons smelting ore. The 6,235' tunnel cuts vein on 1,200' level. A 3-compartment raise was driven from 1,200' to 600' level in 1917 to facilitate ore extraction on upper levels.

Equipment: includes an 8-drill Rand air compressor, electric power with 50-h. p. at the mine and 100-h. p. at the mill, fuel being wood. There are 24 buildings and a 100-ton mill. Property still in the development stage. Idle 1915-1916. Operations resumed the latter part of 1916 and 50 tons per day being shipped to Ohio & Colorado Sm. Co., Salida, from the 1,200' level.

YUKON MINES CO.

COLORADO

Office: J. B. Conger, pres., Century Bldg., Denver. Mine office: Parlin, Colo.

Inc. in Colorado. Cap., \$200,000; shares \$1 par; non-assessable; outstanding, May, 1915, 100,000 shares.

Property: the Alaska and Yukon mines, patented, Cochetopa district, Saguache Co. The ore in the Alaska shaft contains mainly zinc-blende; that in the Yukon vein, gold, silver and copper.

Development: by 2 shafts, the Alaska shaft being 165' deep.

Equipment: includes a compressor, and 100-h. p. boiler. Small shipments of copper ore have been made and lessees on the Alaska shaft have shipped zinc ore.

Property is a prospect.

SAN JUAN COUNTY

ANTI-PERIODIC GROUP

COLORADO

Property, at Rain Gulch, Silverton, Colo., owned by Galena Mt. Gold & Silver Mng. Co., which see.

ASPEN MINE CO.

COLORADO

Property: the old Aspen mine at Silverton, Colo. Controlled by American Smelting & Refining Co. Operated by lessees who are making small but steady shipments to Silver Lake mill.

CONGRESS GOLD & COPPER CO.

COLORADO

Directors: J. B. Ross, pres.; Guy W. Mallon, v. p.; Frank L. Ross, sec.-treas., mgr.

Inc. April 16, 1908, in Colorado. Cap., \$500,000; shares \$10 par. Bonds, \$100,000 authorized, at 6%; all issued.

Property: 3 claims, 20 acres, the Congress and Arlington lodes at Red mountain, in San Juan Co., and the Midway lode in Ouray Co. Property is 12 miles south of Ouray and 12 miles north of Silverton. The Congress is a famous old mine worked 1884-93, said to have produced about \$400,000

worth of ore, averaging 18% copper and 11 oz. silver per ton, with small gold values. The mine, idle for some years, through litigation, was leased 1912-13. The KaPeGi Leasing Co. are operating the lower levels and the Offerman-Hansen Leasing Co. the upper levels.

Development: 400' shaft with about 1,500' of workings, showing chalcocite, reported by company to average about 5-10% copper, 10 oz. silver and ½ oz. gold per ton. Mine has electric equipment including hoist and compressor plant. See Southern Exploration & Mining Co.

CONTINENTAL MINING CO.

COLORADO

Office: Silverton, Colo.

Officers: Jos. Bordeleau, pres.-treas.-mgr.; F. B. Brown, v. p.; W. A. Way, sec.; preceding, with M. J. Heller, supt. and J. H. Slattery, directors.

Inc. in Colorado. Cap., 1,500,000 shares at \$1 par; 23,000 shares in treasury. Transfer office: Silverton. Annual meeting in December.

Property: 18 claims, about 150 acres, located in the Eureka mining district, San Juan Co., Colo., said to show quartz vein in fissure carrying gold and silver. Company spent \$8,000 on development work in 1916.

Development: by vertical shaft and tunnels. Tunnels are 3,000' long with 4,000' of development, having a depth of 500'. Ore shoot is said to be 1,500' by 350' and has 200,000 tons blocked out. Average assays are said to be \$18.

Equipment: includes electric hoist, and electric pump.

DETROIT & COLORADO MINING CO.

COLORADO

Address: care L. W. Partridge, sec., 517 Ideal Bldg., Denver, Colo.

Inc. Nov. 10, 1903, in Colorado. Cap., \$1,000,000; shares \$1 par.

Property: the Champion and Aletha groups, 3 claims, 4 patented, situated 1½ miles S. W. of Silverton, 9,700' elevation. Ore is a mixture of copper and iron sulphides with tetrahedrite, but Aletha ore is a silver-bearing galena with chalcopyrite. The Champion vein is a gold-silver quartz carrying copper pyrite. Ores are said to average 31 oz. silver, 4.5% copper and \$5 gold. The main development is by tunnel. Property idle because of litigation.

DORA CONSOLIDATED M. & M. CO.

COLORADO

Address: Silverton, Colo.

Officers: E. P. Ricker, pres. and gen. mgr.; with Joseph Boyce, resident director; Louis Gillette, local mgr.

Property: 26 claims and 8 mill sites, patented, 300 acres, near Silverton, formerly known as the Hercules Consolidated. Total output since the late seventies is said to be over \$10,000,000.

Geology: claims show fissure veins traversing a complex area of schists, quartzite and granites, overlying San Juan tuffs, in turn overlain by andesite and sedimentaries. These are traversed by dikes of diorite, etc. A large amount of smelting ore is said to be exposed.

Development: 6 crosscut tunnels, one 2,400' long, giving a depth of 1,500'. Total workings amount to 30,000'.

ELK MINING & MILLING CO.

COLORADO

Address: Silverton, Colo. J. J. Cusick, v. p.-mgr.

Property: 325 acres on Red Mountain, near Gladstone, San Juan Co., Colo., said to show several veins in andesite from 2' to 7' wide, the ore carrying 9% copper, \$2 gold and 4 oz. silver.

Development: by tunnel driven at a depth of 1,200'. Management installed new machinery, 1917, and plans to drive tunnel 1,000' in 1918. Will erect concentrator close to railroad.

ELK MOUNTAIN MINING & MILLING CO.

COLORADO

J. J. Cusick, mgr., Silverton, Colo. Company installed new machinery, 1917, and plans concentration mill close to railway.

GOLD KING LEASING CO.

COLORADO

Mine at Gladstone, via Silverton, San Juan Co., Colo. J. H. Slattery, gen. mgr.; Louis C. Bastian, mill supt. Operates the Gold King and Sampson mines, formerly owned by the Gold King Cons. Mines Co., reorganized as New Gold King Mines.

Ore: claims show fissure veins carrying irregular stringers of lead-copper ore with gold-silver contents, in altered andesite, free gold occurring in white quartz associated with iron pyrite, galena or blende.

Development: by 600' shaft and 3,000' tunnel.

Equipment: includes complete steam and electric power, compressor, tramway, 300-ton mill, converted into flotation plant in 1915, 80 stamps, etc.

Production: the Gold King mine is credited with a production in excess of \$12,000,000 to end of 1915. Shipments in 1915 averaged about 400 tons of \$20 ore per month. Present work confined to first to fourth levels, with about 70 men employed.

HAMLET MINING & MILLING CO. COLORADO

Address: C. T. Singleton, supt., Silverton, Colo.

Officers: J. S. Tucker, pres.; H. W. Fox, cons. engr.

Bonds: \$150,000 issued, 1911.

Property: 19 claims, about 200 acres, known as the Hamlet mine, 8 miles from Silverton, in the Howardsville mining district, San Juan Co., Colo.

Development: by tunnels, longest known as Mill tunnel, 500' below 5th level of old mine workings, connected by raises with tunnel.

Ore: a complex mixture of copper-lead and zinc sulphides carrying good gold and some silver values.

Equipment: includes steam power plant, compressor and conical mill with flotation unit, latter destroyed by fire, Dec., 1915. New plant built and fully equipped, 1917, is said to be making an 80% extraction. Company employs about 25 men.

HENRIETTA COPPER MINING CO. COLORADO

Office: 1816 California St., Denver, Colo.

Officers: E. R. Moodie, pres.; N. M. Abbott, sec.-treas.

Inc. April, 1916. Cap., \$3,000,000; shares \$1 par; non-assessable.

Company took over the holdings of the Henrietta M. & M. Co., formerly owned by the San Juan S. & R.

Property: about 6 miles N. of Silverton, San Juan Co., Colo., includes the Henrietta Co. mine, developed by 6,250' of workings, the main or No. 7 tunnel being 2,200' long and carrying auriferous and argentiferous copper ore. Active work reported under way, May, 1917.

HENRIETTA MINING & MILLING CO. COLORADO

Dead. Company suffered from a complication of bad luck and bad financial conditions. Succeeded, 1916, by Henrietta Copper Mining Co., which see.

Company and its property, near Silverton, Colo., are described Vol. X, Copper Handbook.

IOWA TIGER MINING CO. COLORADO

Property at Silverton, San Juan Co., Colo., is operated by the Melville Leasing Co. and several sets of independent lessees.

Mine is reported as being the largest shipper of concentrate from the Silverton district, the lead product containing good gold-silver values.

Flotation used in the mill, gives a high recovery.

KITTIMAC MINES CO. COLORADO

Silverton, Colo.

Officers: Daniel B. Carey, pres.; Wm. Youngson, v. p.; Jos. L. Clark, sec.-treas.; Joseph Jacob, mine supt.; Frank Card, mill supt.

Inc. 1914, in Wyoming, as successor to company of same name inc. in Arizona and now dead, which is described in Vol. XI, Copper Handbook. Cap., \$2,500,000; shares \$1 par; fully paid; non-assessable; \$2,000,000 shares issued and a \$40,000 bond issue outstanding. Property was transferred to a Colorado company in 1916, which continues active development and milling.

Property: 800 acres in Eureka Mining district, near Silverton, San Juan Co., Colo., includes 70 claims and a 76-acre mill site. Mine has 2 sulphide and 7 quartz veins, outcropping on surface for 3,000' and developed by 2 tunnels, 920' and 1,050' long, with 2,000' drifts. Ores carry gold-silver-

copper-lead-zinc and iron values. On the Isabella vein an orebody 19' wide has been developed for 600', said to average \$10 per ton in gold and silver.

Ore reserves: management estimates 500,000 tons of ore in sight.

Equipment: includes compressor, drills, electric motors, 10,040' aerial tramway, 150-ton mill with flotation unit, Huff electrostatic separators and several buildings.

LACKAWANNA MINING & REDUCTION CO. COLORADO

Silverton, San Juan Co., Colo.

Inc. 1917, to operate the Lackawanna mine by R. E. L. Townsend and George Lugg, Silverton, Colo.

Property said to carry lead-silver-copper ore. Developed by 1,200' tunnel. Shipping in 1917.

NEW GOLD KING MINES COLORADO

See Gold King Leasing Co.

OLD HUNDRED MINING CO. COLORADO

Office: Room 706, Electric Bldg., Cleveland, Ohio. Mine near Silverton, San Juan Co., Colo.

Officers: Howell Hinds, pres.; W. S. Briggs, sec.-treas.; preceding, with H. H. Burgess, E. P. Price and Frank S. Whitcombe, directors; J. M. Elmer, supt.

Inc. June, 1906, in Maine. **Cap.**, \$5,000,000; shares \$5 par.

The company has authorized \$400,000 of series "A" first mortgage 6% bonds, none issued. The mine was floated by Thos. Nevins & Sons, of New York, who advanced the money for its equipment and development.

Property: 26 claims, patented, 500 acres, in Cunningham gulch, on Galena mountain, San Juan district, 5 miles north of Silverton. The Silverton & Northern railway runs to the mine. Claims show a quartz vein said to be 5' to 12' wide, carrying values in gold, silver, lead and copper, with increasing copper at depth, ore being claimed to carry average values of \$8 to \$12 per ton.

Development: mainly by tunnel. Mine is claimed to have upwards of 4 miles of workings.

Equipment: includes steam and electric power, numerous buildings, including a store, and the mine has a tramline. The 200-ton mill has 40 stamps, crushers, rolls, jigs, Frue vanners, concentrating and slime tables.

The property was promoted in New York upon representation by engineers that the mine contained bodies of low-grade ore which could be profitably mined if a larger output and lower milling cost could be secured. Despite the new machinery furnished and development done, the mine failed to redeem the promises made and is still awaiting some one who can make it pay by right management and proper ore treatment. Stock regarded as of little value.

PARKER GROUP OF MINES COLORADO

John H. Meager, owner, Silverton, San Juan Co., Colo.

Property: 5 claims, about 2 miles N. E. of Silverton, said to show a fissure vein in andesite-lime-porphry formation, traceable at surface for several thousand feet. The ore is a sulphide, containing copper, silver, gold, iron and molybdenum.

Development: by several tunnels and crosscuts. A prospect.

PRECIOUS METALS CORPORATION COLORADO

Office: 109 W. 26th St., New York. Mines in Mill gulch, San Juan Co., Colo.

Officers: Chas. E. Force, pres.-treas.; F. W. Force, v. p.-sec.; and A. Fricke, directors.

Inc. Nov. 7, 1905, in Colorado. **Cap.**, \$5,000,000; shares \$5 par; issued, \$4,250,000. Columbia Trust Co., New York, registrar. Annual meeting, 3rd Monday in November. Company owned the entire stock issue of the East Canada Smelting Co., Ltd., which owned the McDonald copper-sulphur mine at Weedon, Quebec. The Canadian holdings were sold in 1915 to Weedon Mining Co., Ltd.

Company owns the Silver Crown group, 12 claims, 9 patented, and 4 mill sites, about 7 miles from Silverton; also the Forest and John mines, 9 miles distant, patented and freehold. Ore occurs in quartz veins in andesite, carrying lead and silver values. Developed by 2,500' of tunneling. Idle since November, 1914.

PRIDE OF THE WEST MINE

COLORADO

Address: A. W. Harrison, mgr., Silverton, Colo.

Property: the Pride of the West and Green Mountain mines, in Cunningham gulch, 6 miles from Silverton. The latter mine is opened by a 1,500' tunnel. At 600' a raise was driven to the surface and is said to have cut rich ore at 1,250' in March, 1917.

Equipment: the old mill was remodeled to include flotation and is now working on lead-silver ore.

ROSS MINING & MILLING CO.

COLORADO

Idle many years and probably dead.

Office: Ross Bldg., Waynesburg, Pa. Mines at Silverton, San Juan Co., Colo. The company has had much financial trouble, like its predecessors and collateral relatives in the chain of promotions. Fully described, Vol. XI, Copper Handbook.

ST. PAUL MINING & REDUCTION CO.

COLORADO

Silverton, San Juan Co., Colo. Norwood Johnson, pres. and treas.; J. B. Ross, v. p. and gen. mgr.; Frank L. Ross, sec.

Inc. March, 1908, in Colorado. Cap., \$100,000; shares \$1 par.

Property: the St. Paul group, in the Red Mountain district, an old mine that formerly shipped some ore netting \$1,000 per carload. The mine has a 300' shaft, with levels at 200' and 300', developing small but rich ore shoots, said by former management to carry about 8% copper, 10% lead, 10% zinc, 5 to 10 oz. silver and 1 oz. gold per ton. Since 1914 the mine is being worked by lessees, who were sinking a shaft, said to be in solid ore averaging \$6 per ton.

SILVER LAKE MINES

COLORADO

Owned by American Sm. & Ref. Co. L. R. Clapp, supt, c/o A. S. & R. Co., Denver.

Property: 143 patented claims in the Animas mining district, Silverton, San Juan Co., Colo.

Ore: gold, silver, lead, copper and zinc in fissure veins and andesite. Veins dip 70°, and have an E.-W. strike. Ore reported to occur in shoots from 1'x20' to 8'x1,200', and said to assay 0.20 oz. gold; 6 oz. silver; 2.5% lead; 1% copper; 3.5% zinc.

Development: by tunnels, the two longest 12,000' and 7,500'; greatest depth of workings 1,700' below surface; total workings 165,000'.

Equipment: includes 2 air compressors, aerial tram and a 450-ton mill equipped with flotation plant.

Mine has been worked by lessees since 1911 and production figures are not available.

SUNNYSIDE GOLD MINES CO.

COLORADO

Property taken over by Sunnyside Mining & Milling Co., and operated by the U. S. S. R. & M. Exploration Co.

SUNNYSIDE MINING & MILLING CO.

COLORADO

Subsidiary of U. S. S. R. & M. Exploration Co.

Office: 514 First National Bank Bldg., Denver, Colo. Mine office: Eureka, San Juan Co., Colo.; W. L. Terry, supt.

Property: shows a deposit of complex silver-lead-copper-zinc ore, developed by 400' shaft and 200' tunnel.

Equipment: includes electric power, air compressor, a 150-ton concentrator with 40 stamps, tube mills, flotation unit and a Huff electrostatic zinc separating plant.

In June, 1917, company was erecting a 500-ton flotation plant, also enlarging mine and tramway equipment.

SAN MIGUEL COUNTY

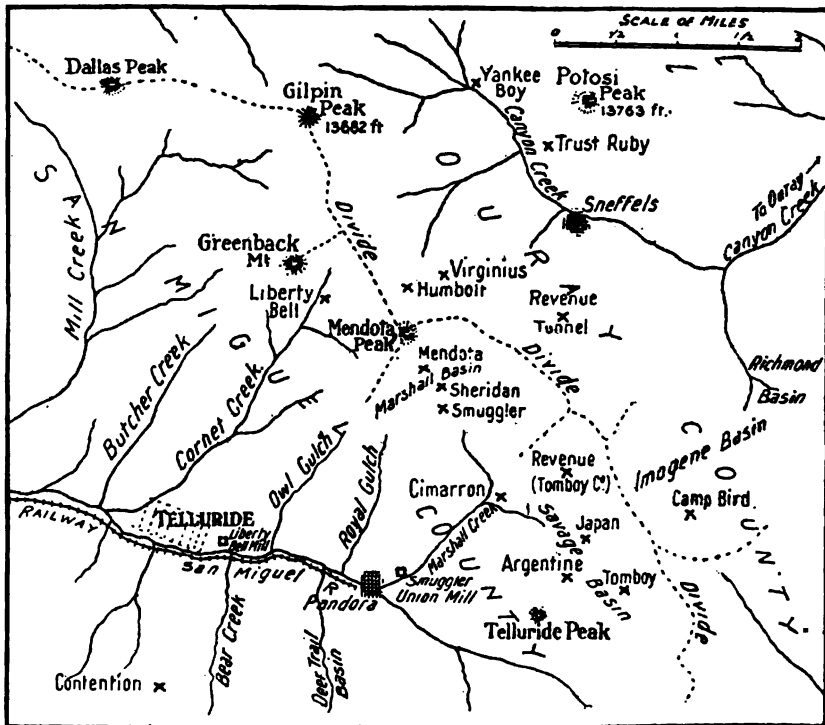
BLACK BEAR MINING CO.

COLORADO

Mine office: Telluride, Colo.

Inc. about 1894. Ike Navala, supt.

Property: 30 claims, includes Black Bear mine in Ingraham basin, Telluride, Colo., showing gold, silver, lead and zinc values in an 8' quartz vein; the ore is concentrated. Mill returns average about \$5.50 per ton, gold



SKETCH MAP OF TELLURIDE DISTRICT, COLORADO

bullion recovered running 30% of the total. Developed by shafts and equipped with electric plant and aerial tramway, connecting with the Smuggler Mill at Pandora.

Property was idle for many years; operations resumed the latter part of December, 1914.

Shipments: averaged 170 tons daily in 1916. Mining and milling costs total \$2.50 per ton, leaving a monthly profit of several thousand dollars if present production is maintained.

CAMP BIRD, LTD.

COLORADO

Offices: No. 1 London Wall Bldgs., London, E. C., and Telluride, Colo. F. W. Baker, chairman; L. Clerc, F. A. Govett, F. H. Hamilton, G. de Pass and O. De Rivaud, directors. J. A. Agnew and L. Chevrillon, technical committee. A. A. Kelsey, sec.; Wm. J. Cox, gen. mgr.; J. B. Glasser, asst. mgr.; Jos. H. Scott, mine supt.; Thos. H. Woods, mill supt.

Registered Sept. 8, 1900, in England.

Cap., £1,100,000, increased to £1,350,000 in Dec., 1909, and in July, 1911,

to £2,100,000, consisting of 750,000 7% cumulative participating preference shares of £1 each, 649,625 issued, and 1,250,000 ordinary shares of £1 each; 1,100,051 issued. Total dividends to end of 1915: \$9,750,836, averaging almost 20% yearly on outstanding stock.

Accounts for fiscal year ending June 30, 1916, showed a profit of £138,684, making with balance forward a sum of £145,274, of which dividends, on 7% pfd. shares only, absorbed £45,473, directors' remuneration, £467 and income tax, £14,304. Balance carried forward was £85,028, to be used for development work. An income of £46,484 was derived from Santa Gertrudis shares. Balance sheet June 30, 1916, showed assets of £1,883,397.

Company's holdings in Santa Gertrudis, Ltd., Mexico, are 1,126,901 shares, or 75.13% of the issued capital, and in The Messina (Transvaal) Dev. Co. Ltd., 29,944 shares out of a total of 727,154. Of the latter company the Santa Gertrudis Ltd. holds 33,500 shares. Ore reserves of the Messina Dev. Co., at Messina, Zoutpansberg, Transvaal, estimated June 30, 1916, as 151,409 tons, 5.2% copper, of practically proved ore, and 56,652 tons, 3.4% copper, of prospective ore. Company owns 3,950 shares in the Nechi Mines (Columbia) Ltd., and 5,000 shares in the Anglo Colonial Estates, Ltd.

The company was formed in 1900 by F. W. Baker and John Hays Hammond to acquire from Thos. F. Walsh the Camp Bird gold mine, near Telluride, Colo. Purchase price was \$5,000,000. This property returned handsome profits for 10 years, when the lower levels showed signs of impoverishment. Other properties were then sought with the idea of making the company a mines-investment organization. The Santa Gertrudis silver mine was floated in this way and holdings acquired in the Messina.

The Camp Bird mine is located at an altitude of 11,000' and 8 miles from the railroad, which necessitates hauling supplies and concentrates over a mountain road, making operating costs comparatively high. The Camp Bird orebodies occur in a fissure vein in andesite. The ore has for its base hematite and is associated with iron, zinc and lead sulphides; it occurs in streaks, being less persistent and narrower with depth, and less regular in its relation to the walls. Stopping width is 5' to 8'.

Ore reserves: no quantity of new ore was developed, and as that available for milling was exhausted all work in mine has ceased pending completion of adit.

Content and value of ore per ton recovered in 1914-1915 is as follows:

Year—	Gold	Silver	Lead	Copper	Value
1914.....	1.13 oz.	4.27 oz.	1.32%	0.26%	\$26.19
1915.....	1.33 oz.	3.78 oz.	1.05%	0.17%	29.47

Past production from April 30, 1903, to June 30, 1916, is given as 820,730 tons treated, yielding £4,778,591, at an expenditure of £1,798,227, leaving a profit of £2,980,363.

Development: shafts and tunnels. Work done in year ending June 30, 1916, amounted to 3,936'. The No. 3 shaft, the main working shaft, is 1,003' deep and opens up the 9th level at the 1,000' point.

Equipment: includes a 60-stamp mill, of which 25 stamps only are used at present, and a cyanide plant. An aerial tramway connects the mine and mill.

During the year ending June 30, 1916, the mill treated 25,601 tons of ore, compared with 32,313 tons the previous year, yielding \$723,421 in gold, \$48,441 in silver and \$19,887 in lead and copper, a total of \$791,749 or \$30.92 a ton.

Plans systematic exploration in depth by means of a low-level adit. This adit will be 10,700' long and will cut the lode 450' deeper than any existing workings and 800' below the main ore-bearing ground. Up to Dec. 15, 1917, 8,000' had been driven and narrow veins cut. Selected samples of these veins assayed 80c to \$2.40 gold, 3 to 10 oz. silver, and 18% to 50% lead. In this part of Colorado the sedimentary series is overlain by a great thickness—10,000' maximum—of lava flows and breccias.

It has been proven by experience that the richer veins in breccia covering do not continue into the sedimentaries, but become impoverished before reaching that horizon. As the adit will be from 1,000' to 2,000' above the sedimentaries, it seems as though there is sufficient margin of safety between it and the limit of possible productivity.

It was thought several years ago that the mine was on the verge of paying its last dividend, but each year has seen it well up on the list of dividend payers, and if present plans of the management are productive of the results they deserve the mine will continue to be a profitable producer for a long time to come.

COLORADO SUPERIOR MINING CO.

COLORADO

Office: Telluride, Colo.

Officers: J. H. Jasberg, pres.; Bulkeley Wells, v. p.; John E. Porthan, sec.-treas., Ely, Minn.; Isaac Nevala, gen. mgr., with O. J. Larson, directors.

Cap., \$1,000,000; shares \$1 par; 561,635 outstanding. Bonds authorized, \$250,000 (8%); issued, \$156,100.

Statement as of Sept. 30, 1916, shows total receipts \$259,324, of which \$257,477 was from ore sales; total disbursements, \$191,664, leaving a net operating profit of \$67,659. Current quick assets, \$18,361, with current liabilities of \$15,621. Current assets in excess of current liabilities were \$8,932.

Property: 322 acres, patented or applied for, near Telluride, in San Miguel Co., at an altitude of 12,500'.

Ore: sulphides of lead and zinc containing gold and silver in a vein averaging 10' in width and supposed to be a continuation of the Argentine vein in the neighboring Tomboy mine. Company owns the Black Bear Mining Co.

Development: to depth of 1,100' by shaft, 500' from N. W. end of property, and crosscuts, totals 5,100' of underground workings. During early part of 1916 new work totaled 1,256' of drifting.

Ore is treated at the Smuggler Union Mng. Co.'s mill, where 20 stamps have been used on Colo. Sup. ore. Ore milled during 1916 amounted to 48,450 dry tons, with average assays per ton of 0.226 oz. gold, 2.49 oz. silver, 3.23% lead and 5.77% zinc.

Ore reserves are estimated at 100,000 tons, averaging better than \$5 per ton, with 75,000 reported blocked out, July, 31, 1917.

Equipment: includes electric hoist, 2 compressors and a 250-ton flotation unit.

Production: for 1916, 7,055 oz. gold, 68,306 oz. silver, 2,354,459 lbs. lead, 2,233,536 lbs. zinc and 15,509 lbs. copper.

Lead concentrates average 1.81 oz. gold, 18.47 oz. silver, 48.88% lead, 4.90% zinc, 1% copper; zinc concentrates: 0.27 oz. gold, 6.95 oz. silver, 6% lead, 23.96% zinc.

Recovery ran from 40% for zinc to 75% for lead. About 6,548 tons of concentrates were produced. Concentration ratio was 7.4 to 1.

HIGHLAND MARY MINES CO.

COLORADO

Address: Ophir, Colo. Wm. Parsons, mgr.; J. D. McAlpine, engr.

Mine said to show several bodies of silver ore of milling grade. Plans to install flotation, 1917.

JAPAN-FLORA MINES & TUNNEL CO.

COLORADO

Idle. Office: 702 Colorado Bldg., Denver, Colo. Mine near Telluride, San Miguel Co., Colo.

Officers: J. J. Fisher, pres.; Chas. H. Johnson, v. p.; Wm. E. Humphreys, sec.; J. P. H. Cunningham, treas.; preceding, with Geo. W. Johnson, directors.

Inc. Aug. 22, 1903, in Colorado. Cap., \$2,000,000; shares, \$1 par; non-assessable; fully issued.

Bonds: \$300,000 authorized, at 6%; issued, \$248,900. Annual meeting in October.

Property: 43 patented claims, 311 acres, and a 5-acre mill site at

Pandora, in the Upper San Miguel district, 4 miles from railway. Property shows 5 fissure veins, in brecciated andesite and porphyry, 3 being exclusively developed and said to show a width of 1' to 8', carrying complex sulphide ores with gold and silver, associated with pyrite, in a quartz gangue. Ore averages 0.23 oz. silver, 23% copper, 7.7% lead, and 3.2% zinc.

Development: by tunnels from 500' to 2,000' long with total workings of 20,000'. Lowest point is 900' below the surface. New work proposed is 1,000' of driving on the Flora vein.

Ore reserves: are estimated at 86,000 tons of \$14 ore.

Equipment: includes 50-ton concentrating plant, but a new mill is proposed.

Property has produced considerable ore in the past, the last shipment in 1910 averaging \$47.85 per ton. Inactive since 1910.

LAKE SUPERIOR OPHIR MINING CO. COLORADO

Ophir, Colo. Inc. Sept., 1911, in Arizona. Cap., \$1,000,000; shares \$2 par. Is reorganization of the Calumet-Telluride Mng. Co.

Property: in Chapman gulch above Ophir, San Miguel Co., Colo., said to carry free gold ore.

Equipment: includes aerial tram, electric power and 20-stamp mill, handling about 100 tons of \$15 ore daily at last accounts. Probably idle.

LEWIS MINE CO. COLORADO

Telluride, San Miguel Co., Colo., Bulkeley Wells, mgr. Property has fissure veins with shoots of complex lead-zinc-copper ore, which was treated in 50-ton concentrating mill. Developed by 500' shaft and equipped with steam plant. Idle.

LIBERTY BELL GOLD MINING CO. COLORADO

Office: 131 State St., Boston, Mass. **Mine office:** Telluride, San Miguel Co., Colo.

Officers: Arthur Winslow, pres.; J. J. Cairnes, v. p.; Henry L. Rand, sec.-treas., with Hermann Kuhn, Geo. R. Fearing, Jr., directors. Charles A. Chase, mgr.; H. G. McClain, supt.

Inc. in Missouri. Cap., \$700,000; shares \$5 par; \$667,755 outstanding.

Dividends: in 1915 amounted to 16%; in 1916, 28%.

Property: the Liberty Bell mine at Telluride, shows gold and silver-bearing quartz in a fissure vein averaging 3' to 4' in width. The main orebody runs N. W.-S. E. and dips 57° W. For geology of the district, see U. S. G. S. Geologic Folio No. 57; also Tomboy Gold Mines Co., Ltd. Shipments in 1916, averaged 2 oz. silver and .204 oz. gold.

Development: by 2,600' tunnel and 1,000' raise from tunnel level to abandoned upper workings. Ore is mined by open stopes on stulls or by shrinkage stoping.

Equipment: includes hoist of 50 tons hourly capacity, electric power, 1 Leyner duplex compressor, 1 Norwalk compressor, 1.5 miles tram and a 500-ton concentrator and cyanide mill. Extraction averaged 88%, and total cost per ton amounted to \$4.07 in 1916.

Production:

	Tons Ore Treated	Oz. Silver Produced	Oz. Gold Produced
1916.....	165,300	256,711	30,580
1915.....	173,700	314,432	24,054
1914.....	173,840	315,919	33,150
1913.....	179,216	288,602	36,693
1912.....	175,340	313,845	48,993

MOUNTAIN FLOWER GOLD MINING & PROS. CO. COLORADO

Office: 502 Corby-Forsee Bldg., St. Joseph, Mo. **Mine office:** Telluride, Colo.

Officers: H. C. Carter, pres.; J. R. Jennings, v. p.; T. G. Sorter, sec.-treas.

Inc. 1907, in Arizona. Cap., \$1,500,000; shares \$1 par; non-assessable.

Property: 17 unpatented claims, 340 acres, at Deep Creek, Telluride district, San Miguel Co., Colo., said to show a quartz vein in diorite and porphyry. Ore is 4' wide and contains gold, silver, zinc, and lead values.

Development: by tunnel, 932' long, early in Aug., 1917, which was expected to cut Delta vein at depth of 1,000'.

Judging by prospectus and other literature of this company, it expects to develop an enormous body of ore. Some of the figures are contradictory, and the reasons for buying shares are flippant. A photo shows vein-matter 30' wide, of which 4,500' in length is owned by company, which the writer of the prospectus argues could not be worked out in 100 years.

Same management as Octotillo Copper Co., which see.

NEW ENGLAND EXPLORATION CO. (THE) COLORADO

Office: 14 Ashburton Place, Boston, Mass. Controls the Smuggler Union Mining Co., Colo., which see.

Officers: T. L. Livermore, pres.; Bulkeley Wells, v. p.; with R. L. Agassiz, H. L. Higginson, Q. A. Shaw, directors. T. E. Sherwin, treas.

Inc. 1898, in Maine. **Cap.**, \$2,000,000; shares \$100 par; outstanding, \$1,875,700. Annual meeting 1st Wednesday in June, at Portland, Me. Stock transferred at company's office.

OPHIR GOLD MINES, MILLING & POWER CO. COLORADO

Succeeded Oct., 1915, by Ophir Range Gold Mining Co., which see.

OPHIR GOLD MINES & RED'N CO. COLORADO

J. H. Sankey, J. M. Belisle, F. W. Ruble and Gord Galloway, of Ophir, Colo., incorporators.

Inc. Aug., 1916, in Colorado. **Cap.**, \$250,000; shares 10c par. One million shares paid for property.

Property: the New Dominion mine at Ophir, San Miguel Co., Colo.; said to show ore in upper workings carrying gold and silver with lead-zinc values at depth.

Development: by 985' tunnel and 1,100' crosscut tunnel. Over \$30,000 has been spent in development work. Management plans to install a flotation plant, 1917.

OPHIR RANGE GOLD MINING CO. COLORADO

Letter returned, 1917, and mine probably closed down.

Ophir, San Miguel Co., Colo. Company acquired the holdings of the Ophir Gold Mines, Milling & Power Co., Oct., 1915. W. P. Day, pres., Peoria, Ill.; A. W. Wilson, sec.; W. H. Staver, mgr.

Inc. July, 1915, in Colorado.

Operates a lease on the Suffolk mine, 300 claims, partly patented, at Ophir.

Ore: gold-silver, in fissure veins, traversing andesite and noted for its pockets of free gold ore.

Development: by several tunnels from 500' to 2,000' long; with a total of 20,000' of underground workings.

Equipment: includes 300 cu. ft. air compressor, 5,270' tramway and 100-ton concentrating mill with 2 Wilfley tables.

Production: in 1915 amounted to 2,000 tons of ore. Concentrates averaged \$15 per ton in gold and silver.

SMUGGLER UNION MINING CO. (THE) COLORADO

Telluride, Colo.

Officers: Bulkeley Wells, pres. and gen. mgr., Telluride; H. L. Higginson, v. p., with R. L. Agassiz, T. L. Livermore, N. H. Stone, Q. A. Shaw and J. M. Crafts, directors. T. E. Sherwin, sec.-treas. Chas. N. Bell, gen. supt.; Carl Aikele, mine supt.; F. B. Thomas, power supt.; O. M. Sackett, tram. supt.; W. L. Reid, mills supt.; J. L. McMenamin, store supt.; A. D. Snodgrass, cashier.

Inc. 1891, in Colorado. **Cap.**, \$5,000,000; all outstanding; shares \$100 par. Bonds authorized \$250,000; outstanding \$67,500. Annual meeting in June. 14 Ashburton Place, Boston, transfer office. Financial reports not made

public. No dividend reported since 1901. Company is controlled by The New England Exploration Co.

Property: 77 patented claims, 996 acres, in San Miguel and Ouray counties. Ore carries gold, silver, lead and iron, occurring in a true fissure quartz vein cutting andesite, tuff and rhyolite for a vertical distance of 2,000'. Vein strikes N. W.-S. E., dips 70°; average width 2½'. For geology of the Telluride district, see U. S. G. S. Geological Folio No. 57; also see Tomboy Gold Mines Co., Ltd., in this volume.

Development: by tunnels, with a 280' winze from lowest tunnel, 3,700' long; main haulage level, 3,600' long; greatest depth of workings, 2,300'. Total workings aggregate 30 miles.

Equipment: includes a 50-h. p. electric hoist, 2 compressors, pumps, hydro-electric power, one 60-stamp and one 80-stamp mill, 600-ton cyanide plant, and flotation unit.

Production: 118,668 tons ore in 1912; 137,567 in 1913; 126,505 in 1914; 107,119 in 1915; 53,009 in 1916. Grade of ore and recovery not made public.

TOMBOY GOLD MINES CO., LTD. COLORADO

Under management of Exploration Co., Ltd., of London.

Office: T. D. Pillans, sec., 24 Lombard St., London, E. C. **Mine office:** D. A. Herron, gen. mgr., Telluride, Colo.

Officers: Lord A. Butler (chairman), Marquis D'Hautpoul and J. H. M. Shaw, directors. P. L. Foster, cons. engr.; W. K. Betty, metallurgical advisor.

Inc. June 7, 1899, in England. Cap., 350,000 shares; £1 par; issued 310,000 shares.

Total revenue for year ending June 30, 1916, \$1,120,320; profit, \$369,200; with balance of \$99,760 there was available \$468,960, of which \$149,000 was paid in dividends: After allowing for depreciation, income tax, etc., the balance was \$94,560.

Dividends: since 1899 total 53s 6d (\$12.84) per share, or 262%.

Property: included, July, 1915, 76 claims; others have since been added. Original holdings were the claims acquired from the old Tomboy Gold Mines Co. of W. Va., also claims carrying a parallel vein, known as the Argentine. Later the company bought the claims containing the Montana vein and its northern extension from the Nevada Tunnel Co. The Sidney-White Cloud property was acquired in 1916, for \$75,000.

A cyanide mill and concentrating plant have been built and paid for out of profits, as well as additions and improvements to the plant of the Tomboy Tramway and Tunnel Co.

Geology: the veins in the Telluride district are filled fissures, 2½' to 4' in width, larger lodes sometimes appearing as a number of parallel plates of filled veins separated by sheets of altered rock. Country rock is andesite, rhyolite and San Juan tuff, with underlying sedimentaries in which the existence of the veins has not been proven. Principal metallic minerals are gold, pyrite, galena, zinc blende, and chalcoppyrite. Ores contain 2 to 3% sulphides, and yield about \$6 in gold and a few ounces of silver per ton. For geology of the district see U. S. G. S. Geologic Folio No. 57, also Lindgren's "Mineral Deposits."

Development: the Tomboy and Montana properties to 2,400' depth, and on the Argentine to 2,200'. In the Argentine lower levels is a large quantity of complex sulphide ore containing zinc, lead and copper, which will be profitable if a process is available. Work in 1916 in the Montana covered 5,159', and this mine is now opened longitudinally by the Ophir or 1,750' level, also 300' beyond the boundary.

Ore reserves: June 30, 1916, Argentine, 175,000 tons; Montana, 400,000 tons.

Equipment: 80-stamp mill, concentrating plant and cyanide mill, all arranged practically under one roof, have a daily capacity of 400 to 450 tons.

Milling for the year ending June 30, 1916, gave an average of \$7.14 per ton, 42% being recovered as bullion and the rest as concentrates.

Flotation is being tried at the mill.

Production: for year ending June 30, 1916, amounted to 150,488 dry tons of ore, which yielded in bullion and concentrate \$1,074,088

Costs were \$4.92 per ton, against \$4.49 in the previous year.

WELLER GOLD MINING CO. COLORADO

J. C. Weller, mgr., Telluride, Colo. Operates the Ballard mine near Telluride, San Miguel Co., Colo. *Employed 15 men and was shipping bullion twice a month, in 1915.

Equipment: includes pipe-line, tramway, 10-stamp mill fitted with plates and concentrating tables.

SUMMIT COUNTY

ALTEZUMA GOLD M. & M. CO. COLORADO

Chas. F. Kennedy, v. p. and mgr., at last accounts.

Inc. in Arizona. **Cap.**, \$5,000,000, shares \$1 par; 2,399,190 shares in treasury.

Property: 4 claims, 2½ miles from Montezuma.

Ore: lead-silver, picked ore said to assay \$100 per ton.

Development: 4 tunnels, longest 190', known as the Franco tunnel, Plans in 1915 included the refinancing of company and driving the Franco tunnel an additional 200', but have not been carried out.

BESSIE-CORA MINING CO. COLORADO

Ralph Roseberry, supt. Owns a group of claims, including Silver-Wave, at Montezuma, Summit Co., Colo.

Ore: silver-lead, in paystreak, 2½' wide and proven for about 100' in Silver-Wave ground.

Development: tunnel, winze and drifts.

Equipment: aerial tramway, air-compressor and electric power. Employs about 15 men.

CUMBRE MINING CO. COLORADO

Address: 1669 Broadway, Denver, and Breckenridge, Summit Co., Colo.

Officers: C. L. Colburn, pres.; F. W. Freeman, v. p.; P. E. Fields, sec.-treas.; with Carl A. Allen and Mrs. B. Maxwell, directors.

Inc. in Colorado. **Cap.**, \$200,000; shares \$1 par; 100,000 outstanding. Annual meeting in September.

Has lease and bond on the Carpenter and 86 placers, consisting of 90 acres, near Breckenridge. Ground is being actively worked by sub-lessees. New exploration contemplated by company.

DUNKIN MINING CO. COLORADO

Breckenridge, Summit Co., Colo. Owns the Dunkin mine, worked under long-time lease by O. K. Gaymon, Theo. H. Knorr and W. W. Wharton of Breckenridge, and J. A. Summer of Salt Lake City.

Property: on Nigger hill, 1½ miles from Breckenridge, shows lead-sulphide ore carrying good gold values. Several rich pockets of ore were reported found in 1914-15 and to have netted the lessees \$15,000, \$30,000 and \$35,000. The Wolfstone vein, under development, is said to carry lead-carbonate ore, valued at \$40-\$50 per ton, at a depth of 500'.

Development: to depth of 600' by shaft, tunnel and crosscuts. Producing 1 carload monthly at last accounts.

ELK MOUNTAIN MINING & MILLING CO. COLORADO

Owns the Wilfley mine and mill in the Kokomo-Robinson district, north of Leadville, Summit Co., Colo.

Ore occurs as replacements in limestone and carries silver, gold, lead and zinc values.

KING SOLOMON TUNNEL & DEVELOPMENT CO. COLORADO

Office: 810 Majestic Bldg., Denver, Colo. **Mine office:** Frisco, Summit Co., Colo.

Officers: F. C. Dinsmore, pres. and gen. mgr.; S. H. Alexander, v. p.; C. W. Rowe, sec.-treas.; preceding, with W. W. Theobald, H. J. Theobald, R. L. Cosmu, C. D. Johnson, E. S. Blau, directors. H. S. Sanderson, managing engr.

Inc. Jan., 1903, in South Dakota. Cap., \$2,500,000; shares \$1 par; non-assessable.

Property: 64 quartz claims and 250 acres placer claims, in the Ten-Mile district, shows fissure veins in granite, carrying auriferous and argentiferous copper and lead ores.

Development: by a 5,200' tunnel with 5,000' drifting. Company is working the "Eleven" vein, 3,700' from portal of the tunnel, said to show gold-silver and lead values. Steady shipments are being made from this vein, and additional development is planned.

Equipment: includes a 160-h. p. steam and 115-h. p. electric plant, with an 8-drill compressor. Management plans erecting mill. Colorado & Southern R. R. runs by the property.

MARIE MINING CO.

COLORADO

Idle and probably dead. Breckenridge, Colo. Is a reorganization of the O'Reilly Gold Mining Co.

Inc. 1915, in Arizona. Cap., \$1,500,000. Owned by Haverhill, Mass., capitalists.

Property: 51 acres on North Star Mtn., 10 miles S. of Breckenridge, Colo., said to show Witch Hazel and other veins of gold ore.

Development: by 763' adit, expected to cut vein at 1,100', at depth of 1,000' below apex.

MICHIGAN MINING & MILLING CO.

COLORADO

Office: 901 Majestic Bldg., Denver, and Kokomo, Summit Co., Colo.

Officers: Edward Moir, pres.; S. H. Dunlop, v. p. and mgr.; W. R. Benzic, sec.-treas.

Inc. in Colorado.

Property: Michigan group of 8 claims and Snowbank group of 3 claims in the Consolidated Ten-Mile district, Summit Co., Colo.

Property is an old one, extensively developed, and has produced considerable quantities of gold-silver ore, but was forced to close down several years ago due to the heavy zinc penalty on the ore. Since that time it is said bodies of zinc and lead ore have been opened and shipments started early in 1916.

Production: since Sept., 1916, shipments total 6,696 tons. Iron sulphides go to the Globe smelter at Denver; lead sulphides to the Arkansas Valley smelter at Leadville. Present output is 50 tons daily, to be increased to 100 tons.

O'REILLY GOLD MINING CO.

COLORADO

Reported in 1915 that company was to be reorganized as the Marie Mining Co., and development continued. Owns the Bay State mine, near Breckenridge, Summit Co., Colo. Developed by a 300' tunnel, showing auriferous and argentiferous copper ore.

PHILADELPHIA MINES CO.

COLORADO

Mine office: Montezuma, Colo.

Officers: E. F. Pooley, pres.; F. P. Rosengarten, v. p.; W. F. Wagner, sec., 16th and Indiana Sts., Philadelphia, Pa.; W. B. Le Wald, treas.-mgr.; with T. W. Bunnell, directors; F. E. French, supt.

Inc. May, 1913, in Colorado. Cap., \$1,250,000; shares \$1 par; \$755,760 outstanding. Reported gross earnings for 1915, \$8,000, and operating expenses, \$16,000.

Property: 75 claims, 16 patented, about 365 acres, in Montezuma mining district, Summit Co., Colo., carries a sulphide ore in fissure veins traversing Montezuma granite and porphyry, said to give average assays of 1.07 oz. gold; 8.7 oz. silver; 15.05% lead; 26.6% zinc; 40% copper. The main ore-body is reported to be from 8" to 8' wide and 900' long, running N.-W., with dip of 45°.

Development: by 6 tunnels, the 405' Jumbo, 150' Monitor, 450' Tip Top, 1,490' Philadelphia, 3,400' Colorado-Toledo and 112' Cross Lode, with total workings of 7,500'.

Equipment: includes Blaisdell compressor, electric power and 100-ton wet concentrating mill. About 1,000 tons of ore were treated in 1915 and

shipments of concentrates, started in November, totaled 350 tons, averaging \$35 per ton. Plans adding ball mill and flotation unit to treat the slime.
PUZZLE LEASING CO. COLORADO

Addresses: Bulkeley Wells, Telluride, or William Keogh, supt., Breckenridge, Colo.

Property: the Puzzle mine in the Breckenridge district, Summit Co., Colo.

Development: by 500' shaft and several thousand feet of drifting. In June, 1917, high-grade lead ore was shipped to smelter, and the mill was being overhauled. Examined by Forbes Rickard.

RILLA MINING CO. COLORADO
Address: Samuel Klous, gen. mgr., 50 Congress St., Boston, and Breckenridge, Colo.

Officers: Wm. A. Irving, pres.; Edson W. Noyes, v. p.; Frank S. Sinnick, sec.-treas.; above with Samuel Klous and Geo. S. Sinnick, directors. Inc. Feb. 18, 1915, in Colorado. **Cap.**, 1,000,000 shares, \$1 par; 500,000 in trust, 177,000 shares listed on Boston Curb, Jan., 1916. Annual meeting, 3rd Wednesday in January. Company is practically a reorganization of the O'Reilly Gold Mining Co., capital being reduced from \$2,500,000.

Property: the Bay State group, 13 claims, 65 acres, on the north slope of North Star Mt., 8 miles from Breckenridge, Colo., is said to show copper, silver and gold ore in fissure veins in diorite and porphyry. The Witch Hazel vein is 8' wide. Porphyry dike cut 1916 is said to carry \$4 values for 18' in width and 1,000' in length.

Development: tunnels, 1,300', 200', 100' and 60' in length. In the 1,300' tunnel a 200' crosscut is said to have cut a 6' vein of copper ore. Management claims that \$125,000 has been spent on development work. No ore reserves given.

Equipment: 330 cu. ft. air compressor, electric power. Future plans provide for 100-ton mill and 2 additional compressors.

Is one of a new crop of Curb promotions of Boston. It is a tunnel proposition and is favorably regarded as a speculative venture.

ST. JOHN MINES (COLORADO), LTD. COLORADO

Edwin H. Platt, mgr., Equitable Bldg., Denver, Colo. M. F. Bremer, Broad St. House, E. C., London, Eng., sec.; Geo. A. Williamson, chairman; with Herbert Weld-Blundell, E. J. Nicholas, Chas. P. Winterton, M. M. Dewar and Count Lewenhaupt-Falkenstein, directors.

Inc. Feb. 13, 1913. **Cap.**, £75,000; shares 5s. par; all issued and fully paid.

Accounts for 2 years ended June 30, 1916, showed expenditure on St. John mine, £78,576, and on Revenue property, £5,354.

Property: company was organized to acquire from E. L. A. Munby and E. J. Munby, the St. John silver-lead-zinc mines, 19 claims, 100 acres, together with concentrator, located on the west side of Glacier Mt., 1½ miles south of Montezuma, Summit Co. Purchase price was \$58,250, payable £3,000 cash and £30,000 in fully-paid shares for the property and £20,000 cash and £5,250 in fully-paid shares to the promoters, the Tres Forcas Synd., Ltd.

In addition the company owns 50 acres timber land within a mile of the mining property. The bulk of St. John ore is milling grade; small shipments of high-grade ore, £4 to £7 per ton, coming from development work, were being made in February. Ore on dump, in stope fillings, and in the mine estimated at over 100,000 tons.

Company also holds an option on the Revenue Tunnel group of mines, 600 acres, in the Ouray district; this property includes the Virginius mine, which is reported as having 400,000 tons of stope filling and 50,000 tons probable ore below the tunnel level. The purchase price of this property is \$187,000, of which the final payment of \$42,223 was due July 1, 1917. To provide for further payments a loan of £25,000 was decided upon of which £21,000 was subscribed to. The loan carries 7% interest. The undeveloped portion of this property was sold in Nov., 1915, for \$75,000.

In Sept., 1915, a 1/3 interest was acquired in the Hilltop mine at Leadville, said to be producing high-grade zinc carbonate ore, £8 to £9 per ton, until forced to close temporarily owing to the weather; the mine is at an altitude of 13,000'.

The company holds a 2/5 interest in the Ruby mine at Leadville. Production started in Dec., 1916, and in Feb. was returning a profit of £40 per day. A lease is also held on the Shamrock, Mt. Sneffels and Lake claims.

At last accounts mill was being remodeled to include flotation.

TONOPAH PLACERS CO.

COLORADO

Controlled by the Tonopah Mining Co., Tonopah, Nev.

Office: Bullitt Bldg., Philadelphia, Pa. Operating office: Breckenridge, Colo.

Cap., \$1,000,000; shares \$1 par. Notes outstanding, \$112,000.

Balance sheet at Dec. 31, 1916, showed assets totaling \$1,433,538, of which \$1,018,482 was for property and \$268,634 for dredges. Current assets were \$146,419, and liabilities \$82,255.

Revenue in 1916 was \$406,368, and expenditures \$257,139. Gross profit was \$151,591, less \$78,062, on account Farncomb company's agreement, leaving \$73,529, less depreciation on property and plant, \$108,218, making a loss of \$34,689. Surplus was \$239,279.

Property: placer deposit near Breckenridge, Colo., on which 3 dredges operate about 9 months each year.

Production: in 1916 was 19,559 oz. gold and 4,748 oz. silver from 3,199,962 cu. yds. of gravel. The average gold content was 12.7c. per yd. and cost 7.2c.

TUCKER MOUNTAIN M. & M. CO.

COLORADO

Office: 901 Foster Bldg., Denver, Colo. Mine office: Kokomo, Colo.

Officers: G. P. Lingenfelter, pres.; S. H. Dunlop, v. p. and mgr.; W. R. Benzie, sec.-treas.; with G. N. Quigley and F. A. Clarkson, directors.

Inc. Nov. 9, 1916, in Colorado. Cap., \$150,000; shares 1¼c par; non-assessable; 500,000 issued.

Property: the Washington and Hancock mines at Kokomo, Summit Co., Colo., said to show a contact deposit in limestone, dipping 22° and striking N. W.-S. E. Ore is a sulphide of lead and zinc, with gold and silver, assaying \$15 to \$20 per ton.

Development: by 300' tunnel and 1,000' of workings. Shipments commenced June, 1917.

WASHINGTON MINE

COLORADO

P. M. Tyler, mgr., Breckenridge, Colo. An old-time property on Nigger Hill, near Breckenridge, Summit Co., operated under lease by Tyler & Myers after many years idleness. Ore treated in 20-stamp mill, and silver, lead and gold concentrates shipped. Some rich ore was reported as opened in April, 1917. Examined by V. C. Alderson.

WELLINGTON MINES CO. OF COLORADO

COLORADO

Office: 1000 Grand Avenue Temple, Kansas City, Mo. Mine office: Breckenridge, Colo.

Officers: J. W. Oldham, pres.; J. H. Harkless, v. p.; C. Charpiot, sec. and treas.; the foregoing and F. J. Dean, C. Histed, W. B. Burget, directors. R. M. Henderson, gen. mgr.

Inc. June 12, 1906, in Ariz. Cap., 10,000,000 shares; \$1 par; non-assessable; all outstanding. Company office in Kansas City, transfer office. C. Charpiot, registrar. Annual meeting, 1st Monday in June. The company organized in Arizona was only a holding company, property being operated by the Wellington Mines Co. of Colorado, which had a capital of \$50,000. To reduce taxation the former was dissolved and the present company reorganized Jan. 16, 1917, with a capital of \$1,000,000; shares \$1 par. Company has over 5,000 shareholders.

Receipts in 1916 totaled \$950,612, of which concentrates yielded \$947,764. Expenditures amounted to \$350,612. Cash and bills receivable were \$227,799 at the end of 1916.

Dividends were \$300,000 in 1915 and \$600,000 in 1916. In 1917, to October, the amount was \$400,000.

Property: 15 patented claims, 75 acres at Breckenridge, is said to show lead and zinc sulphide ore in a fissure vein in diorite; dip 60° S.; strike N. 50° E. Pay ore occurs in shoots and is said to give average assays of 3% lead, 18% zinc, 23% iron, 15% silver.

In Sept., 1917, the Dives-Pelican claims at Silver Plume were acquired.

Development: by one vertical and incline shaft and several tunnels, longest 1,800'. Greatest depth of workings, 1,000'; total linear extent several miles. Orebody is mined by stulling method. In 1916, 3,367' of work was done. Ore extraction was confined to the Great Northern vein, and the shoot in the upper workings has been opened for 750' on No. 5 level. One-third is not commercial ore; the remainder carries 25 to 50% zinc. Reserves were estimated at 40,000 tons of 23% zinc ore. Mining costs, \$3.13 per ton.

Equipment: includes double-drum electric hoist, 500' compressor, a number of pumps, 1,800' tramway, all electrically driven. There are two mills, a concentrator, and a plant for roasting and magnetic separation. Capacity, 2,000 tons monthly. Lead concentrates shipped in 1916 averaged 29.5%; zinc concentrates, 48.2%.

Production: in 1916, the concentrator treated 39,230 tons of 0.5% lead and 24.3% zinc ore, yielding 8,603 tons of 42.4% zinc and 130 tons of 29.5% lead concentrates. The magnetic mill treated 22,275 tons of middlings, assaying 24.2% zinc and 1.5% lead. This yielded 9,453 tons of 48.2% zinc concentrates and 95 tons of 70% lead concentrates. Other products consisted of 2,175 tons of 45% zinc ore and 3,500 tons of magnetic iron tailing. Mill work and construction cost \$2.228 per ton. Total costs were \$6.231 per ton of dry ore mined and milled.

Wellington Mines is now a highly profitable concern, handling a complex ore in a satisfactory manner.

CRIPPLE CREEK DISTRICT TELLER COUNTY

ACACIA GOLD MINING CO.

COLORADO

Mining Exchange Bldg., Colorado Springs, Colo. **Mine office:** Cripple Creek, Colo. K. Mackenzie, pres.; C. S. Gambrell, v. p.; K. Macdermid, sec.-treas.

Cap., \$1,500,000; shares 5 cts. par; outstanding, Jan. 1, 1916, 61,011 shares. Gross production to Jan., 1917, \$1,395,291. Net production, 1916, \$50,776. No liabilities. Annual meeting in Jan.

Dividends: to Jan., 1916, \$136,703. Payment of last dividend, Dec. 15, 1912, \$14,389.

Property: The Burns and Morning Star claims, patented, 20 acres, on Bull Hill, Cripple Creek. Developed by a 425' shaft with over 2,000' of underground work, on the Morning Star, and 3 shafts on the Burns claim, one being double compartment with depth of 1,350' and a mile of underground workings. A second shaft, 350' deep, has 3,390' of drifting, and a third, 825' deep, has 3,600' of drifting. Cost of development work is about \$694,000. The Burns claim is being worked at present, shipments being made from the 1,200' level. Ten men employed.

AJAX GOLD MINING CO.

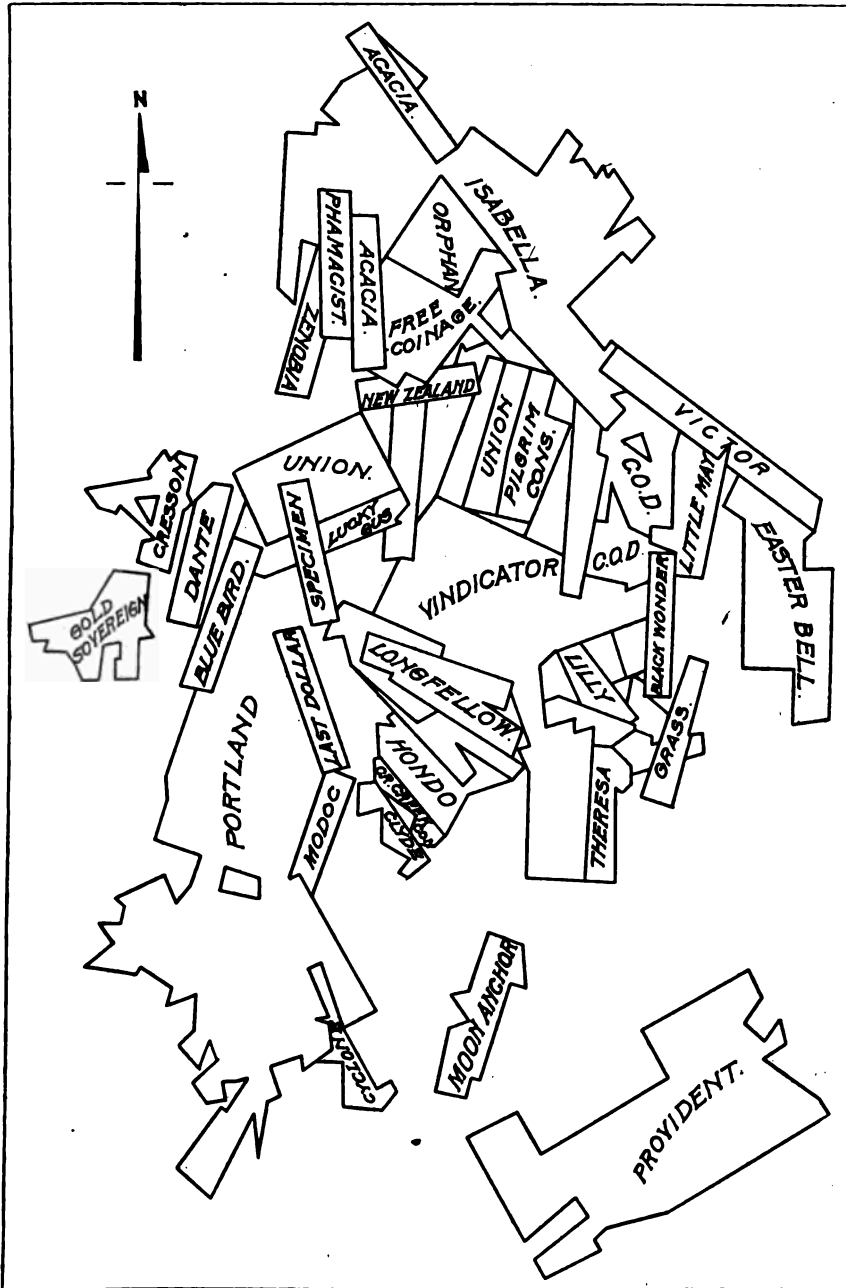
COLORADO

Address: 416 E. 10th Ave., Denver, Colo. **Mine address:** Victor, Colo. Reported Dec., 1916, to have sold its entire property, except the Colburn mill, to Ernest A. Colburn, for \$480,400.

Officers: E. A. Colburn, pres.; Wm. Lennox, v. p.; B. L. Gorich, sec.-treas.; E. A. Colburn, E. A. Colburn, Jr., Wm. Lennox and C. H. Dudley, directors; W. S. Black, supt.

Reorganized in 1914.

Cap., \$1,250,000; shares \$1 par; outstanding, \$1,000,000.



PROPERTY MAP OF CRIPPLE CREEK DISTRICT, COLORADO

Property: 11 claims, patented, 33 acres, on southeast slope of Battle Mt., Cripple Creek mining district, show quartz fissure veins in granite, phonolite and basalt. Veins dip 72° S. W. with strike of N. 32° W. Pay ore occurs as telluride. Company reported 1914 to have leased the property of the Aloha Gold Mining Co., adjoining on the south. Lessees found good grade gold ore on the different levels of the Ajax from the 400' to 1,200' levels, in veins from 2' to 4' wide, probably the extension of ore shoots previously worked. Average grade of ore shipped in 1915 was \$16 per ton.

Development: is by means of the Ajax shaft of 1,800' depth, with over 12 miles underground workings. There is a 300-ton cyanide-concentration mill on the property treating custom ores in addition to company ore.

Equipment: includes a steam hoist and 40-drill air compressor. Output to date said to total \$4,500,000. Property operated by lessors in 1916.

ALBERT BEACON GOLD MINING CO.

COLORADO

Office: Cripple Creek, Colo.

Officers: Frank Vetter, pres., treas. and gen. mgr.; F. W. Revoice, v. p.; John R. Dunn, sec., with Wm. Y. Seaman, D. W. Kilpatrick and A. M. McVicar, directors.

Inc. May, 1916, in Colorado. Cap., \$250,000; shares 10 cts. par; 1,602,825 shares in treasury, Jan. 20, 1917. Annual report for 9 months, ending Jan., 1917, shows: net receipts from ore shipments and stock sales, \$11,596; expenditures for the same period amounted to \$10,577.

Company has a 3-year bond and lease on the property of the Prince Albert Cons. Mining Co., with option to purchase for \$50,000; all royalties paid on ore shipments during life of lease to apply on the purchase price.

Property: the Prince Albert, Beacon and Eureka claims, 26.42 acres, patented, on Beacon Hill, Cripple Creek, Teller County, credited with a past production of \$1,000,000. Company's literature closely resembles that of a stock-jobbing scheme. Reported merged with Gold Camp Syndicate, May, 1917, and a new company organized, the Victory Gold Mining Co., which see.

ALOHA GOLD MINING CO.

COLORADO

Property: the Coriolanus mine on Battle Mountain, Cripple Creek, Colo.; under lease in 1914 to Ajax Gold Mining Co., whose property adjoins on the north.

Ore: gold occurs in footwall of intrusive dike, phonolitic in character. See Ajax G. Mining Co.

ANCHORIA LELAND M. & M. CO.

COLORADO

Address: Cripple Creek.

Inc. about 22 years ago. Cap., \$600,000; shares \$1 par. Irving Howbert, principal stockholder; Chas. Howbert, mgr.

Property: Anchoria mine on Gold Hill, Cripple Creek, is one of the old-time producers and dividend payers. In 1914 the company had a debt of \$30,000, due to attempts made in recent years to open up new orebodies. The mine has been worked down to the barren zone, reaching from a depth of 500' to 1,000', the lowest development. Recent work has been done by leasers. No recent returns secured.

BANNER GOLD MNG. CO.

COLORADO

Address: 317 Exchange National Bank Bldg., Colorado Springs, Colo.

Officers: J. T. Hawkins, pres.; J. R. McKinnie, v. p.; E. C. Sharer, sec.-treas.; A. D. Aitken, asst. sec. and treas.

Cap., \$2,000,000; shares \$1 par. Treasurer's statement, Jan. 1, 1916, shows 11,000 shares in treas., and cash on hand \$185. At last accounts taxes paid to 1915; liabilities, \$490. Last stockholders' meeting June, 1903. Listed on Denver and Colorado Springs Exchanges.

Property: 7 claims, patented, 68 acres, on Beacon Hill, Cripple Creek, show 3' fissure vein, containing gold and silver, and the C. K. & N. vein, 3' wide where cut.

Development: 90', 110' and 400' shafts, with prospecting on 3 levels. Worked in 1915 by lessees through the 700' level on the Henry Adney

shaft on adjoining property, and produced \$1,800. Gross production to Jan. 1, 1916, \$8,149.

BIG THOMPSON MINE

COLORADO

Worked under lease by L. G. Carlton and I. T. Russell, Elkton, Colo.

Property: the Big Thompson mine, an old-time producer, near Elkton, Teller Co., Colo. Ore occurs in vein 15' to 25' wide, reported to average \$14 per ton; mined by stoping. Shipping in 1915. No recent returns.

BLUE FLAG GOLD MINING CO.

COLORADO

Office: 703 Exchange Bldg., Denver, Colo.

Officers: J. F. Erisman, pres. and gen. mgr.; Jos. J. Gunnell, v. p.; Jos. S. Pigall, sec.-treas.; preceding officers, D. A. Schaffnit, J. M. Heaton, J. M. Burkhart and Geo. W. Duke, directors. Company is a close corporation.

Properties: Blue Flag Mine on Raven Hill, Cripple Creek, the Laurium group at Breckenridge; also holdings in the Harshaw mining district, Ariz., and at Ballarat, Calif. Ore is gold quartz. Blue Flag main shaft is 1,100' deep; management plans sinking to the 1,400' level. Equipped with 150-ton cyanide plant.

The Laurium group is developed by tunnels, one over 1,800' long.

Ore: gold-silver-lead-zinc. Property equipped with 100-ton mill.

Operations resumed in 1917.

BOB LEE CONSOLIDATED MINING CO.

COLORADO

H. H. Mitchell, sec.-treas., 65 Independence Bldg., Colorado Springs, Colo., writes, 1917: "Company lost its property through excessive taxation. Deed has been given and title quieted."

Eight years taxes, or about \$1,800, hardly seem excessive in our opinion. See Vol. XII for description of property.

BUCKEYE MINES & MILLING CO.

COLORADO

Office: Colorado Springs. **Mine:** Cripple Creek, Colo.

Officers: E. S. Johnson, W. J. Chinn, R. C. Argo, of Colorado Springs. **Inc. in Colorado. Cap., \$50,000.**

Operating property of the Blue Bird Gold Mining & Milling Co. on Bull Hill, Cripple Creek, Colo. The Blue Bird shaft is down 1,875'. Lessees are working in bottom level which is deepest in the district.

CATHERINE GOLD MINING CO.

COLORADO

Chas. Walden, mgr., Victor, Colo.

Reported to have taken 5-year bond and lease, 1917, on the Last Dollar mine, adjoining the Modoc, in Cripple Creek district, Teller Co., Colo.

Installed electric hoist and 12-drill compressor, costing over \$15,000.

Total equipment destroyed by fire, July, 1917.

CHRISTMAS GOLD MINING CO.

COLORADO

See Vindicator Consolidated Gold Mining Co.

C. K. & N. MINING CO.

COLORADO

Cripple Creek, Colo. G. A. Macdermid, gen. mgr.; H. Christiansen, supt.

Property: the C. K. & N. mine, 5.3 acres, on Beacon Hill, Cripple Creek, shows veins 3-4' wide. Ore occurs in shoots, and is said to average \$20 to \$30 gold per ton.

Development: by 860' shaft.

Production: amounts to about 550 tons of ore monthly. Mine worked by lessees in 1916, has been a steady producer for many years and is credited with a total output of \$1,350,000.

C. O. D. CONS. GOLD MINING & DEVELOPMENT CO.

COLORADO

Idle. Cripple Creek, Colo.

Officers: Jas. E. Hanley, pres.; L. A. Van Tilborg, v. p.; Virgil Mann, sec.-treas. E. J. Evans, supt.

Inc. 1915. Cap., \$200,000; shares 10 cts. par.

Organized to operate the C. O. D. mine in Poverty Gulch, Cripple Creek, Teller County, which was one of the old-time producers, credited with an output of \$1,000,000 in gold. The mine was closed down years ago as a result of drainage difficulties and was in litigation for a number of years.

The El Paso and Roosevelt drainage tunnels have since lowered the water level 1,000' or more below the lowest workings of the mine. A new discovery of shipping ore was made, August, 1917, on the line between this and the Gold King Mining Co. property (El Paso claim).

The main 3-compartment working shaft was bottomed at 800', with the 10th level the lowest. Present management is said to have found an ore-body on the 10th level which warrants sinking the shaft to 1,300' level. The first ore was shipped in Sept., 1915.

Equipment: includes a new 65-h. p. air compressor.

CONSOLIDATED MINES & REDUCTION CO. COLORADO

Office: 433 Century Bldg., Denver, Colo. **Mine office:** 412 E. Bennett Ave., Cripple Creek, Colo.

Officers: P. A. Burns, pres.; R. A. Schwab, v. p.; John H. Gallup, sec-treas.; J. B. Conger, gen. mgr.; with W. W. Oliver, directors.

Inc. March 10, 1916, in Colo. Cap., \$1,200,000 common and \$300,000 preferred stock; shares \$1 par.

Property: the Mary A. and Ella W. claims on Tenderfoot Hill, in the Cripple Creek district; the Kittie Wells No. 2 mine, on Carbonate Hill; the Buckhorn mine, adjoining the Kittie Wells on the east, and the Tenderfoot Hill mine. In April, 1916, company secured a 5-year lease on the Dante Gold Mine Co., which see. Company also has a millsite on Carbonate Hill. The Ella W. has been developed to a depth of only about 85'. Vein opened for 100' along the strike, said to be 20' wide and to assay \$20 to \$50 per ton.

The Tenderfoot Hill property is said to show ore in vein 1' to 22' wide, assaying \$3.20 to \$75 gold per ton.

Development: the 700' Tenderfoot tunnel with drifts and crosscuts.

Equipment: includes a 30-h. p. hoist and an 8-drill electric air compressor.

Production: claims to have shipped 20 cars ore in first 3 weeks of March, 1916. Plans building a 250-ton mill and cyanide plant, sinking a third shaft, extending the Tenderfoot tunnel an additional 700', and adding a 6-drill air compressor to the tunnel equipment. Company has sent out much expensive advertising and is evidently in the hands of the "promoter." No reports since July, 1916, are available.

COOPERATIVE MINING AND LEASING CO. COLORADO

Officers: A. LaMontague, mgr., Cameron, Colo.; C. D. Taylor, sec., Colorado City, Colo.

Property: company operates a lease on school section 16, adjoining the Isabella mine.

Development: 1,500' of drifting was done in 1916, on upper levels. Shaft is 875' deep with levels at every 135'. In the lower levels it is said that there is a stope 600' long, 6' to 8' wide and 125' high, averaging \$12 to \$14 a ton, which can not be mined owing to mine water. Company has 200,000 tons of tailings said to run \$3 per ton.

CRESSON CONSOLIDATED GOLD M. & M. CO. COLORADO

Office: 800 Exchange Nat'l. Bank Bldg., Colorado Springs, Colo. **Mine office:** Cripple Creek, Colo.

Officers: A. E. Carlton, pres.; C. K. Boettcher, v. p.; A. F. Zang, sec.; E. P. Shove, treas.; A. L. Blomfield, gen. mgr.

Cap., \$1,500,000; shares \$1 par; 1,220,000 issued. Transfer office: Columbia Trust Co., N. Y.

During the 13 months ended Aug. 31, 1917, under new ownership, ore sales, etc., amounted to \$2,388,620. Operations cost \$350,579, and net profit was \$1,934,971. On Aug. 1, 1916, cash on hand amounted to \$960,689; and 13 months later \$1,201,566, after paying \$1,769,000 in dividends.

Dividends: 10c. per share monthly; total to June, 1917, \$5,075,163. In 1916, 85%; 1917, to Aug., 60%; being 10c per share monthly, for \$122,000.

Property: 49 acres on Raven Hill, Cripple Creek, Colo., considered of little value until 1914, when a sensational discovery was made in a cave, 14'x33'x36', found on the 1,200' level, with walls lined with rich telluride

of gold. One shipment returned \$468,637. The then owners divided \$1,200,000 in first half of 1915, and in July, 1916, present company bought the mine for over \$4,000,000.

Ore Reserves: estimated at 206,236 tons, worth nearly \$30 per ton, developed to the 14th level. New vein on 1,400' has ore shoot 8' wide, proved for 125', running \$500 per ton. June 23, 1917, Cons. Engr. Noble reported fully developed reserves net value of \$3,917,880.

Production: including former company's totals over \$8,000,000. From Aug. 1, 1916, to Aug. 31, 1917, the new company produced 101,348 tons of ore assaying \$29.66 per ton, shipments realizing \$2,359,663. Output about 200 tons daily.

Is a gold mine of considerable importance.

CRIPPLE CREEK DEEP LEASING CO. COLORADO

F. H. Denman, supt. Cripple Creek, Colo.

Inc. in 1915. Company is a close corporation, 50% of the stock being held by the Milltown Extension Gold Mining Co., a Nevada corporation, and the remainder by those controlling the Jerry Johnson mine. The Deep Leasing Co. has a lease on the workings of the Jerry Johnson mine below the 650' level. The property is described under title of Jerry Johnson Gold Mining Co.

The 750' level is yielding \$16 ore, which is being shipped. Driving is underway at 950' to connect with the winze from the 850' level.

CRIPPLE CREEK DRAINAGE & TUNNEL CO. COLORADO

Colorado Springs, Colo.

Officers: A. E. Carlton, pres., with J. T. Milliken, J. T. Snyder, R. Roelofs, Irving Howbert, executive committee; Colo. Title & Trust Co., treas.; W. R. Weston, sec.; T. R. Countryman, engr.; C. H. Fuller, supt.

Cap., \$1,000,000; shares \$1 par.

Company drove and controls a drainage tunnel through properties of Cripple Creek producers, from western slope of Grouse Mtn. toward the Golden Cycle and Vindicator mines at the N. E. end.

The tunnel as originally driven had a length of about 14,300'. In sections it is 9' wide, 7' high, with a ditch on one side, 2' deep and 4' wide. Grade is 0.3%. Average cost per foot of tunnel was \$27.27, the cost being defrayed by the larger companies of the district. An extension financed in the same manner has been started and should be completed by November, 1917, when the tunnel will have a total length of 22,000'. The only large mines not directly benefited by the tunnel are the Vindicator and Golden Cycle, but the extension, a little over 7,700' long, will pass under these mines, cutting the Vindicator at 1,950' vertical depth. In 1917, the tunnel was discharging 10,000 gallons water per minute, but this varies with the season.

CRIPPLE CREEK GENERAL MINING & EXPLORATION CO. COLORADO

Cripple Creek, Colo.

Officers: Geo. S. Ryan, pres.; S. N. Francis, v. p.; with H. T. Hartman, E. A. Ritter and O. H. Nelson, directors. M. M. Belshe, sec-treas.

Inc. in Colorado. **Cap.**, \$200,000; shares 10 cts. par. Treasury, 1,250,000 shares.

Property: 5 claims, 25 acres, patented, on Bull, Raven and Ironclad hills at Cripple Creek, had been idle for some time previous to recent acquisition by present company. Developed by a 300' shaft, 3 shallow shafts and a tunnel, all on the Katie Hollis claim.

Extensive underground prospecting under way, 1917.

CRIPPLE CREEK GOLD MINING CO. COLORADO

No recent returns secured.

Address: Victor, Teller Co., Colo. Company is a close corporation. Geo. Harris, mgr.; B. J. Corbett, supt.

Property: the Kohyneo mine at Victor, first worked about 14 years ago, operated unsuccessfully for a time, closed down and again reopened in 1914.

Ore: shows gold-quartz ore in veins 18" to 2' wide, in contact between black schist dike and granitic country rock.

Development: 220' shaft and drifts on the Strong vein, which traverses the property. Shaft is being sunk an additional 300'. Two levels are said to show large bodies of fair grade ore; a few shipments in 1915 said to have assayed \$15 per ton.

Equipment: hoist, air compressor and 80-h. p. boiler.

DANTE GOLD MINING CO.

COLORADO

Office: 317 Exchange Bank Bldg., Colorado Springs.

Officers: L. L. Aitken, pres.; W. Arthur Perkins, v. p.; A. D. Aitken, sec.; Thos. A. Dines, treas. A. B. Crosley, supt.

Cap., \$1,250,000; shares \$1 par; all issued. Company has no liabilities and had \$6,495 cash and \$1,575 securities in the treasury, Jan. 1, 1917. Stock listed on the Colorado Springs Mining Exchange. Charter renewed Nov. 25, 1915, for 25 years.

Property: Dante mine, about 10 acres, patented, in Sec. 20 on Bull Hill, Cripple Creek, is under 5-year lease from April, 1916, to the Cons. Mines & Reduction Co. Said to show gold ore averaging \$20 per ton.

Development: 850' shaft with 6,500' of crosscuts and drifts, 520' shaft with 3,800' of crosscuts and drifts.

Equipment: 75-h. p. hoist, air compressor, complete machinery plant, 1,000' of cable and surface buildings.

Production: (gross) to Jan. 1, 1917, \$1,120,951; gross production for 1916, \$871; 1915, \$3,559 from mine, and \$13,641 from mill. Mill was treating about 2,000 tons of \$2 gold ore per month when it was destroyed by fire in Nov., 1915.

DEXTER GOLD MINING CO.

COLORADO

A close corporation controlled by Eastern capitalists.

Property: the Dexter mine, on Bull Hill, Cripple Creek, under lease to C. W. Benkleman, of Denver, and Anderson Bros., of Victor, Colo. Gold ore occurs in veins, 4' wide and proved for 175'.

Development: by 1,300' shaft, crosscuts and tunnel. Has been a steady producer for several years. Average output 600 tons monthly, showing values from \$10 to \$30 per ton.

Equipment: compressor, power plant and surface buildings. Employs about 15 men. Plans further development to the 1,400' level.

DIG-GOLD MINING CO.

COLORADO

Inc. 1915. **Cap.,** \$150,000.

Officers: M. B. Burke, pres. and gen. mgr., Denver, Colo. Chas. Bender, supt.

Property: the Alpha and Omega mines, on Gold Hill, near Cripple Creek, Teller Co., Colo.

Ore occurs in a vein, 5' wide on 200' level, and is said to assay from \$9 to \$60 per ton in gold. Surface work said to show a number of veins containing low-grade ore.

Development: by new shaft on line between the two claims. Will mine ore from 100' level. Mine is drained to 200' level by the Roosevelt tunnel.

Equipment: includes steam hoist and air compressor.

DOCTOR JACK POT MINING CO.

COLORADO

Offices: First Natl. Bank Bldg., Cheyenne, Wyo., and Cripple Creek, Colo.

Officers: A. E. Carlton, pres.; J. A. Hayes, v. p.; V. H. Mann, sec.-treas.; L. G. Carlton, mgr., with H. L. Shepherd, Ira Harris, F. H. Gay, A. M. Stephenson, directors.

Inc. Aug. 31, 1905, in Wyo. **Cap.,** \$75,000; shares 2½c. par; \$71,083 outstanding; non-assessable. Colorado Title & Trust Co., Colorado Springs, transfer agents. Annual meeting, 2nd Wednesday in June. Listed in Colorado Springs and Denver. Balance sheet Jan. 1, 1917, shows cash \$83,941, accounts receivable \$467. No liabilities.

Gross production by present company, Sept. 1, 1905, to Dec. 31, 1916, \$1,356,224; under former owners about \$2,480,000. Gross earnings, 1916,

were \$37,396, of which \$25,944 was from ore sales; operating expenses were \$16,733.

Dividends: to Jan. 1, 1917, \$143,264; last dividend, \$30,000, paid Dec., 1916.

Property: 15 claims, 99.3 acres, patented, on Raven Hill, Cripple Creek, said to show gold ore in fissure veins.

Development: tunnels and vertical shafts, amounting to several miles of underground workings with deepest at 900'. The Raven tunnel is over 3,000' long. A total of 577' of work was done in 1916 without developing any ore. There are 8 sets of leasers working on the property, 3 of whom are making occasional shipments.

Three fractional claims were purchased at a cost of about \$5,000, in 1916.

Equipment: includes a 52-h. p. electric hoist and air compressor. Electric power is used.

Production: in 1916, 15,216 tons gold ore, averaging \$7.47 per ton.

EAGLE ORE CO. COLORADO

Operates ore sampling plant at Victor, Colo.

ECLIPSE LEASING CO. COLORADO

F. R. Marsh, pres., Colorado Springs, Colo.

Inc. 1917, to operate a lease on the Jo Dandy mine, Raven Hill.

EL PASO CONSOLIDATED GOLD MINING CO. COLORADO

Officers: 20 Broad St., New York; Cripple Creek and Colorado Springs, Colo.

Officers: H. McGarry, pres. and gen. mgr.; Fred W. Bailey, v. p.; Geo. N. Miller, 2nd v. p.; Daniel Thatcher, sec.-treas.; preceding, with J. K. Corbiere, W. C. Sherwood, Geo. W. Gano, R. M. Rankin, and A. E. Carlton, directors.

Executive Committee: H. McGarry, F. W. Bailey, and R. M. Rankin. Owen Johnson, mine supt.

Inc. Feb. 27, 1893, in Colorado. **Cap.**, \$2,450,000; shares \$1 par; changed, 1913, to \$2,500,000; shares \$5 par; outstanding, 490,000 shares. No bonded debt. Stock transferred at office of secretary, Colorado Springs. Colorado Title & Trust Co., Colorado Springs, registrar. Annual meeting, 2nd Monday in April. Fiscal year ends March 31. Listed in Colorado Springs and on New York Curb.

Dividends: (on stock of \$1 par) 1903, 2½c.; 1904, 13½c.; 1905, 23c.; 1906, 7c.; 1907 and 1908, 2c. each; 1909, 1c.; 1910, 2c.; 1911, 2½c.; 1912, 5c.; (dividends on stock of \$5 par): March 31, 1913, 12½c.; Feb. 25, 1914, 10c.; none in 1915. Total dividends, \$1,707,545.

Balance sheet of Dec. 31, 1916, shows: assets, \$2,806,041, which includes: mining property (stock), \$2,500,000; mining property (cash), \$92,762; stocks and bonds, \$11,457; notes receivable, \$215; accounts receivable, \$2,113; ore in transit, \$537; cash, \$4,686. Liabilities show: working capital, \$50,000; surplus, \$229,931; vouchers payable, \$2,842.

Accounts for 1916 show: company ore sales, \$56,779; royalty, \$34,892; other income, \$20,772; total income, \$112,443. Mining and general expenses, \$80,634; net operating profit, \$31,809. Company's indebtedness of \$29,000 on Jan. 1, 1916, paid off, leaving cash balance Jan. 1, 1917, of \$2,647. In treasury Feb., 1917, \$4,229.

EL PASO EXTENSION CORP'N. OF WEST VIRGINIA COLORADO

Al Campbell, supt., Cripple Creek, Colo.

Property: Rocky Mountain and North Slope claims; 9.55 acres on Beacon Hill. First named claim has old 250' shaft. Is driving a cross-cut tunnel to cut vein.

ELKTON CONSOLIDATED M. & M. CO. COLORADO

P. O. Box 146, Colorado Springs, and Cripple Creek, Colo.

Officers: George Bernard, pres.; A. E. Carlton, v. p., with M. F. Stark, C. G. Kingsbury, C. B. Ferrin, D. C. Goddard and E. P. Shove, directors. H. M. Ragle, sec.-treas.; R. P. Windsor, supt.

Inc. 1892 in Colorado; extended 1912 for 20 years. Cap., \$3,000,000; shares \$1 par; 500,000 shares in treasury. Annual meeting in Feb. Listed in Colorado Springs and Denver. Company is one of the oldest in the Cripple Creek district.

Balance sheet as of Feb. 13, 1917, shows: assets, \$3,536,070, which includes, property and plant, \$2,845,980; treasury stock, \$500,000; Cripple Creek Drainage & Tunnel Co., \$98,400; cash, \$774; accounts receivable, \$622; current liabilities, \$31,260.

Earnings from ore sales amounted to \$283,090; miscellaneous earnings, \$8,379; expenses, \$316,425; depletion of mine, \$283,090; net loss from operations, 1916, exclusive of depletion, \$14,955.

Dividends: to Jan. 1, 1916, \$3,579,460; last dividend paid May 24, 1915, \$50,000, previous to which time the rate had been 2c a share quarterly.

Property: Elkton group, 93½ acres, patented, on Raven Hill, in Cripple Creek district. Company holds the Arequa lease on the property of the Raven & Beacon Hill Gold Mining Co., but operations in 1915 showed a slight loss.

Ore: telluride in fissure veins in breccia and granite.

The Ida May group of claims, purchased in 1911, was developed by 390' of crosscutting, 1916, but work was temporarily abandoned due to gas in the workings.

Development: by shafts, with many miles of underground workings. The main shaft is 1,636' deep, has 17 levels, and is connected with the Roosevelt tunnel by a raise from the tunnel level. In 1916, 1,797' of development work was done, compared with 3,471' in 1915.

Work for 1916 disclosed a great decrease in values on the 16th, 17th and 18th levels, and the management states that the Elkton has at last reached the so-called lean zone. Since October, 1916, only lessees have operated on the property.

Production: in 1916, on company account, 11,539 tons of ore averaging \$10.67 gold per ton; on lessees' account, 23,797 tons of \$6.90 per ton gross value.

Production: (from the Elkton mine)

	Tons Ore	Value p. Ton	Cost p. Ton (a)	Freight & T'tment
1916.....	36,036	\$8.09	\$...	\$4.17
1915.....	16,510(b)	18.42	3.30	5.63
1914.....	29,509	18.37	2.62	5.34
1913.....	28,814	18.88	2.40	5.95
1912.....	29,163	19.01	2.22	5.85

(a) Total cost of ore shipped includes underground labor and sorting, sampling and loading, but not development. (b) Production was curtailed, awaiting extension of Roosevelt drainage tunnel.

FAUNTLEROY GOLD MINING CO.

COLORADO

Office: 317 Exchange National Bank Bldg., Colorado Springs, Colo.

Officers: Verner Z. Reed, pres.; L. L. Aitken, v. p.; A. D. Aitken, sec-treas.

Cap., 1,250,000 shares; \$1 par. In treasury Jan. 1, 1917, \$65.44; no stock. All taxes paid. Liabilities, \$3,336. Last stockholders' meeting, April 18, 1911. Listed on Colorado Springs Exchange.

Property: 5 claims, 20.3 acres, patented, on Gold Hill and Mineral Hill, Cripple Creek.

Development: on the Little Fauntleroy, consists of 900' of work done from the Ophelia tunnel at 278' from surface. Shaft from surface also connects with tunnel. On the Garfield claim is an 80' shaft with 100' of drifting. During 1916 about 100' of drifting and crosscutting was done.

Little Fauntleroy claim is leased for two years on graduated royalties ranging from 15 to 25%; 50 shifts per month required. Gross production to date, \$8,311; production during last six months of 1916, \$421.

FINDLEY MINES CO.

COLORADO

Cripple Creek, Colo.

Officers: L. G. Carlton, pres.; A. E. Carlton, v. p.; V. H. Mann, sec.-treas.

Inc. Jan. 1, 1912, in Wyoming. **Cap.**, 2,000,000 shares; par value 2½¢. In treasury Jan. 1, 1917, 750,000 shares stock.

Dividends: Total, \$337,500; last dividend paid September, 1906, by original company; amount, \$12,500. Colorado Title & Trust Co., Colorado Springs, transfer office. Annual meeting 2nd Wednesday in June. Last meeting, June, 1913. Stock listed on Colorado Springs Exchange. Liabilities, \$3,000 demand note.

Property: 5 claims, patented, 12.5 acres, on south slope of Bull Hill, Cripple Creek, Colo.

Ore: carries gold and occurs in fissure veins. Underground workings are extensive, aggregating about 6 miles. Property fully equipped with machinery.

Litigation: Stratton C. C. M. & D. Co. vs. Findley, re-ownership of certain ores. Gross production to date, \$1,651,183.14. None of this company's mines are being worked.

FLOWER OF THE WEST GOLD MINING CO.

COLORADO

Cripple Creek, Teller Co., Colo.

Officers: K. C. Schuyler, pres.; N. S. Gandy, sec.-treas.

Cap., \$1,500,000; shares \$1 par. In treasury Jan. 1, 1916, 69,500 shares; cash, \$10,000. All except current taxes paid. No liabilities. Exchange Registry and Guarantee Co., Colorado Springs, transfer office. Listed in Colorado Springs.

Property: 2 claims on Squaw Mountain, and 2 on Gold Hill, 15 acres, patented. Gross production to date, nominal.

FREE COINAGE CONS. MINES CO.

COLORADO

Address: Killen, Reinert & Downey, 717 Cooper Bldg., Denver, Colo. John B. Neville, mgr., Altman, Colo.

Is successor of Free Coinage Gold Mng. Co., and owns mine of this name and the Delmonico, acquired for \$500,000 in April, 1917.

Property: 5 claims of the Free Coinage group in Cripple Creek district, said to show the Pinto, Wilson, Black Dick and Pueblo veins. The Delmonico adjoins them.

Development: will be through the 1,125' Delmonico shaft, into Pinto and Wilson ground, two mines that have a record of 2,000,000 production. Work requires 2,000' crosscutting and will take a year.

Property well worthy of deep development, but brokers' literature considered rather sensational.

GOLD BOND CONSOLIDATED MINES CO.

COLORADO

Offices: 415 Kittredge Bldg., Denver, and Cripple Creek, Teller Co., Colo.

Officers: G. A. Hummer, pres.; S. R. Herber, v. p.; C. R. Slusser, sec.-treas., with I. W. Herber and F. H. Beers, directors.

Inc. 1900 in Colorado. **Cap.**, \$1,350,000; shares \$1 par; outstanding, 1,350,000 shares. In treasury, Jan. 1, 1917, \$100. Taxes unpaid for 1915.

Gross production to 1916 said to be \$100,000. Company office transfers stock. Exchange Guaranty & Registry Co., Colorado Springs, registrar. Listed on Colorado Springs Exchange. Last shareholders' meeting held in 1900. No sale of stock in 1916.

Property: 4 patented claims, 18 acres, on S. W. slope of Gold Hill, Cripple Creek.

Ore: gold in fissure veins in granite, said to average \$5 to \$32.50 per ton, with 1915 shipments of \$12 ore.

Development: 300' vertical shaft with over 2,500' underground workings. Worked by lessees, 1916.

GOLD BOND LEASING & DEVELOPING CO.

COLORADO

Operating under lease the Cripple Creek claims of the Gold Bond Consolidated Mines Co., which see.

GOLD CAMP SYNDICATE.**COLORADO**

Address: W. Y. Seaman, 1842 Stout St., Denver, Colo.

Property: 16 acres, said to be favorably situated at Cripple Creek, Colo., but the method of raising money by boom literature, memberships, (\$35 per membership, three for \$100) and shares of an adjoining property, are not conducive to much faith. In July, 1917, it was proposed to transfer property first to a trustee, then to a new company, the Victory Gold Mining Co.

GOLD DOLLAR CONSOLIDATED MINING CO.**COLORADO**

Mine office: Cripple, Creek, Colo.

Officers: H. L. Shepherd, pres.-treas.; J. J. Hughes, v. p.; preceding with E. E. Quentin and J. E. Jones, directors. J. R. Young, sec., 128 N. Tejon St., Colorado Springs.

Cap., 2,500,000 shares; par value 10c. In treasury Jan. 1, 1917, \$225 cash; no stock. Transfer office: 125 East Pike's Peak Ave., Colorado Springs, Colo. Liabilities, \$12,000.

Dividends: paid to date, \$100,000; last dividend, \$12,500, paid Dec. 1, 1912. Listed on Colorado Springs Exchange.

Property: 62 acres, patented, being a part of the Arequa townsite, Cripple Creek mining district. Gold ore occurs in vein 2' to 4' wide, said to average \$20 gold per ton. Under lease to various syndicates, one, the Union Leasing Co., reporting good development.

Development: the 1,050' Mabel M. and Union shafts, from which there has been considerable drifting and crosscutting. In July, 1917, fire destroyed most of surface plant.

Gross gold yield for first 6 months, 1917, \$6,441; net to company, \$518.

GOLD KING MINING CO.**COLORADO**

Probably dead. See vol. XII.

GOLD SOVEREIGN MINING & TUNNEL CO.**COLORADO**

Office: 218 Burns Bldg., Colorado Springs, and Cripple Creek, Colo.

Officers: Jas. F. Burns, pres. and treas.; John T. Hawkins, v. p. and sec.; with Daniel Thatcher, A. Feringher, directors. C. G. Jackson, supt.

Charter renewed Oct. 31, 1915. Cap., \$2,000,000; shares \$1 par; in treasury Jan. 1, 1917, 195,228 shares; cash, \$8,471. Listed on Colorado Springs Exchange. Dividends, \$32,559, last dividend of \$5,000 paid in 1912.

Property: Gold Sovereign and J. G. Blaine claims, 7.2 acres, patented, on Bull Hill (Sec. 20), adjoining the Cresson, is under lease to the Union Leasing Co. Management believes firmly that rich Cresson veins extend into the Gold Sovereign ground. Shoots reported as 3' wide and assaying \$50 per ton in gold said to be disclosed on the 15th level.

Development: 1,350' shaft, to be sunk an additional 200'.

Production: gross production of lessee, Union Leasing Co., for 1916, \$38,559, netting company \$5,554. Lessees spent \$6,260 on development in 1916.

GRANITE GOLD MINING CO.**COLORADO**

Offices: 301 Mining Exchange, Colorado Springs, and Victor, Colo.

Officers: C. M. MacNeill, pres.; C. C. Hamlin, v. p., treas. and gen. mgr.; Spencer Penrose, sec.; C. B. Garnett, asst. treas., with Michael Finerty, E. P. Shove, C. L. Tutt, directors. D. L. McCarthy, supt.

Inc. 1905, in Wyoming. Cap., \$1,750,000; shares \$1 par; non-assessable; outstanding, \$1,650,000; stock transferred at company's office. Colorado Title & Trust Co., Colorado Springs, registrar. Annual meeting, 4th Monday in April. Stock has been very closely held, but was listed on Colorado Springs Exchange in July, 1915.

Owens all the stock, excepting 3 shares, of the Little Montana Mining Co. Those portions of the Granite Gold property lying within the City of Victor were incorporated as a separate company, the Little Montana Mining Co. Financial statement of this company for 1916 shows: gross income, \$40,701; expenses, \$40,768; net loss, \$67.

Receipts from ore sales in 1916 were \$272,068, including 16,033 tons of \$18.24 company ore, 21,691 tons of \$17.91 lessees' ore, and \$42,332 from the

Little Montana lease. Profit was \$29,050, less \$25,029 for depreciation, leaving \$4,020 net. Total production to 1917, about \$14,772,000. Profit for 1st quarter in 1917 was \$47,584.

Dividends: paid to date, \$319,500. Last dividend paid Sept., 1917, \$16,500. Expected to continue rate of 1c. per share each 2 months.

Property: 11 claims, 40.5 acres, patented, in the Cripple Creek district. In 1914, to avoid apex litigation, the Dead Pine claim, owned by the Raynor Gold Mining Co., was bought for \$87,500. The main production of the company is now coming from this claim. For geology of the Cripple Creek district, see U. S. G. S. Prof. Paper 54.

Development: by shafts with several miles of underground workings. The Dillon shaft is 1,770' deep, the Gold Coin shaft, 1,300' deep. The Roosevelt tunnel will, when completed, drain Granite Gold ground and deeper development will be possible. In March, 1916, an orebody said to be over 450' long, was being developed on the 1,400' level of the Dillon shaft, the ore shoot following the contact of the Little Montana phonolite dike with the granite. There is 550' of unprospected ground between the bottom of the Dillon shaft and the Roosevelt tunnel level. Upper levels of the various properties are operated under lease; lower levels are worked by company.

Equipment: mines are well equipped; a hoisting plant good for 2,000' installed at the Dillon shaft. Employs 75 men.

Stock of the Mohican Gold Mining Co. was purchased for \$22,580, and new plant erected at the Dillon shaft made necessary the borrowing of \$15,000, since repaid.

Production: in Aug. 1917, was 2,360 tons of ore, averaging one ounce gold per ton. Shipping about 2 cars daily from the Dillon mine.

The mine is considered one of the most promising at Cripple Creek.

HENRY ADNEY GOLD MINING CO. COLORADO
A close corporation operating the Henry Adney mine on Rosebud Hill, Cripple Creek.

HONDO GOLD MINING & MILLING CO. COLORADO
Cripple Creek, Teller Co., Colo., C. W. Savery, pres. and gen. mgr.
Inc. in 1914.

Property: adjoins that of the Golden Cycle on Battle Mountain and includes the old Keystone property, developed by the Sitting Bull shaft, down 250' at the time property was acquired. Also owns 3 claims in the Tenderfoot Hill section. Little work had been done on the Battle Mountain property for 20 years. Present management sank the shaft to the 500' level, and is said to have opened up low-grade ore from the 3rd to 5th levels. At last accounts a crosscut on the 5th level was being driven to strike the 3 veins cut on the 4th level. Some shipments have been made, but results are not available.

Reported, August, 1917, that company had abandoned its lease and option on the Keystone G. M. Co. properties and had removed its mine plant.

ISABELLA MINES CO. COLORADO
Office: 203 Burns Bldg., Colorado Springs. J. W. Brown, sec.-treas.
Mine office: Independence, Colo.

Officers: E. E. Quentin, pres.; R. M. Carson, v. p.; C. G. Mitchell, mgr.; foregoing with H. S. Lunt and J. T. Hawkins, directors.

Inc. 1903 in Wyoming. Cap., \$3,000,000; shares \$1 par; 2,528,291 outstanding. Stock listed on Colorado Springs Exchange. Colorado Title & Trust Co., registrar. Annual meeting 1st Monday in February at Cheyenne, Wyo.

Profit in 1916 was \$66,663. An initial dividend, 1%, or \$25,283, was paid.

Property: 116 claims, patented, in N. E. ¼ of Sec. 20 and N. W. ¼ of Sec. 21 on Bull Hill, Cripple Creek district, shows quartz veins in breccia carrying gold and some silver values.

Development: by 2 main vertical shafts, the Lee, 1,274' and the Empire, 1,407'. During 1916, 18,587' of development work was done, as compared with 17,289' in 1915. Much work was done on the lower levels of the mine, and a good tonnage of rich ore was found on the bottom level of the Lee shaft. The Buena Vista vein was cut in March, 1917, on No. 16 level, giving high assays in gold and silver. In Oct., 1917, a depth of 1,500' was reported for the winze sunk below the 1,250' level of the Lee shaft, and drifts run on the East Victor vein.

Equipment: includes a 100-ton concentrating mill, entirely remodeled in 1915, to use a cyanide process with sand leaching, pump, Parkison furnace, Heine boiler, etc. This plant is recovering 76% from \$3 ore.

Recent production: has been as follows:

Years—	Tons Mine ore	Tons Dump ore	Total tonnage	Gross Value
1916.....	19,377	....	19,377	\$412,962
1915.....	23,861	837	24,698	507,791
1914.....	15,706	2,040	17,746	345,819
1913.....	11,385	6,903	18,288	243,251

Of the 1916 output 30 sets of lessees mined 16,573 tons, worth \$258,688. Total production to date estimated at \$8,400,000. Company is one of the oldest in the Cripple Creek district and is operated successfully along conservative lines.

JENNIE SAMPLE CONSOLIDATED MINING CO. COLORADO

Office: 218 Burns Bldg., Colorado Spring.

Officers: Daniel Thatcher, pres.; Jas. F. Burns, v. p.; R. M. Frank, sec.; F. H. Gay, treas.; John T. Hawkins, gen. mgr.

Inc. in Wyoming. **Cap.**, \$25,000; shares 1c par; 1,668,885, shares issued. Stock listed on the Colorado Springs Stock Exchange. Gross earnings for 1915 were \$42,351, all from ore sales; operating expenses amounted to \$16,061. Company had no liabilities and \$958 cash in treasury, Jan. 1, 1917.

Shares ranged between 2c and 4c during 1916.

Property: 5 patented claims, 31 acres, on S. slope of Raven Hill, in Cripple Creek district, shows fissure veins with streaks of gold. Developed by shafts and drifts to depth of 1,100'. Equipped with hoist, drills and steam power. Company inactive, but property worked by lessees in 1916.

JERRY JOHNSON GOLD MINING CO. COLORADO

Office: 427 Symes Bldg., Denver, Colo. **Mine office:** Cripple Creek, Colo.

Officers: A. P. Mackey, pres. and mgr.; C. F. Potter, v. p.; J. W. Graham, sec.-treas.; with J. F. Mackey and C. A. Graham, directors; D. C. Smith, supt.

Inc. 1902, in Wyoming. **Cap.**, \$250,000; shares 10c par; all issued, has paid \$187,500 in dividends to date. Last payment of \$5 per 1,000 shares in Nov., 1914. Stock listed on the Colorado Springs Exchange. Company had \$19,326 cash in treasury, Jan. 1, 1917, and no debts. Derives income from royalties on leasing operations.

Property: 35 claims, patented, in Cripple Creek district, shows gold-silver ore in contact veins. Developed by 975' vertical shaft to depth of 850'. The mine is being worked from surface to the 650' level by Frank Caley, and below the 650' level by the Cripple Creek Deep Leasing Co.

Equipment: includes steam power, 8 drills, concentrator and 75-ton cyanide mill, erected in 1915 by Frank Caley. Total output to 1917, \$1,783,-126. In 1916 the mine produced \$45,000. In the first 5 months of 1917, 28 cars of 2 oz. gold ore were shipped.

About 20 men employed.

JOE DANDY LEASING CO. COLORADO

Thos. Smith, supt. Operates a lease on the Joe Dandy mine on Raven Hill, Cripple Creek district, Teller Co., Colo. Mine developed to about 1,000' depth by shaft and drifts, exposing an orebody, 2' to 4' wide, said to

average \$30 per ton. Reported shipping from 3 to 5 cars of ore per week, Jan., 1916.

The Joe Dandy cyanide leaching plant, operated under lease by Thos. Kavanaugh, treats about 2,000 tons of ore per month, partly \$2 per ton dump ore. No 1917 report received.

KISHMAN LEASING CO.**COLORADO**

Out of business in May, 1916. Fully described, Vol. XII.

LAST DOLLAR GOLD MINING CO.**COLORADO**

Property: the Last Dollar mine, 18 acres, adjoining the Portland & Modoc mines, Cripple Creek district, Teller Co., Colo. Mine is credited with a past production of \$30,000,000.

Bond and lease on Last Dollar mine reported taken, 1917, by Catherine Gold Mng. Co., which sec.

Development: by 1,517' shaft with levels at 500', 1,000', 1,200', 1,300' and 1,500'. The West vein, opened on the bottom level, is said to be 2½' wide. Shipments are made to the Golden Cycle mill at Colorado City. Four sets of lessees are working above the 1,100' level.

LAURA LEE MINING & LEASING CO.**COLORADO**

Address: Wm. A. Steiniger, sec.-treas. and mgr.; Cripple Creek, Colo.

Officers: A. S. Pierce, pres.; C. J. Hallett, v. p.; with J. B. Braidwood, directors.

Inc. 1916, in Colorado. Cap., 1,500,000 shares; 10c par; fully-paid and non-assessable; 300,000 issued.

Property: a 3 years' lease, with option to purchase, on the Laura Lee mine, on the southern slope of Mineral Hill, Cripple Creek, owned by the Vindicator Cons. Gold Mining Co.

Development: by 200' shaft, sunk about 15 years ago, and 2 west drifts on the vein for 200'.

Equipment: includes 15-h. p. hoist.

A prospectus of the company contains the following typical paragraph: "Our Ore—starting from the 100' level: This is about as low as any mine can figure on stoping ground (meaning breaking the ore down from above in place of digging at much greater expense), and what have we? Ore that will assay from a few dollars a ton to as many thousands a ton, as you would want in your wildest imagination of possible wealth, and it will average enough to make every pound of it Pay Ore. The drift to the South is offering possibilities of riches that would make any prospector work without food and sleep to get to the 'big pay streak,' etc., etc. Advertising literature and stock selling campaign very unfavorably regarded.

New officers in charge, 1917, but advertising matter of same character being sent out.

LELAND MINING & DEVELOPING CO.**COLORADO**

Chas. Howbert, Cripple Creek, Colo., gen. mgr.

Property: the Conundrum and Anchoria Leland mines on Gold Hill, Cripple Creek district. The Conundrum is developed by an 800' incline shaft and the Anchoria Leland mine is operated through the Gold Hill tunnel. Development work reported in progress by company and lessees in 1916.

No later returns.

LEXINGTON GOLD MINING CORPORATION**COLORADO**

Office: 702 Colorado Bldg., Denver. Mine office: Manitou, Colo.

Officers: H. J. Anstie, pres. and mgr.; N. H. Partridge, v. p.; Wm. E. Humphreys, sec.-treas., with W. H. Wadley and J. W. T. Gray, directors.

Inc. 1917, in Colorado, as a reorganization of the Lexington Gold Mng. Co. Cap., \$20,000; shares \$14 par. Stock listed on Colorado Springs Exchange. Colorado Title & Trust Co., Colorado Springs, registrar and transfer agents.

Property: 5 patented claims, 12.6 acres on Gold Hill, Cripple Creek district, shows gold ore in fissure veins, assaying from \$7 to \$8 per ton.

Developed to depth of 350' by shafts and crosscuts. The mine is credited with an output of \$200,000, and management estimates 125,000 tons of ore blocked out. Lessees have been operating the property on a royalty basis during the past few years, but company plans resumption in 1917 and erection of a 100-ton cyanide mill.

LITTLE MONTANA MINING CO.**COLORADO**

Office: Colorado Springs, Colo.

Officers: C. M. MacNeill, pres.; C. C. Hamlin, v. p.; C. B. Garnett, sec.-treas.

Inc. 1912, in Wyoming. Cap., \$150,000; \$1 par. In treasury, May, 1917, \$2,056.

Gross earnings, 1916, were \$21,749; expenses, \$10,788.

All stock, except three shares, owned by Granite Gold Mng. Co., which company operates mine. Property described under Granite Gold Mng. Co., in Cripple Creek district.

MARY MCKINNEY MINING CO.**COLORADO**

Address: Colorado Springs and Cripple Creek, Colo.

Officers: Chas. Castello, pres.; Daniel Thatcher, v. p.; John L. Nichols, sec.-treas.; preceding, with John T. Hawkins and W. H. Spurgeon, directors. Dave Buckles, supt., Anaconda (Cripple Creek), Colo.

Inc. 1892, in Colorado; renewed March, 1912. Cap., \$1,500,000; shares \$1 par; outstanding February, 1916, \$1,309,252. Transfer office: 306 Exchange Bank Bldg., Colorado Springs. Colorado Title & Trust Co., Colorado Springs, registrar. Annual meeting, 2nd Monday in February. Listed on Colorado Springs Exchange.

Balance-sheet for 1916 shows: revenue, \$233,044 (inclusive of \$4,698 misc.); expenses, \$232,169; profit, \$875. In 1915 profit was \$27,517. Cash on hand at end of 1916 was \$82,306. Of the revenue, \$97,080 was from lessees' ore, who were paid \$50,689 net.

Dividends: to 1917, \$1,182,398; last paid Oct. 26, 1916, \$13,093.

Property: several claims, 144 acres patented, on west slope of Raven Hill, at Cripple Creek. First claim was discovered in 1891. In 1906, the property of the Anaconda Gold Mining Co. was purchased.

Ore: gold in LeClair and Mary McKinney quartz veins in phonolite. Ores carry tellurides in fluorite, quartz and altered wall rock. (For geology of the Cripple Creek district, see U. S. G. S., Prof. Paper No. 54.)

Development: shafts to the 1,300' level; shaft sunk to the 13th level in 1916. Total underground workings, about 15 miles. In 1916, 6,031' of new work was done, compared with 4,939' in 1915. Ore between No. 11 and 12 levels was irregular during 1916, resulting in lower yields. Mine was examined Dec., 1916, by J. T. Milliken and L. S. Noble, who recommended that No. 9 and 10 levels be extended N. to the West vein, until they reach its intersection with No. 5 vein. The latter vein and others are then to be explored. Junctions in upper levels showed good shoots. Work will cost \$20,000.

Equipment: includes two plants, with 100-h. p. electric hoist, 200-h. p. electric compressor, boiler-plant, machine-shop, etc.

Company employs 40 men. There is also considerable work done by lessees; in 1916, 37% of output was result of leasing operations.

Production: gross to end of 1916 was \$8,964,287. In 1916, 6,328 tons, worth \$131,265 by company, and 5,232 tons, worth \$97,080 by lessees.

Property is well managed, and a policy of extensive exploration is now under way.

MARY NEVIN GOLD MINING CO.**COLORADO**

Cripple Creek, Colo.

Officers: H. J. Gehm, pres.; R. S. Ellison, v. p. and sec.; H. J. Gehm, treas.

Cap., \$1,500,000; shares \$1 par. In treasury, Jan. 1, 1916, 38,000 shares. Listed on Colorado Springs Stock Exchange.

Property: the Mary Nevin and Hibernia patented claims, 10 acres, on Rosebud Hill.

Development: by a 385' shaft on the Hibernia claim and a 200' shaft on the Mary Nevin claim; some drifting has been done. Property is under lease and is being operated through the Henry Adney shaft.

MARYANA MINING & LEASING CO. COLORADO

Cripple Creek, Colo. W. A. Matlock, mgr.

Inc. in 1914. In 1915 company had a lease on the Mary McKinney mine from the 8th level down.

MODOC CONSOLIDATED MINES CO. COLORADO

Address: A. H. Frankenburg, mgr., Victor, Colo.

Officers: F. Cannon, pres.; A. H. Frankenburg, v. p.; with R. Roelofs, T. Arneal, M. A. Skinner, and E. D. Avery, directors.

Property: a rich old Cripple Creek gold producer, credited with production of about \$2,000,000 since 1892. Bought by T. M. Pettigrew and others of Denver, late in 1916.

Development: was by 600' incline shaft and 500' winze. A new 1,500' vertical shaft is being sunk. At 1,000' depth a shoot 400' long, carrying \$30 ore is said to have been cut.

MODOC MINING & MILLING CO. COLORADO

Property operated by Modoc Cons. Mines Co., which see.

MORNING GLORY MINE COLORADO

Jas. Harbaugh and A. B. Harbaugh, owners, Pitkin, Teller Co., Colo.

Property: 12 claims, 120 acres, at the head of north fork of Quartz Creek, said to show a number of veins from 4' to 35' in width, developed by tunnels. A 400' tunnel is said to cut a 10' vein assaying up to \$107 per ton in gold and silver. An 800' tunnel is said to cut a 35' vein that will assay 4% copper, in addition to 4' of molybdenum ore, while a third tunnel, 190' long, cuts a 4' vein assaying \$8 per ton in copper, lead and zinc.

Lessees working on property and some shipments being made.

OSTON LEASING CO. COLORADO

I. J. Russell, supt. Operates under lease the 7 upper levels of the Thompson shaft on the Elkton Cons. Mining & Milling Co.'s property on Gibbons Hill, Elkton, Teller Co., Colo.

Shipments resumed in March, 1916, amounted to 980 tons, estimated to average \$8 per ton. Ore is shipped to the Golden Cycle mill at Colorado City.

PHARMACIST GOLD MINING CO. COLORADO

Officers: L. G. Carlton, pres.; Thos. J. Ward, v. p.; V. H. Mann, sec-treas.

Inc. Jan. 3, 1912. Cap., \$15,000; shares 1c par. In treasury Jan. 1, 1917, 55,000 shares and \$437 cash. Stock listed on Colorado Springs Exchange. Exchange Registry & Guarantee Co., Colorado Springs, Colo., transfer office. Paid dividends to Feb., 1910, \$7,500; none since.

Property: 10 patented acres on Bull Hill, Cripple Creek district, Teller Co., Colo.

Development: being carried on from the 500' level of the Isabella Mines Company shaft.

Production: in 1916 was \$142. Operated by lessees.

PORTLAND GOLD MINING CO. COLORADO

Office: 310 Mining Exchange Bldg., Colorado Springs, Colo. Mines at Victor, Colo. Mills at Colorado Springs and Victor, Colo.

Officers: Irving Howbert, chairman; Frank G. Peck, pres.; Dr. D. H. Rice, v. p.; Thos. F. Burns, sec.-treas.; above with J. F. Burns, directors. Harry V. Holman, purch. agent. Frank L. Smale, mine mgr.; Fred Jones, mine supt.; O. A. Willson, engr.; Geo. M. Taylor, mgr. of mills; Jas. B. Heffernan, mill supt. at Colo. Springs; Thos. B. Crowe, mill supt. at Victor. Hills & Willis, cons. engr.

Inc. 1894, in Iowa. Cap. \$3,000,000; reorganized 1905, in Wyoming, same capitalization; shares \$1 par; all issued. Colorado Title & Trust Co., registrar. Stock transferred at company's office. Listed on Colorado Springs Exchange. Annual meeting, 3rd Monday in February, at Cheyenne, Wyo.

Comparative General Balance Sheet:

	Assets—Jan. 1st—		Sec't's, Ins.			Total
	Property	Equip.	Supplies	Furn., etc.	Current	
1917.....	\$3,782,639	\$193,284	\$287,970	\$74,841	\$460,867	\$4,799,601
1916.....	3,823,771	165,915	189,522	68,628	564,303	4,812,139
1915.....	3,717,408	184,509	141,702	40,344	592,883	4,678,846

Liabilities—

	Cap. Stock	Current	Surplus	Total
1917.....	\$3,000,000	\$14,157	\$1,785,444	\$4,799,601
1916.....	3,000,000	8,695	1,803,444	4,812,139
1915.....	3,000,000	14,968	1,661,878	4,676,846

Comparative Profit and Loss Account:

	Net Optg.		Balance		Divid's	Balance
	Profit	Total	Jan. 1	Deprec.		
1917.....	\$768,810	\$772,571	\$1,803,444	\$370,571	\$420,000	\$1,785,444
1916.....	798,460	799,739	1,661,878	298,172	360,000	1,803,444(a)
1915.....	590,594	591,046	1,767,789	336,957	360,000	1,661,878(b)

(a) Jan. 1, 1916. (b) Jan. 1, 1915.

Dividends: 16% per year, paid quarterly, from Jan. 15, 1907, to and including Jan. 15, 1909; April 15, 1909, 3%; July 15 and Oct. 15, 1909, 2% each; 1910, 1911, 1912, 8% each; 1913, 10%; 1914, 12%; 1915, 12%; 1916, 14%. Total dividends to November, 1917, were \$11,047,080.

Property: the Portland and Independence mines, 253 acres, in Cripple Creek district, Teller Co., Colo., carrying gold ore in quartz veins. The Independence mine and mill, comprising 110 acres on Battle Mtn., were purchased from the Stratton-Independence, Ltd., a British corporation, in July, 1915, for \$325,000. The Independence mine has over 15 miles of workings and is credited with a gross production to July, 1915, of \$23,621,728.

Development: the Portland mine, worked continuously for 23 years, has a total of 59 miles of underground workings. Total work in 1916 was 18,263', as compared with 19,808' in 1915.

For geology of the district, see U. S. G. S. Prof. Paper, No. 54; also Vindicator Cons. G. M. Co.

Mine is worked by 2 shafts, No. 2 2,000' deep. Oreshoot on the 19th level is over 1,000' long and contains unusually high-grade ore. Mine is drained by the Roosevelt tunnel. In October, 1917, rich ore was opened in 2,000' level of No. 2 shaft.

Company operates two mills at Victor, Colo., with a capacity of 2,000 tons daily, and reduction works at Colorado Springs, treating 400 tons daily.

The Independence mill at Victor, taken over in July, 1915, was completely remodeled into an oil-flotation plant for treatment of the unoxidized ores and enlarged to 1,000 tons daily capacity. Experiments demonstrated that the oil flotation was not satisfactory in treatment of the oxidized ores, which predominate in upper workings of the mine, so the cyanide treatment will be continued.

Costs per ton crude ore was \$1.7965; total mining cost was \$676,152; milling cost was \$1.22189 at Colorado Springs and \$2.5186 at both mills.

Production: from the Portland mine in 1912, 44,562 tons, gross value, \$987,416; in 1913, 53,245 tons, gross value, \$1,380,713; in 1914, 62,997 tons, gross value, \$1,467,005; in 1915, 72,192 tons, gross value, \$1,710,277; in 1916,

96,045 tons, gross value, \$2,236,842; with a grand total from April, 1894, to Jan., 1917, of 1,480,106 tons, gross value, \$40,071,567.

In addition the Victor mills produced from 1910-1917, 1,333,937 tons, gross value, \$3,773,298.

Management estimates from 12-15,000,000 tons of low-grade ore in the mines and on the dump.

Company has a co-operative insurance fund and maintains a hospital at Victor, jointly with the Vindicator company, for the benefit of the employees. The management is excellent, and the outlook promising for many years of profitable operations and substantial dividends.

PRINCE ALBERT MINE

COLORADO

Formerly owned by the Prince Albert Cons. Mining Co., and purchased at foreclosure sale in Dec., 1914, by Frank Johannngmann, of Cincinnati, for \$31,496.

Property: on Beacon hill, near Cripple Creek, Teller Co., Colo., operated under 3-year bond and lease from 1916 by Frank Vetter, who was reported, July, 1916, to have organized the Albert Beacon Gold Mining Co. to take over the mine. Developing through the Hand tunnel.

QUEEN BESS MINE

COLORADO

A fractional claim on Tenderfoot hill, owned and operated by August Hahnwald, Cripple Creek, Colo. The mine is being developed from the 500' and 900' levels of the El Paso Gold King. Reported shipping 3-5 cars of ore per week, that averages \$50 per ton, July, 1917.

QUEEN GOLD MINING CO.

COLORADO

John Lind, supt., Cripple Creek, Colo. A close corporation, reported controlled by John T. Milliken of St. Louis. T. B. Burbridge, pres.; Thornton Brown, sec.-treas.

Property: 90 patented acres on Butte Mtn. and Raven hill, including the Eclipse mine, between the Elkton and Cresson mines, at Cripple Creek, formerly owned by the El Oro Mng. & Dev. Co., and purchased by present company in 1915. Mine is said to show 2 parallel veins, carrying \$15 gold ore.

Development: by 1,000' shaft, with levels every 100'. Equipped with machine drills, hoist, pumps and electric power. Shipped 3 cars of milling ore daily during part of 1916. Employs 8 men.

RAVEN & BEACON HILL GOLD MINING CO.

COLORADO

Office: 309 Exchange Bank Bldg., Colorado Springs.

Officers: W. W. Price, pres.; John T. Hawkins, v. p.; W. B. Price, sec.

Cap., \$170,000; shares 10c; in treasury Jan. 1, 1917, 328,000 shares stock and \$4,500 in cash. Listed on Colorado Springs Exchange.

Property: 17 acres of the Arequa townsite and 7 acres of the Cameron townsite, at Cripple Creek; crosscut by the Roosevelt tunnel. Developed by 554' shaft. The mine has been blocked out for leasing; the Elkton Cons. M. & M. Co. operates Blocks 1 and 2 from the Roosevelt level of the Elkton main shaft.

Gross production to date, \$85,691; none since 1915.

REQUA-SAVAGE MINES CO.

COLORADO

Was formerly the Requa-Savage Gold Mining Co.

Address: 112 Tejon St., Colorado Springs, Colo.

Officers: J. S. Geyer, pres.; J. Yeomans, v. p.; A. Schumacher, sec.-treas.

Reincorporated Nov., 1915, as original incorporation had expired by limitation.

Cap., 1,250,000 shares; 1c par; 393,000 shares in treasury Jan., 1917; also note, secured for \$1,713. Stock listed on Colorado Springs Exchange. Total dividends, \$8,070.

Property: Roman, Savage and Trojan claims, on Beacon Hill, and 1 acre on Gold Hill, Cripple Creek district, Colo., under lease, 1916. De-

veloped by several shafts, deepest 700' and a 100' tunnel. Production to date, \$161,378.

ROSE NICOL GOLD MINING CO.**COLORADO**

Offices: Colorado Springs and Cripple Creek, Colo.

Officers: L. L. Aitken, pres.; J. F. Burns, v. p.; A. D. Aitken, sec.-treas., with J. T. Hawkins and R. H. Forbes, directors.

Inc. in Colorado. Cap., \$1,500,000; shares \$1 par; non-assessable; all outstanding. Colorado Title & Trust Co., Colorado Springs, registrar. Income from lessees royalty, \$156; expenses, \$855.

Property: 11 acres on Battle Mountain, between the Portland, V. G. M. and Cresson mines, Cripple Creek, Colo.

Development: by lessees for 6 years. Workings total 3,000'. Mining to 720' depth by shaft and 1,000' by adjoining Portland mine drift. Rich ore was reported in September, 1917.

Production: in 1916 was \$2,884, making \$22,327 to end of last year.

SCHOOL SECTION LEASING CO.**COLORADO**

Address: Victor, Colo. Operates under lease from State, block 8 of School Section 16, on Bull Hill, near Cameron. Company is reported to have operated for 15 years consecutively and to be a steady producer.

SEEMANN INVESTMENT & FINANCE CO.**COLORADO**

Address: Box 1375, Denver, Colo.

Officers: Henry I. Seemann, pres.; K. R. Seemann, v. p.; W. S. Lippincott, sec.-treas., Flint, Mich.

Inc. July 12, 1904, in Colorado. Cap., \$100,000; shares \$100 par.

Company owns the following mining claims at Cripple Creek, Teller Co.:—Black Crow Lode, Mayflower Lode, Pride of Grassy Lode, W. E. S., E. F. C., & Rittenhouse, The 4-11-44, Idlewild & Mexican, Dark Cloud and Nada Lodes; and in Clear Creek Co.: Golden Star Lode, Ace of Diamonds Lode, Deuce of Diamonds Lode, Jack of Diamonds Lode, Und. ½ Surprise Ext. West, Vindicator Lode.

The company is not a mining company. It is the intention to lease or sell, or probably form a mining company, and turn the properties over to such company.

STRATTON CRIPPLE CREEK MNG. & DEV. CO.**COLORADO**

(Stratton Estate.) **Property:** the American Eagle, Abe Lincoln and other mines on Bull Hill and Globe Hill at Cripple Creek, with the typical veins of the district. Company is operating the American Eagle mine and has 30 sets of lessees at work on other properties.

Matoa Gold Mng. Co. is a subsidiary, and there are a half dozen or more incorporated leasing companies working on Stratton ground.

STRATTON'S INDEPENDENCE, LTD.

Secretary and offices: H. P. Smith, 3 Lothbury, London, E. C., Eng. **Directors:** C. F. Rowsell, Ch., F. W. Baker and F. S. E. Drury. Philip Argall & Sons, Denver, cons. engrs.

Inc. Sept. 8, 1908, as a reorganization of a company of same name, inc. April 29, 1899. Cap., £62,500 in 1,000,000 shares of 1s 3d each, all issued; was originally £125,000. Under reorganization plan stockholders were offered one share credited as 1s 6d paid for every old fully-paid £1 share held. On sale of the property it was decided to reduce the capital to present amount, by canceling 9d per share and returning to stockholders 6d per share, thus reducing the shares to 1s 3d each. Plan was approved by the Court, Dec. 14, 1915, and warrants were posted for the return of capital, Jan 7, 1916.

During year ended June 30, 1915, net profit was £12,042, plus £13,233 brought forward. Of total, £12,849 was written off, and £12,426 distributed. Cash amounted to £85,646, debtors £10,720, War Loan £9,943, and creditors £6,122

Dividends: by present company, 1908-9, 5%; 1909-10, 15%; 1910-11, 10%; 1911-12, 20%; 1912-13, 20%; 1913-14, 5%; 1914-15, 13 $\frac{1}{3}$ %; paid January 31, 1916.

Company formerly operated the Independence Gold mine and mill at Cripple Creek, Colo., sold, June, 1915, to the Portland Gold Mining Co. for £68,027. Out of the cash received stockholders had returned to them 6d per share, the balance being retained with a view to acquiring a new property. Up to date of sale mine produced ore with a gross value of \$23,621,728, yielding \$8,116,778 in earnings. Present company paid \$455,625 in dividends and had \$510,000 cash on hand after selling the property for \$372,000. Company has closed its business at Cripple Creek and is looking for a new property.

STRONG GOLD MINING CO.

COLORADO

Victor, Colo. Is a close corporation, owned in Colorado Springs.

Property: the Jolly Tar claim, 7½ acres near Victor, in the Cripple Creek camp, shows a cluster of veins in granite, carrying large shoots of ore. The yield of gold per acre is said to be the richest of any mine in the camp.

Development: by 1,600' shaft with extensive levels and drifts. Has 20-drill compressor.

TENDERFOOT HILL CONS. MNG. CO. COLORADO-SO. DAKOTA

Office: 317 Exchange Nat'l Bank Bldg., Colorado Springs.

Officers: W. A. Otis, pres.; L. L. Aitken, v. p.; A. D. Aitken, sec.; T. A. Dines, treas.

Cap., \$1,500,000; shares \$1 par; all issued. Listed on Colorado Springs Stock Exchange. Last stockholders' meeting held 1911. No liabilities and no production. Cash in treasury, Jan. 1, 1916, \$14,210.

Property: 61 acres on Tenderfoot Hill, Cripple Creek district, and 93 acres in the Black Hills, South Dakota.

Development: main shaft on Cripple Creek property, 511' deep with 600' of drifting. Black Hills property has drifts, tunnels and crosscuts totaling about 1,350'.

UNION LEASING CO.

COLORADO

Mine office: Cripple Creek, Colo. C. G. Jackson, supt. Owns a lease on Mabel M. and Husted shafts of Gold Dollar Consolidated Mng. Co. (which see). High-grade ore was opened in 1917.

UNITED GOLD MINES CO.

COLORADO

Office: Exchange Nat'l Bldg., Colorado Springs, Colo.

Officers: A. E. Carlton, pres.; H. McGarry, v. p. and gen. mgr.; R. C. Wilson, sec.-treas.; I. J. Russell, supt.; R. Roelofs, A. E. Carlton, H. McGarry, W. D. Wright and C. S. Davis, directors.

Stock is listed on Colorado Springs Stock Exchange.

Controls several subsidiary mining companies at Cripple Creek, Teller Co., Colo., including the W. P. H., Damon and Montrose Co., Ironclad Hill, May B, Squaw Mountain, Deadwood, Wild Horse, Requa Gold Mining & Milling Co., B. H. & S. M. Co. on Bull Hill. Company leases its mines.

In October, 1917, the B. H. & S. Co.'s property was purchased outright for \$31,642.

Production: by lessees in 1916, 17,435 tons of ore worth \$425,869, against 13,966 tons and \$181,657 in 1915. In August, 1917, the yield was 3,200 tons, worth \$65,800.

UNITED STATES MINING CO.

COLORADO

W. R. Benzie, 502 Majestic Bldg., Denver, Colo.

Inc. in Colorado. **Cap.,** \$50,000; shares \$1 par; non-assessable. "No individual liability." Organized to operate leases in the Cripple Creek district. Is a stockholders' mail order promotion.

VICTOR GOLD MINING CO.

COLORADO

Cripple Creek, Colo. Controlled by Moffatt-Smith estates. Owns the Victor mine, with reported production of \$2,250,000 to 1900. Operated 1916, under lease by A. Osberg. Mine had been inactive for many years and was supposedly exhausted when present lessees began operations.

Main shaft 1,000' deep, has 14 levels. For geology of district see U. S. G. S. Prof. P. 54.

Production: in 1915 varied from 200 to 500 tons monthly, of milling ore yielding \$10 to \$20 per ton.

VICTORY GOLD MINING CO.

COLORADO

Frank Vetter, supt., Cripple Creek, Colo. H. J. Newton, president, promoter, and effusive "slush writer."

Reported to be a consolidation of the Albert Beacon, Cripple Creek General and Gold Camp Syndicate companies in May, 1917, headed by the notorious promoter, Harry J. Newton, with a capital of 5,000,000 shares at 10c par. Some of the claims have produced a good deal of gold and are operated by lessees.

In September, 1917, said to have bought the Leora V. mine, also at Cripple Creek.

VINDICATOR CONSOLIDATED GOLD MINING CO. COLORADO

Office: 603 Symes Bldg., Denver, Colo. **Mine office:** Independence, Colo.

Officers: G. S. Wood, pres.; I. T. Snyder, v. p. and gen. mgr.; A. F. Zang, v. p. and treas.; G. A. Stahl, sec.; with A. E. Carlton, C. Sigel, Jr., and P. A. Zang, directors. W. E. Ryan, gen. supt.; A. R. Minner, mill supt.; L. A. Noble, cons. engr.; T. H. Sheldon, purch. agent.

Inc. Nov. 20, 1896, in Colorado. **Cap.,** 1,500,000 shares; \$1 par; all issued; non-assessable; no bonded indebtedness. Annual meeting 2nd Thursday in February. International Trust Co., Denver, transfer agent and registrar. Listed on Colorado Springs Stock Exchange.

General Balance Sheet:

Assets—						
	Property	Equip.	Secur.	Cash	Miscel.	Total
1916.....	\$2,430,491	\$212,694	\$202,589	\$100,712	\$116,332	\$3,062,818
1915.....	2,436,751	105,330	179,289	286,495	54,229	3,062,094
Liabilities—						
	Cap. Stk.	Bills Pay.	Surplus	Other	Total	
1916.....	\$1,500,000	\$.....	\$1,506,806	\$56,012	\$3,602,818	
1915.....	1,500,000	340,000	1,220,918	1,176	3,062,094	

Comparative Income Account:

	Mine Receipts	Mine Expense	Oper't'g Profit	Other Receipts	Divi- dends	Other Deduc.	Surplus for Year
1916....	\$1,328,006	\$780,485	\$ 547,511	\$84,274	\$270,000	\$ 631,794(a)	\$270,009
1915....	1,969,646	703,783	1,265,862	84,302	225,000	1,046,939(b)	78,225
1914....	636,568	335,708	300,860	10,818	270,000	60,521	(c)18,843

(a) Includes depreciation and mine depletion, \$631,794. (b) Includes notes paid, \$910,000. (c) Deficit.

Dividends: 1900, 17½%; 1901, 15½%; 1902, 23%; 1903, 16%; 1904, 9%; 1905, 13%; 1906, 12%; 1907, 13%; 1908, 15%; 1909, 7½%; 1910, 1911, 1912, 1913, 12% each; 1914, 18%; 1915, 15%; 1916, 18%; and to Oct. 25, 1917, 9%; total, \$3,712,500.

Property: a number of patented claims, about 130 acres, at Independence on Bull Hill, Cripple Creek district, Teller County. Owns 95% of stock of Christmas Gold Mining Co. and bought the mine of the Golden Cycle Mining Co., 43.5 acres, purchased March, 1915, for \$1,300,000, fully paid April, 1916. Since then has yielded \$900,000 net. Property includes former holdings of the Keystone Mng. & Mfg. Co. Owns La Bella plant, near Golden Cycle dumps, to be used as a flotation plant. Two acres for millsite and tailing disposal were leased during 1916.

Geology: the plateau on which Cripple Creek is located is mainly made up of a red granite. Breaking through this is a plug of volcanic breccias and tuffs, composed of phonolite, and including many granite fragments torn off and carried up from below. This volcanic core is cut by dikes

and intrusive masses of syenite and phonolite, and latest of all the basalt dikes.

The ores occur in veins which follow a system of steep fissures; the veins being mere fissures with a central film or streak of ore filling and an impregnation of the wall rock on both sides. The low-grade ores are formed by mineralization of the country rock adjacent to such narrow seams. Most of the veins occur in sheeted zones ranging in width up to 40'.

The gold occurs chiefly as the telluride calaverite, with but little silver, but associated with it there are small quantities of iron, copper, zinc, and molybdenum sulphides. The gangue is either quartz and fluorite with some carbonate or merely altered rock. The greatest horizontal extension of any pay shoot thus far opened is about 1,300'. Such pay shoots are many and usually vary from 4' to 40' in length. The vertical extension has not yet been reached in some shoots. For detailed geology see U. S. G. S. Prof. Paper No. 54; "Nature of Ore Deposits," by Beck and Weed, or Lindgren's "Mineral Deposits."

The gold content of the ore from the Vindicator and Golden Cycle mines in 1916 averaged \$22.85 per ton; of the ore shipped by lessees, \$15.88 per ton.

Development: by Vindicator shaft, 1,950' deep, and Golden Cycle, 2,200'; linear extent of workings, about 245,107'. Mining methods, filled stope and square sets.

New openings in 1916 amounted to 22,029', lessees doing 8,294'. Development resulted in 36,261 tons being added to reserves, which was somewhat disappointing. No commercial ore had been opened on No. 20 level of the Golden Cycle, and only a small quantity on No. 19 of the Vindicator; but only 25% of the mineralized area has been prospected. There is no geologic reason why ore shoots should not be found at these points. The present position is a repetition of other mines in the Cripple Creek district. Reserves are estimated at 412,796 tons, of which 100,740 tons are broken in stopes. In addition are 2,000,000 tons of ore-house reject dumps, which contain from 50 to 75c per ton profit. Mining cost \$2.81 per ton hoisted.

Upon completion of the Cripple Creek drainage tunnel, pumping costs, \$42,984, in 1916, will be greatly reduced. In October, 1917, the heading was under 3,000' from the Golden Cycle shaft, advancing about 300' per month. Three 4-stage centrifugal pumps were installed in 1916 on No. 20 level of the Golden Cycle shaft.

Equipment: includes two hoists, Sullivan electric and Ingersoll-Sargent compressors, 3 electric triplex 175-h. p. pumps, electric locomotive on No. 17 level, and steel sharpening shop on No. 16 level. Power is steam and electric. Treatment plants consist of one 300-ton washing and concentrating mill, which handled in 1916 a total of 127,947 tons of \$1.68 ore at a cost of 17.4c per ton. This ore and the reject from the Golden Cycle ore house, averaging about \$2 per ton, is now treated, with the 2,000,000 tons mentioned above, in a 300-ton flotation plant started in October, 1916. Ball mills and the Minerals Separation flotation system are operated. On \$2.26 ore the recovery in January, 1917, was 84.4%, and the process deemed a success.

Production: for 1915 was 218,487 tons crude ore, which yielded 125,397 tons shipping ore; gross value, \$2,164,669; net, \$1,718,022. Lessees shipped 49,188 tons; gross value, \$815,183; net, \$546,364. Received net royalties from lease operations, \$251,624. In 1916, 319,197 tons of crude ore, producing 119,130 tons of \$19.27 ore; the company's share being 57,978 tons of \$22.85 ore, and lessees' 61,152 tons, averaging \$15.88 per ton. The gross value was \$2,295,730 and net value \$1,644,120. Royalties from lessees amounted to \$226,231.

To date the company has produced 696,100 tons of shipping ore. Its net ore receipts were \$12,175,842, and operating profits, \$4,471,131, of which \$3,532,500 was paid in dividends.

Like other Cripple Creek mines, the Vindicator has had its day,

although good ore will continue to be mined for some time; but much of the future lies in profitable treatment of the lower-grade ores.

WAR EAGLE CONSOLIDATED MINES CO. COLORADO

Address: Cripple Creek, Colo.

Officers: T. Scott, pres.; M. E. O'Bryan, v. p.; W. H. Malone, sec.-treas.; the foregoing and S. J. Burris, T. Annear, T. E. Munson and T. R. Countryman, directors. T. R. Countryman, cons. engr.; C. Kissell, supt.

Cap., 5,000,000 shares; par value not reported; in treasury, 4,000,000, to be used in acquiring and developing additional property. Financed by T. M. Pettigrew & Co., Denham Bldg., Denver.

Property: originally 17.3 acres, since increased to 41 acres, in Cripple Creek district, upon which in January, 1916, there was a bond of \$50,000, due in 3 years.

Development: mostly by lessees. Official statements have been mostly with past performances of surrounding properties, and efforts seem to be confined to the sale of stock.

In 1916 the Scott shaft was sunk to 500' in the Happy Year claims. In June, 1917, \$10 to \$15 ore was opened in this ground. On the 400' level the shoot is 110' long, and shipments were made. Great results were anticipated from connections with the Moffat tunnel.

YELLOW BIRD GOLD MINING CO. COLORADO

Address: J. J. Yeckel, pres. and gen. mgr., Cripple Creek, Colo.

Cap., 1,500,000 shares; 10c par; non-assessable. A new company promoted to revive and develop a group of claims, about 40 acres, on Gold Hill, Cripple Creek, Teller Co., Colo., including the Yellow Bird, Red Bird, Cottontail, Volcano, Mound Rock and Red Jacket. These properties have been inactive for years except for a little work by lessees. Initial offer of stock was made at 2½c a share.

In February, 1917, 250,000 preferred shares were issued in place of an equal number of common shares. Work was then resumed.

CONNECTICUT

NEW HAVEN COPPER CO. CONNECTICUT

Property at Seymour, Conn., shows a copper-bearing band of horn-blende schist, carrying chalcopyrite with some bornite. Operations have been carried on intermittently for several years, the last work being done in October, 1911. Company has power plant on the border of the Naugatuck river.

TUNGSTEN COMPANY OF AMERICA CONNECTICUT

Office: 115 Broadway, New York. Mine and concentrating plant at Long Hill, Conn.

Officers: B. T. Lyons, pres.; Lawrence Mortimer, v. p.; F. H. Osborn, sec.; E. M. Post, treas.; with H. C. Dickinson and Melville E. Grey, directors; T. Parsons, asst. sec.; Kirby Thomas, cons. engr.

Inc. March 9, 1916, in Delaware. **Cap.,** \$1,000,000; shares \$5 par; all outstanding. Listed on New York Curb.

Statement of assets and liabilities June 9, 1916, shows: assets, \$1,323,140, which includes leases and contracts, \$1,250,000; accounts receivable, \$10,340; ore and concentrates, \$22,500; equipment, \$40,000; cash, \$300. Liabilities include bills payable, \$20,000; accounts payable, \$11,500; surplus, \$68,640.

Property: the old tungsten mine at Trumbull, Conn., was acquired in January, 1916. See U. S. G. S. 22nd Annual Report, 1900-1901.

Geology: consists of wolframite, scheelite and wolfram ocher, occurring in a contact deposit, 3' to 5' thick, between crystalline limestone and horn-blende-gneiss; dip 25° N. Company claims ore averages 2 to 3% tungsten.

Development: shallow pits and a short adit. Management states "pending the completion of the new plant, mining operations on a large scale will be continued to block out large bodies of ore, and to pile up

ore reserves," also "the cost of mining and milling this ore will not exceed \$5 per ton."

The old buildings were destroyed by fire; plans building a 100-ton concentrator. The present company began production of tungsten concentrates about April 6, and to May 11, 1916, shipped to the Vanadium Alloys Steel Co., Latrobe, Pa., 4,008 lbs., yielding \$8,734. Prior to being taken over by new management the property had been operated in a small way. Mine is an old and well-known mineral producer, but it is very doubtful if it could pay operating expenses should the price of the tungsten ore decline to its anti-war price of \$6 per unit.

No recent information available.

GEORGIA

CROWN MOUNTAIN M. & P. CO.

GEORGIA

Address: Dahlonega, Lumpkin Co., Ga. W. D. McGinnis, mgr. Will erect 100-ton cyanide plant to treat \$6 gold ore.

GEORGIA COPPER CO.

GEORGIA

Has lease, 1917, on the Magruder mine of the Lincoln Gold & Copper Mng. Co., which see.

Address: Magruder Mine, Lincolnton, Ga.

LINCOLN GOLD & COPPER MINING CO.

GEORGIA

Idle. Metasville, Wilkes Co., Ga. Carl Heinrich, pres. and gen. mgr.; Inc. June 11, 1906, in Oklahoma. Cap., \$2,000,000; shares \$1 par; issued, \$1,820,000. Paid 1 dividend, of one-half of 1%. Was practically the successor of the Seminole Mining Co., which was a sad failure. Annual meeting, first Tuesday in Aug.

Property: 901 acres, freehold, known as the Magruder or Seminole mine, just over the Wilkes Co. line, 12 miles from the Georgia Central railroad and 70 miles from Ducktown, Tenn. Shows gray sericitic schists, intruded by eruptive dikes of 2 different ages, with 4 veins in schist and between schists and eruptive rocks. They have an average strike of N. 30° E., to N. 40° E., and dip of 50° to vertical, veins averaging 3 to 14' in width, and traceable 1,200', showing ores consisting of pyrite with chalcopyrite, some bornite, cuprite and melaconite, estimated by company to average 2.5% copper, 3% lead, 1.5% zinc, 4 to 5 oz. silver and \$5 gold per ton.

The mine, opened 1852, and closed 1862, on account of the American Civil War, was reopened 1878, 1899 and 1905.

Development: by a 225' main shaft, a 150' air shaft and shafts of 40', 45' and 80', with about 1,500' of workings.

Equipment: includes a 175 h. p. boiler, 12 h. p. and 15 h. p. hoists and a 4-drill Rand air compressor. There are 10 buildings, including a machine shop, smithy, assay office and boarding house.

The small and ramshackle mill is equipped with a Gates centrifugal crusher, set of rolls, Twentieth Century jig, 2 Bartlett tables, elevators and revolving screens.

The toy smelter, immediately adjoining the concentrator and very close to the mine, has a 16-ton rectangular water-jacket blast furnace, and a 10-ton reverberatory furnace, making, when in operation, a matte of 15 to 20% copper tenor, carrying 20 oz. silver and 1.5 to 3 oz. gold per ton, shipped to the Maurer works of the American Smelting & Refining Co. for reduction, first-class ore and concentrates also being shipped to Maurer.

Mine under lease, 1917, to the Georgia Copper Co., a Tennessee corporation.

IDAHO

The great mining region of the State is in the Coeur d'Alene, in Shoshone Co., but inasmuch as the properties of the Boise section, of Hailey, Mackay, Seven Devils and other camps can be easily found under the county name, they are grouped that way.

*BOISE, Ada County***WEST COAST MINES CO.**

IDAHO

Directors: C. E. Stables, sec.-treas., Lansing, Mich.; Wm. L. Hoag, pres., Lansing, Mich.; H. C. Wyman.

Property: the Pearl mine near Boise, Idaho, showing a vein of gold-silver ore.

Idle in 1917 for want of capital.

*ADAMS COUNTY***AMERICAN MINING CO., LTD.**

IDAHO

Office: 630 Monroe Ave., Helena, Mont. Mines are located in the Seven Devils district, Idaho.

Officers: A. H. Kleinschmidt, pres.; Maria Kuphal, sec.; A. H. Kleinschmidt, treas.; preceding officers and Louis Hillehecht, directors.

Inc. Oct. 2, 1910, in Montana. **Cap.**, \$50,000; shares \$1 par; non-assessable; issued 25,000 shares, sold at \$1.

Property: A number of patented claims in Montana, also a one-half interest in the Blue Jacket and Queen mines, near Landore, Adams Co., Idaho. The Blue Jacket mine has a 400' shaft, and the Queen has a 1,500' tunnel; these properties said to have produced about \$250,000 in ore, with smelter returns up to 47% copper. The company's half interest in this group is under lease to John C. Rogers, Huntington, Ore. on a royalty basis.

Holdings also include a five-eighths interest in the Peacock, White Monument, a two-third interest in the Helena mines, held jointly with A. M. Holter and S. T. Houser; and a one-half interest in the Blue Jacket No. 2, Copper Queen, Norma, Legal Tender, Copper Crescent and Calumet mines, held jointly with Mr. A. C. Johnson and Amelie H. Kleinschmidt.

The Peacock mine, discovered 1869, is the most noted property and the largest producer in the Seven Devils district, having 1,500' of workings, said to have produced 25,000 tons of high-grade ore, and estimated to show 200,000 tons of 4½% copper ore with about \$5 combined gold and silver values per ton. Shipments, 1903, returned 13.3 to 18.3% copper, from 3 to 5 oz. silver and \$1.33 gold per ton; and 11 shipments to the Oregon Smelting & Refining Co. gave returns of 20.5 to 40.2% copper, 1.15 to 8.7 oz. silver and \$1.20 to \$3.40 gold per ton. Production, 1905, was 500 tons of ore, of about 15% copper tenor, equal to 150,000 lbs. fine copper. Property idle since 1909, owing to litigation.

See Mines Handbook, Vol. XII.

BLUE JACKET COPPER CO., LTD.

IDAHO

Company has discontinued operations. Fully described Vo. XI, Copper Handbook.

IDAHO GOLD COIN CO.

IDAHO

Controlled by the Salger Seed Co., La Crosse, Wis. S. W. Ford, supt., Landore, Idaho.

Property: in the Black Lake section of the Seven Devils district, Adams Co., carries gold ore assaying from \$12-\$16 per ton. Company has expended \$250,000 in 12 years development work. A 50-ton cyanide plant at the mine treats the output.

NATIONAL COPPER MINES CO.

IDAHO

Office: 926 Chamber of Commerce, Portland, Ore. Mine at Cuprum, Idaho.

Officers: Wm. Trevor, pres. and mine supt.; R. J. Marsh, v. p.; Edward H. Hayes, sec.; W. F. Coffey, treas., with Capt. Jas. Wolfs and Capt. Fred Hagstrom and C. H. Skews, directors.

Inc. in Oregon. Cap., \$3,000,000; shares \$1 par; 1,500,000 shares "placed in treasury."

Property: 31 claims, surveyed for patent, in Cuprum Basin, Seven Devils district, Adams Co., Idaho; also the Gold Barr mine and Coad placer mine in southern Oregon. The Idaho claims are near Cuprum, a few miles from Homestead on the Northwest (Snake River) R. R.

Ore: contains gold, silver, and lead as well as 5-17% copper, and occurs in contact deposits, developed by over 3,500' of tunnels, shafts, and opencuts. New orebodies were opened 1917, and shipments began. In 1916, 300 tons of ore were mined.

Company intends erecting a mill.

RED LEDGE COPPER MINE

IDAHO

Address: care R. N. Bell, Boise, Idaho. Mine is 10 miles north of Landore, Adams Co., Idaho, in Deep Creek canyon, described in Vol. XII.

SEVEN DEVILS COPPER CO.

IDAHO

Office: 217 Linden Ave., Ithaca, N. Y. **Mine office:** Landore, Adams Co., Idaho.

Officers: Wm. K. MacNamara, pres.; Chas. F. Riddle, v. p.; Chas. H. McColloch, sec.; Fred D. Smith, treas. and gen. mgr.; preceding, with M. J. Brundage and Chas. Marvin, directors; Geo. A. Jones, supt.

Inc. March 31, 1908, in Ariz. Cap., \$2,000,000; shares \$1 par; non-assessable; issued, \$1,558,993.

Bonds: \$250,000 authorized at 6%. Annual meeting, second Tuesday in March.

Property: 15 claims, partly patented, 134 acres, including the Arkansaw, Margaret mines, and bond and lease on the Decorah mine, 16 miles from a railway. Lands show contact deposits, between diorite and limestone, having a strike of N. 75° W., and said to be 15 to 50' in width. These deposits carry oxidized ores, succeeded at a little depth, by sulphides, the chalcopyrite and bornite ores said to average 5% copper, 2 oz. silver and \$1 gold per ton.

Development: exclusively by tunnels, there being drift tunnels of 900' and 150', and a 483' crosscut tunnel, with 2,800' of workings, estimated by the management to show 182,700 tons of ore blocked out for stoping. The Arkansaw mine has produced a little high-grade ore in the past.

Equipment: includes a 125 h. p. electric plant, taking power from the Oxbow station of the Oregon-Idaho Power Co., and there is a sawmill near the mine.

Production: to 1916, 555 tons ore said to average 11.2% copper.

Inability to pay off \$20,000 debentures caused closing down of mine and suspension of all operations except leasing, in 1915. Arrangements were being made, 1916, for the financing of this loan. Management planned further development of Iowa tunnel and addition of compressor, drills, etc., at last reports.

BANNOCK COUNTY**FORT HALL MINING & MILLING CO., LTD.****IDAHO**

Care C. W. Pomeroy, sec., Pocatello, Bannock Co., Idaho.

Officers: Wm. A. Hyde, pres.; C. W. Pomeroy, sec.; M. A. Hendricks, treas.**Cap.**, \$1,000,000; shares \$1 par; 600,000 shares in treasury. Stock listed on Salt Lake City Exchange.**Property:** 23 unpatented claims, 7 miles from Pocatello, said by R. N. Bell, State mine inspector, to show big, low-grade deposits of copper-iron-sulphide ores, not as yet profitably mined.**Development:** by 6,000' of tunnels, 300' shaft, 200' winze, 100' of raises and 300' of crosscuts. Equipped with steam power and 50-ton mill.**POCATELLO GOLD & COPPER MINING CO.**

Pocatello, Bannock Co., Idaho. H. W. Lockhart, pres.

Inc. Dec. 1, 1902, in Idaho. **Cap.**, \$1,000,000; shares 50c par.**Property:** 7 claims, 140 acres, in the Fort Hall district, 12 miles east of Pocatello, shows a vein of about 3' average width, reported to give assays of 30% copper, 13.8 oz. silver and \$1 gold per ton, from bornite and chalcocopyrite ore. Ore is mainly of milling grade with a small paystreak of rich ore, from which shipments to the White Knob smelter gave returns of 17 to 30% copper and 15 to 18 oz. silver per ton. Development is mainly by short tunnels, with about 1,000' of workings. Presumably idle.**SOUTHERN IDAHO DEVELOPMENT CO.****IDAHO**

D. J. Mahoney, supt., Pocatello, Idaho. U. B. Sollie and Dr. J. C. Arnout, directors.

Property: group near Pocatello, showing a vein of copper ore, from which a carload shipped, 1916, returned 17.7% copper and 4 oz. silver per ton.**BEAR LAKE COUNTY****BONANZA MINING CO.****IDAHO****Office and mine:** Montpelier, Bear Lake Co., Idaho.**Officers:** Col. E. J. Parrish, pres.; E. M. Stewart, v. p.; A. D. Young, sec.; H. H. Hoff, treas.; preceding officers, Chas. Sweet, M. F. Whitman and Ira Chaffin, directors.**Inc.** Nov., 1905, in Idaho., successor of Montpelier Copper Mining & Smelting Co. **Cap.**, \$5,000,000; shares \$1 par.**Property:** 25 claims, unpatented, 500 acres, 9 miles S. W. of Montpelier on the Oregon Short Line Ry.**Geology:** the U. S. Geological Survey report (Bull. 430-B., p. 49) describes the geological occurrence of the ore as an impregnation of sandstone and underlying shale, only 4' thick in all, with copper carbonate stain associated with carbonized fossil plant stems. There is no well-defined orebody. Good specimens are obtainable but average values are very low. Workings includes a shaft said to be 350' deep on a dip of 50° and a 50' shaft farther south. The copper bed is traceable for 8 miles on the east side of a Red Bed ridge of Permian rocks. Property regarded as of doubtful value.**BLAINE COUNTY****BLACK BARB MINING CO.****IDAHO****Office:** 625 Rookery Bldg., Spokane, Wash.**Officers:** Raymond Guyer, pres. and mgr.; Wm. Black, v. p.; H. L. McNair, sec.-treas.; J. G. Sawyer, supt., Hailey, Idaho.

Inc. March 21, 1917, in Idaho. **Cap.**, \$1,500,000; shares \$1 par; all outstanding.

Property: 14 claims, 4 patented, 280 acres in Mineral Hill mining district, Blaine Co. Ore contains gold, silver, lead and zinc with iron pyrites, occurring in quartz fissure veins in limestone.

Development: consists of 2,600' of underground workings, including tunnels, 600', 200' and 300' in length.

BOSTON-IDAHO MINING CO.

IDAHO

Office: 720 Scollay Bldg., 40 Court St., Boston, Mass. **Mine office:** Ketchum, Blaine Co., Idaho.

Officers: Levi Diamond, pres.; Joseph Briggs, v. p.; Winthrop, Me.; M. A. Costello, sec.; E. M. Schwarzenburg, treas., with A. H. Bailey, Winthrop, Me.; David A. Calhoun, Portland, Me.; J. H. Hickey, Boston, Mass. and W. C. Smith, directors; C. Fred Howe, supt., Ketchum, Idaho.

Inc. May 28, 1907, in Maine. **Cap.**, \$2,500,000, in 1,000,000 common; \$1 par; and 150,000 preferred, \$10 par. In treasury \$200,000 common, \$1,300,000 preferred. Bonded debt, \$125,000 authorized, \$110,000 issued.

Should not be confused with another company of same name, operating 2 gold dredges on Elk and Moore creeks, near Idaho City, which has a bond on the Banner mine.

Property: 500 acres, 29 claims, 7 patented, 12 held by location, 8 leased and bonded; 2 mill sites, at Boyle Mtn., Idaho, comprising one zinc and two lead-silver mines. Claims cover a granite-limestone contact showing fissure veins a few inches to several feet wide, cutting across the granite. Veins carry complex sulphide ores showing argentiferous galena, zinc blende and other sulphides in irregular stringers and replacements. The ore shipped is reported to show from 9% lead and 10 oz. silver to 79% lead and 36 oz. silver, per ton, with 19% to 54% zinc. Over a million dollars' worth of ore is reported to have been taken out by former owners.

Development: 3,000' tunnel work with depth of 900'.

Property large, requiring \$150,000 or more to develop lead-silver and \$100,000 to explore zinc deposits, and company thus far has not been able to secure funds for this work.

Equipment: includes 100-ton Traylor mill. Buildings include an office, laboratory, 2 warehouses, boarding house, bunk house, 2 smithies, 2 stables, 2 powder houses, a 5,000' sawmill, 2 ore houses and 8 dwellings.

COPPER & URANIUM MINING CO.

IDAHO

Office: Rexburg, Idaho. **Mine office:** Clyde, Blaine Co., Idaho.

Officers: N. P. Hansen, pres.; M. H. James, v. p.; Alfred J. Cole, sec.-treas. and mgr.; preceding officers and James Shail, directors; H. Hill, supt.

Assessment of 1/5c a share levied July 30, 1917.

Property: known as the Automatic mine, near the Wilbert mine, in the Hamilton district, 40 miles from Arco, has a 125' shaft on a 10' contact vein between limestone and quartzite, said to show copper and uranium ores.

Development: by 800' tunnel at a vertical depth of 400'. The last 30' are reported to have been driven on 15' vein with a narrow streak showing 7% to 17% copper. Ore, for shipments comes from a 5' vein on upper levels. Plans new tunnel. Ships from Arco.

CROESUS GOLD & COPPER MINING CO.

IDAHO

Company dead. See Croesus mine.

CROESUS MINE

IDAHO

Reported sold, Dec. 1, 1915, to F. C. Robertson, Spokane, Wash. Formerly belonged to Croesus G. & C. Mng. Co.

mine, 4 miles west of Hailey, Blaine Co., has an 800' three-compartment vertical shaft, on a 20 to 60' fissure vein of nearly vertical dip, in te; pay streaks on both walls said to carry chalcopryrite, with value ly in gold. There also is a nearly vertical blind vein, apparently ng the main vein at depth, carrying silver-lead ore at depth of 600'. **Equipment:** includes steam and electric power, and a 12-drill electric mpressor. The 100-ton concentrator has 10 stamps, crusher, rolls and ington mills.

idle for some time, but development under way in 1917. Under previous rs, output was \$75,000 in 2 years.

DEN GLOW MINING CO.

IDAHO

Office: 408 Commercial Bldg., Portland, Ore., T. Papworth, pres., sec. treas.

Cap., \$750,000; shares 50c par.

Property: near Ketchum, Blaine Co., Idaho, contains low-grade silver-copper ore, opened by tunnels. Operated intermittently only.

HO EXPLORATION CO.

IDAHO

Property: a group of patented claims in Kelly Gulch, W. of Hailey, e Co., Idaho, showing lead-silver ore at surface. A rich strike made 15, said to have disclosed an orebody several feet wide, assaying z. silver and 70% lead per ton. Under development in 1916; nothing in 1917.

DEPENDENCE MINING CO.

IDAHO

Address: Mrs. H. J. Allen, Hailey, Idaho.

Property: in Wood River district optioned until November 15, 1917 Federal Mining Co. of Wallace, for \$300,000.

COT MINING & MILLING CO.

IDAHO

Address: Pocatello, Idaho. **Mine office:** Hailey, Idaho.

Officers: Chas. Peter, pres.; J. M. Stevens, sec.-treas., with E. S. Keys, Gardner, A. Walton, A. J. Weber and O. Olson, directors; A. Rameyer, supt.

Inc. March 6, 1915, in Idaho. **Cap.,** \$1,000,000; shares \$1 par; outstanding \$650,000. Annual meeting, first Monday after first Tuesday in Oct.

Property: 7 claims, 4 patented, 150 acres, at Peter, near Hailey, in n Springs Creek mining district, Blaine Co., Idaho, said to show gold, and lead ore in a vein in limestone-shale formation.

Development: main workings at Silver Fortune claim. The Perkins l cut a vein at 50', which is 35' wide in one place. One shoot yields lead ore. Milling ore exists in fair tonnages.

Equipment: hydro-electric power, hoist at 80' shaft. 100-ton mill to ected in Fall of 1917, sawmill, etc.

NIE MOORE MINES CO.

IDAHO

Officers: I. E. Rockwell, Bellevue, Idaho, pres.; J. A. Blomquist, v. p.; Rookh White, sec.-treas.

Cap., \$500,000; shares \$1 par.

Property: at Bellevue, in the Mineral Hill district, Blaine Co., was d to Chas. M. Schwab interests but relinquished by them in 1906 ore was found to be cut off by complex faulting.

1 June, 1912, all the property of the Idaho Cons. Mines Co. was it at receiver's sale and in 1914 the Mill Site and Onyx lode claims bought for \$5,000. Some lead and zinc concentrates have been shipped. bly idle, 1917.

KY BULLION GROUP

IDAHO

Address: A. Worswick, mgr., Lovelocks, Nev.

Property: 3 claims, patented, 57 acres, on headwaters of Smoky river

near Hailey, Blaine Co., Idaho, contains a big deposit of low-grade concentrating ore opened for 4,200' on a contact zone between granite and limestone. Ore carries galena chalcopyrite and zinc. The sulphide shows on the surface.

Development: amounts to 2,000', mostly by tunnels, one 600' long, with 375' back. Property has been examined by Prof. Knutson and by J. M. Wilfley.

Property has milling plant erected by an eastern syndicate which spent \$100,000 on the property and allowed it to be sold for taxes. Regarded as a promising prospect.

Reported in July, 1917, that mine was being reopened by A. G. Kirby of Toronto, Ontario, under lease.

UNITED MINES CO.

IDAHO

Office: 501 C. of C. Bldg., Spokane, Wash. **Mine office:** J. L. Magney, Fairfield, Idaho.

Officers: T. S. Griffith, pres.; E. J. Peterson, v. p.; L. J. Raef, sec.; Chas. Uhden, treas., with V. A. Johnson, E. A. Worswick, Jack Wallace and J. C. Lawrence, directors.

Inc. May 17, 1916, in Washington. **Cap.**, \$250,000; shares 25c par; non-assessable; 659,670 issued.

Property: 8 claims, 160 acres, 13 miles N. E. of Fairfield, Blaine Co., Idaho, said to show a fissure vein in granite, dipping 45° with N. S. course. Shoots are 3 to 7' wide, 260' long and 150' deep. Ore is mostly sulphide, carrying pyrite, galena and chalcopyrite. Value in gold, silver and copper is \$20 per ton.

Development: by 511' tunnel, opening to 157' depth with total of 697' of workings. Ore reserves estimated at 30,000 tons, 13,000 tons blocked out. The lower tunnel is being extended to gain depth.

Equipment: 10-stamp mill and 2 concentrators, to be enlarged, including flotation.

UTAH BELLEVUE MINES CO.

IDAHO

Bellevue, Idaho.

Officers: A. W. Kelley, pres. and mgr.; T. H. Saxman, v. p.; L. H. Goulet, sec. and treas., with J. E. Naylor and M. Cullinson, directors.

Cap., 500,000 shares; in treasury, 165,000. No bonded indebtedness.

Property: 3 claims in Wood River district, Blaine Co., Idaho, said to show silver, lead, zinc ore. Developing at last accounts.

WILBERT MINING CO., LTD.

IDAHO

Office: 222 Kearns Bldg., Salt Lake City, Utah.

Officers: A. S. Ross, pres. and gen. mgr.; J. A. Foley, sec.-treas.; D. J. Lennion, supt.

Inc. in Utah, 1907. **Cap.**, \$1,000,000; shares \$1 par; assessable; all issued. Annual meeting May. Stock transferred at company's office. Listed on Salt Lake Stock Exchange.

Dividends: \$10,000, Nov. 15, 1915; \$40,000 in 1916; and \$30,000 in 1917 to October.

Receipts for year ending May 1, 1917, were \$181,389 and disbursements, \$128,475, dividends, \$40,000; leaving \$12,914 cash in bank. Received from ore sales, \$120,889.

Property: 16 patented claims, in the Dome mining district, 40 miles from Arco, Fremont Co. The claims have a fissure vein in Cambrian quartzite that contains lead and silver ore, mostly of concentrating grade. The top of the vein has been folded into a nearly horizontal bed, worked by quarrying. The main ore-shoot has been followed to a depth of 600', and is stoped out from No. 5 level to the surface, May 1, 1916.

Development: in 1916-17, 1,045' of new work cost \$9.61 per foot, and a new shaft was sunk 152', costing \$7,493. By the end of 1917 this incline will be 800' deep, connecting with the fifth level, and reducing handling.

Equipment: includes a 100-ton concentration mill. In the annual statement, value of the mill is placed at \$65,000, and that of the mine plant, \$50,000.

Production: for year ending May 1, 1916, was 15,204 tons crude ore, assaying 25% lead and 3.86 oz. silver, which yielded by sorting and concentration, 5,787 tons, assaying 52% lead and 8 oz. silver. Costs were \$3.56 per ton.

In 1916-17, the mill treated 6,981 tons of 18.7% lead and 4.9 oz. silver ore, yielding 1,758 tons of concentrate, assaying 54.2% lead and 15.3 oz. silver. Extraction was 72.9% and 78.6% respectively. Milling cost \$1.89 per ton.

In Sept., 1917, the output was from \$15,000 to \$20,000 net per month.

BOISE COUNTY

GOLD HILL & IOWA MINES CO.

IDAHO

Quartzburg, Boise Co., Idaho, E. E. Carter, mgr.

Property: Gold Hill & Iowa groups, at Quartzburg, said to show gold-quartz ore averaging \$7 per ton.

Development: 10,000' tunnel and shaft.

Equipment: 20-stamp mill, 10' Lane mill, 8' Hardinge mill, tables, Lenn amalgamators, cyanide plant, compressor, stamps, electric power. Employs 50 men. A production of \$5,000,000 is claimed for the property.

LAKINA COPPER CO.

WASHINGTON-IDAHO

Office: Eagle Bldg., Spokane, Wash.

Officers: E. A. Patrick, pres. and mgr.; E. J. Coleman, v. p.; T. E. Coleman, sec.-treas., with G. W. Dickinson, H. R. Waters and L. N. Koonz, directors.

Cap., \$3,000,000; shares \$1 par; 1,750,000 shares outstanding.

Property: 2 claims, 40 acres, in Deadwood mining district, 3 miles N. E. of Lowman, Boise Co., Idaho, and 4 claims, about 25 miles N. of Twisp, Okanogan Co., Wash. The Idaho property is a free milling proposition reported to carry a fissure vein, 30' wide, traversing granite-porphry and giving assays of from \$48-\$76 per ton. Both properties are under development.

LUCKY BOY GOLD MINING CO.

IDAHO

Office: Empire Bldg., Boise. **Mine office:** Idaho City, Idaho.

Officers: Thos. Brown, pres.; E. W. Barry, v. p.; Fred V. Tinker, mgr., with R. E. Highnote, F. E. Johnesse and John G. Huber, directors; T. E. Rippey, sec.-treas.

Inc. Sept. 30, 1914, in Idaho. **Cap.,** \$500,000; shares \$1 par; 320,000 shares outstanding.

Property: 7 claims, 120 acres, in Gambrinus mining district, Boise Co., said to show a shear zone, 3'-40' wide, of granite porphyry, carrying some quartz streaks and considerable soft talc. The orebody runs E.-W. and dips about 60°. Ore is free gold and said to average \$4.78 per ton.

Development: by 300' shaft and 840' tunnel to depth of 360', with 2,100' of drifts and crosscuts.

Equipment: includes Newark 12"x14" compressor, electric power, 100 h. p. crude oil engine direct connected to 55 k. w. electric generator, 100-ton Marathon mill and electric hoist.

Ore reserves: estimated Feb., 1916, 130,000 tons of ore. Credited with

production of \$130,000 under former owners. Present management competent and property considered promising.

MCKINLEY GOLD MINES CO.**IDAHO**

M. F. Smith, sec., 506 Gumbel Bldg., Kansas City, Mo.

Inc. in Ariz. **Cap.**, \$1,000,000; \$1 par. Has spent \$75,000 without return.

Property: 700 acres on Jupiter Mountain, Boise Basin, 6 miles from Idaho City, Idaho, shows a big vein carrying erratic values.

Development: a crosscut tunnel which has not yet reached the vein. Idle for lack of funds.

NATIONAL MINING & DEVELOPMENT CO.**IDAHO**

Address: A. C. Gallupe, pres., Placerville, Boise Co., Idaho.

Inc. Sept. 23, 1911. **Cap.**, \$1,000,000; shares \$1 par; divided into 600,000 common and 400,000 preferred shares.

Property: the Mountain Chief mine at Placerville, Boise Co., Idaho, shows gold-silver ore in a fissure vein, 1-3' wide. Ore averages from \$20-\$25 per ton. Developed by 5 tunnels.

Equipment: includes 30-ton all-sliming cyanide plant.

Producing since 1912. Property promising. Geology described 17th Annual Report of the Mineral Industry of Idaho, 1915.

NELLIE BLOOM MINING CO.**IDAHO**

M. E. Hopkins, supt.

Property: the Nellie Bloom mine, about 2 miles from Horse-shoe Bend, Boise Co., Idaho, shows a shoot of oxidized gold ore, 3-5' wide, 500' long at depth of 300', said to carry average milling values of \$10 per ton.

Equipment: includes a 10-stamp mill and electric power. Employs 16 men. Management estimated six months' supply of free milling ore blocked out Jan., 1916.

BONNER COUNTY**ARMSTEAD MINES CORPORATION****IDAHO**

(Formerly the Blacktail Mining Co.)

Sagle, Pend d'Oreille Lake, Idaho.

Officers: H. H. Armstead, pres. and mgr., Washington, D. C.; A. H. Burroughs, v. p.; Karl Jungbluth, 2nd v. p.; H. D. Kingsbury, treas.; H. L. Brown, sec., with C. C. Dula and J. Peterson, directors.

Property: the Keystone, or Blacktail mine, on Blacktail mountain, west side of Pend d'Oreille lake, near Blacktail landing, Shoshone Co.; mine was formerly owned by the Keystone Mines Corporation (described in Volume XII).

Development: to depth of 900' by 1,400' tunnel, with a 1,000' upraise and about 3,000' of drifting, said to expose 20,000 tons to 70,000 tons of ore with gold-silver-copper values, averaging \$25 per ton, mainly in silver.

New equipment has been installed and company is extending 1,400' Rainbow No. 3 tunnel, 2,200' further to cut the vein at a depth of 1,600'. At the end of October the heading was about 1,800' in. A concentrator is planned. Property sold by Blacktail Co. (Volney D. Williamson), for \$250,000 in June, 1917. This resulted in a distribution of 13½¢ a share to the 1,746,440 shares of the old company.

IDAHO CONTINENTAL CO.**IDAHO**

Officers: A. Klockman, pres. and gen. mgr., 711 Paulsen Bldg., Spokane, Wash.; J. B. Whitehill, v. p.; R. Schacht, sec.-treas.; preceding, with E. M. Robinson, Wm. Wraith, directors.

Inc. 1909, in Wash. **Cap.**, \$1,500,000; shares \$1 par; all issued. John D. Ryan, through the International Smelting & Refining Co., advanced \$325,000

for the development of the property on condition that it be given a 10-year contract to treat the company's ores, and receive an option on 150,000 shares at 50c a share.

Property: 20 patented claims, 26 miles from Port Hill, Bonner Co., Idaho, N. of head of Priest Lake, said to show a strong vein in quartzite and slate with a succession of ore shoots, 8' to 20' wide, carrying galena and a little copper ore. These ore shoots have been opened to a depth of 600' and on that level exceed 1,000' in length. Is an important new lead producer. A 300-ton concentrator was erected and was operating during June and July, 1915, producing over 2,000 tons of concentrates, when destroyed by fire. Rebuilt 1916.

Output: 30 to 40 tons concentrates daily.

IDAHO-MONTANA AMALGAMATED MINING CO. IDAHO

Owns the Idaho-Montana mine, near Kalka station, on the Great Northern R. R., 7 miles E. of Bonner's Ferry, Bonner Co., Idaho.

Developed by a 400' incline shaft which discloses a 2 to 4' vein in diorite, containing lead and silver values associated with iron sulphide, expected to develop copper with depth. Has 50-ton concentrator.

Considered promising.

LAWRENCE MINING & MILLING CO., LTD. IDAHO

Office: 728 Mission St., Spokane, Wash. **Mine office:** Clarke Fork, Idaho.

Officers: Jos. Reed, pres. and mgr.; O. A. Turnbow, v. p.; S. Hilliard, sec.-treas., with John Callan and W. W. Wood, directors.

Cap., \$75,000; shares 5c par; 1,472,794 outstanding.

Property: 10 claims, about 1½ miles from Clarke Fork, said to carry gold-silver-copper-lead ore in fissure vein, 2" to 9' thick.

Development: 1,000' tunnel. Equipped with 60-ton concentrator, pump and compressor. Property considered promising, but development hampered by lack of capital.

PONDERAY SMELTER IDAHO

Sandpoint, Bonner Co., Idaho. Owned by Idaho Smelting & Refining Co., whose properties were sold at sheriff's sale to Union Trust & Bank Co., of Spokane. A new company will be formed by the bondholders.

BONNEVILLE COUNTY

CARIBOU GOLD MINES CO. IDAHO

Office: 325 Kearns Bldg., Salt Lake City, and Mount Pisgah, Idaho.

Officers: John W. Clark, Jr., pres.; J. P. Fanning, v. p. and gen. mgr.; J. W. Stringfellow, sec.-treas., with C. R. Bates and A. B. Rockhill, directors. Company was formed in 1915 to take over the property of the Idaho Gold Mining Co.

Cap., 1,000,000 shares, par value 1c. All outstanding.

Property: 13 claims and a millsite, 2 claims and millsite patented, in Mount Pisgah district, Bonneville Co., 42 miles from Soda Springs. The mine was first operated in the early 70's, but was closed down on account of poor management, after an accredited production of \$200,000 from free milling gold ore. Mine has been idle for 15 years, but present company believes it can be made to pay as the ore, though low-grade, is said to be in a vein 18 to 30' wide, and capable of being mined cheaply.

Developed by tunnels, main tunnel over 400' long and a 280' shaft.

Ore reserves: said to have blocked out 12,000 tons, in 1915, averaging \$6.14 per ton in gold.

Equipment: 10-stamp mill, 100 h. p. engine, air compressor and hoist.

BOUNDARY COUNTY

IDAHO GOLD & RUBY MINING CO.

IDAHO

Address: Lenia, Boundary Co., Idaho.

Property: gold placer. In Feb., 1917, company spent \$12,000 on plant capable of hydraulicking 25,000 cu. yd. gravel daily.

CASSIA COUNTY

MELCHER MINING & MILLING CO.

IDAHO

Office: 409 Hooper Blk., Salt Lake City, Utah. Mine office: Albion, Cassia Co., Idaho.

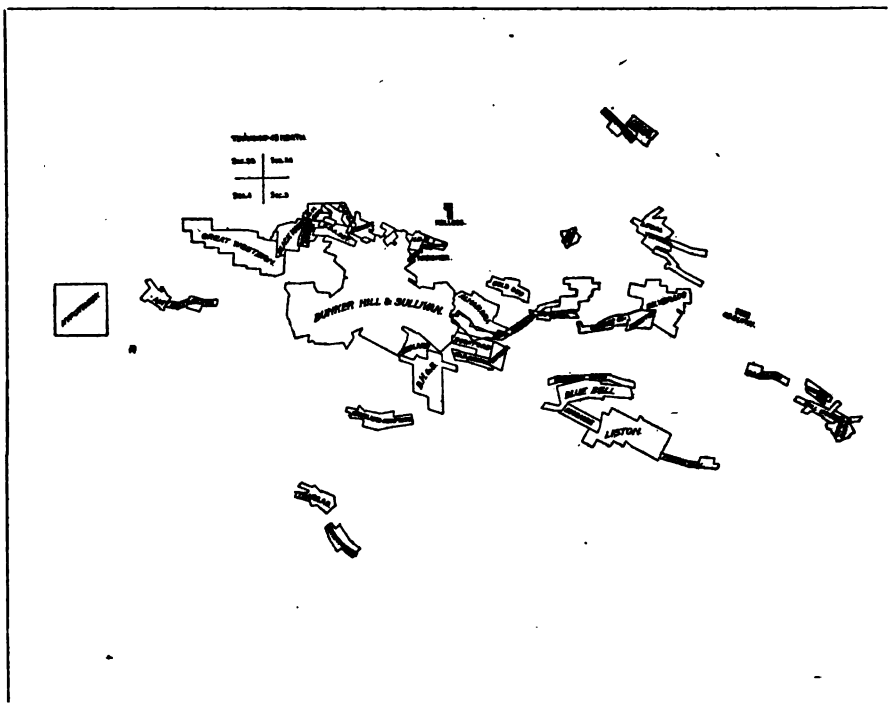
Officers: Samuel McIntyre, Sr., pres., gen. mgr. and treas.; R. M. Wilkinson, sec. and purch. agt.; P. McIntyre, supt.

Inc. in Utah. Cap., \$50,000; shares 10c par; 500,000 issued.

Property: 37 claims, including former holdings of the Cumora Mining Co., bought 1912, in the Stokes district, 25 miles from a railroad. Country rock is schist, granite and quartzite, orebodies occurring as fissure veins in both schist and granite. The vein developed runs N. 10° E. and dips 68° west.

Development: by two shafts and 4 tunnels, one 3,290' long. Shows a 3' quartz vein carrying chalcopryrite and galena and lead carbonates, said to average 5% copper, 4% lead, 5 oz. silver and \$5 gold per ton.

Equipment: includes 200 h. p. steam and water power plant, 5-drill air compressor and 6 small buildings. Company developing vein in Giant tun-



nel and driving the Melcher crosscut tunnel to crosscut the 3 veins. A 100-ton concentrating mill is being built.

CLEARWATER COUNTY

KING DAVID CO.

IDAHO

Address: 302 Hyde Bldg., Spokane, Wash. **Mine office:** Neva, Idaho.

Officers: A. R. Immisch, pres.; W. L. Smith, v. p.; P. A. Hughes, sec.; L. A. Smith, treas., with J. A. Brown and F. C. Dolke, directors.

Inc. Aug. 27, 1915, in Washington. Cap., \$1,500,000; shares \$1 par; non-assessable; 1,150,000 issued.

Property: 6 unpatented claims in Ruby Creek district, Clearwater Co., Idaho.

Geology: contact veins in trachyte and metamorphic granite with vertical streaks, 1 to 4", carrying 45 to 63% zinc, with some lead-silver values.

Development: by 100' shaft.

Equipment: includes steam hoist, compressor, pump, etc. A prospect.

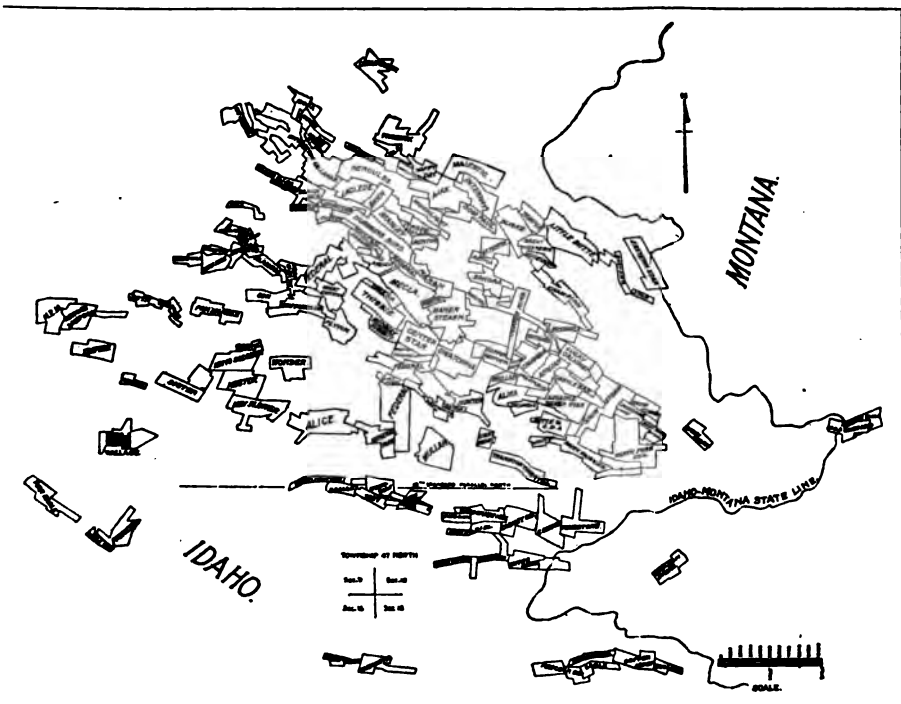
COEUR d'ALENE DISTRICT, SHOSHONE COUNTY

ADVANCE MINING CO.

IDAHO

Office: 824 Vine St., Missoula, Mont. **Mine office:** Mullan, Shoshone Co., Idaho.

Officers: F. D. Fox, pres.; Herbert Crego, v. p.; Henry Hubert, sec-treas.; preceding officers, and F. H. Murphy, directors; Joe Peila, mgr.



THE COEUR D'ALENE REGION (SHOSHONE COUNTY), IDAHO

Inc. 1903. Cap., \$1,000,000; shares \$1 par, assessable. Last assessment, 5 mills per share, levied May 8, 1916.

Lands: 5 unpatented claims, 4 miles from Mullan, on Snowstorm Hill, lying between the Snowstorm on the east and the Butte & Coeur d'Alene on the west and 107 acres of timber land.

Development: by 1,550' tunnel with 2 crosscuts showing streaks of chalcopryrite ore. Management plans further development work, installation of a Pelton water wheel and other necessary machinery.

AEOLIAN COPPER CONSOLIDATED MINING CO., LTD. IDAHO

Idle. Described in Copper Handbook, Vol. XI.

AETNA M. & M. CO. IDAHO

Address: Wallace, Idaho.

Officers: Jas. Murphy, pres.; O. W. Lewis, sec.-treas., with Dr. C. S. Stone, Dr. F. Leo Quigley and A. Wilmot, directors.

Cap., \$150,000; shares 1c par.

Property: 4 claims, unpatented, 1 mile S. E. of Burke, Shoshone Co., developed by 250' of underground workings. Idle since 1915.

AJAX MINING CO. IDAHO

Office: Burke, Idaho.

Officers: Harry W. Woodward, v. p., Lynn, Mass.; A. C. Bixby, mgr.; J. A. Harghorst, treas.

Cap., \$1,600,000; shares \$1 par; all issued; assessable; 8 assessments of 5 mills each called to Aug. 1, 1917.

Property: 13 patented claims, 184 acres in Gorge gulch, Coeur d'Alene district, adjoining the Hercules on the E. and said to carry the extension of the Hercules vein system for 1¼ miles in length. About \$200,000 has been expended in development work and \$10,000 in equipping property.

Ore contains silver-lead values, but to date nothing of commercial value has been found. Management plans sinking from 600' to 800' level in 1917 and completing 10,000' tunnel, in 8,000', Aug., 1917. Ten men employed.

ALAMEDA MINING CO. IDAHO

Wallace, Idaho.

Officers: F. J. Finucane, pres., 323 8th St., Spokane, Wash.; Frederick Burbridge, v. p.; Chas. McKinnis, mgr.; J. A. Wayne, sec.-treas.; above, with Chas. Hussey, directors.

Originally inc. 1900 as the Alameda M. & M. Co., Ltd. Reorganized 1910 as Alameda Mng. Co. Cap., \$1,500,000; shares \$1 par; assessable; 14 assessments levied since 1900. Control of 800,000 shares purchased April, 1916, at 15c a share, by syndicate consisting of above named officers. Stock listed on Spokane and Butte Exchanges.

Property: 6 claims adjoining Success Mng. Co. ground; on the E., in Nine-mile section, Coeur d'Alene district, Shoshone Co., Idaho. Little work has been done on the property during the last 5 years, owing to litigation with the Success Company, but operations of the latter company have shown that orebodies opened on the 400, 450 and 700' levels of the Success mine extend into Alameda ground. The faces on the 400' and 450' levels are said to average 31.7 oz. silver per ton, 31.5% lead, 21.1% zinc and on the 700' level, 7.5% lead, 7 oz. silver and 25.7% zinc.

Operations through a new crosscut tunnel to tap the vein were started in 1916.

Development: up to Jan., 1917 consisted of a 7½' by 9' tunnel in 900'. Property considered promising and new management able. Further litigation with the Success Company pending.

ALICE MINING CO.

IDAHO

Address: Wallace, Shoshone Co., Idaho. Jas. F. McCarthy, mgr.**Property:** The Alice mine, located between Wallace and Mullan, output of which is lead, silver ore. Developed by 640' shaft.**Equipment:** includes a compressor and 125-ton concentrator. Electric power is used.**AMAZON-DIXIE MINING CO.****Office:** Wallace, Idaho. **Mine office:** Mullan, Shoshone Co., Idaho.**Officers:** Wesley Everett, pres. and gen. mgr.; Hugh Tool, v. p.; Herman J. Rossi, sec.-treas.; preceding officers, W. W. Woods and A. W. Ellenburger, directors; F. W. Calloway, engr.**Inc.** 1909, in Montana. **Cap.**, \$750,000; shares 50c par; assessable; 1,450,000 shares outstanding. Stock pooled since organization.**Property:** 8 claims and 4 mill sites, 64 acres, well timbered, at Sildix, Mont., near Lookout, just across the Montana line, adjoining the Leslie Copper Mining Co. Property shows a fissure vein in quartzite exposed by surface trenching for 2,000', carrying galena, chalcopyrite and lead carbonates, associated with pyrite, with values mainly in galena.**Development:** by 2 tunnels, 6,500' long, the lower or main working tunnel with mouth near the Northern Pacific railway. Tunnels are connected by a 400' raise.

Company claims to be blocking out an orebody, 8'-8' average width and 600' long, carrying lead, copper, zinc and silver ore. Plans sinking 500' shaft, down 250', Aug., 1917, and, if results of development warrant it, building a concentrator.

Equipment: includes a water-power plant developing 110 h. p., a 10-drill compressor, 8x10' hoist, pump, 20,000' sawmill, machine shop, smithy, carpenter shop and other necessary mine buildings. Property is served by the Northern Pacific railway, 160' from the mine.**AMBERGRIS MINES CO.**

IDAHO

Address: Wallace, Idaho.**Officers:** Eugene R. Day, pres.; Harry L. Day, v. p., with August Paulsen, W. Clayton Miller and Al. Page, directors.**Inc.** June, 1916, in Idaho. **Cap.**, \$1,000,000; shares \$1 par; assessable; last assessment, 2c per share, called August, 1917. Company is a reorganization of the Ambergris Mining Co., organized under laws of Washington with \$3,000,000 capitalization. Stock was exchangeable at the rate of 3 shares of old for 1 share in the new company. Controlled by the Day family.**Property:** 3 claims, patented, adjoining the Hercules at Burke, Shoshone Co., developed by 200' shaft, said to show 2-3' of silver-lead ore. As a result of former litigation, company has the right to use the Hercules tunnels and the aerial tramway for shipments to the railroad. Developing through the No. 4 Hercules tunnel to cut the Ambergris vein at depth of 1,200' in 1917.**AMERICAN COMMANDER M. & M. CO.**

IDAHO

Address: Mullan, Shoshone Co., Idaho.**Officers:** E. J. Clark, pres.; M. J. McHugh, sec.-treas.; Jas. Gearon, supt.**Cap.**, \$1,250,000; increased in 1915 to \$2,500,000; shares \$1 par; assessable; 3 assessments called to April, 1917.**Property:** 2 claims, patented, 40 acres, located 3,000' north of Mullan, shows lead-silver ore of good grade in a vein 50' wide on surface. It is claimed that the You Like vein of the Federal M. & S. Co. and the Hunter vein cross the claims. Property is developed to a depth of 1,200'

by several tunnels varying in length from 500' to 1,200'. In the experimental state.

AMY-MATCHLESS M. & M. CO.

IDAHO

Wallace, Idaho. Gus Smith, mgr. and principal owner.

Inc. Dec., 1913, in Arizona. Cap., \$1,250,000; shares \$1 par.

Property: several developed claims on Pine Creek, 3 miles from a railroad. At last accounts company was planning to build a 50-ton mill.

ANTIMONY-SILVER MINING CO.

IDAHO

Address: Wallace, Idaho. H. J. Rossi, Theo. Brown and John Finnel, directors.

Inc. April, 1915. Cap., \$100,000; shares 10c par. Claims, on Pine Creek, are said to show silver-antimony ore in a vein 10 to 36" wide, exposed by tunnels and a shallow shaft.

Presumably active.

ARGENTA MINING CO., LTD.

IDAHO

Address: Mullan, Idaho.

Officers: E. Lindsley, pres. and mgr., Missoula, Mont.; D. C. Smith, v. p.; C. D. Brock, sec.-treas., with A. L. Duncan and W. C. Richardson, directors.

Inc. Dec., 1906, in Idaho. Cap., \$1,092,000; shares \$1 par; assessable; all outstanding. Annual meeting, second Monday in January. Operating expenses for 1916, amounting to \$3,000, paid for by sale of stock.

Property: 5 claims, 3 patented, 75 acres, in Hunter district, Shoshone Co., claimed to show quartz fissure vein, 12' wide, carrying carbonate and oxide ore at surface and sulphide ore at depth; the surface ores consisting of iron oxide, quartz and barite, average 2% lead and 1 oz. silver. Development by 875' tunnel to depth of 400'.

Management was crosscutting for the vein, August, 1917.

AURORA-SAMPSON MINING CO.

IDAHO

Consolidated Jan. 14, 1916, with H. E. M. Mng. Co. to form the Western Union Mining Co., which see.

BASIN MNG. CO.

IDAHO

Wallace, Idaho.

Incorporators: John P. Gray, Therrett Towles and F. Pfirman. Control purchased May, 1916, by the Hercules Mining Co., which bought 700,000 shares of issued and 500,000 shares treasury stock.

Inc. July, 1915. Cap., 1,500,000 shares, par value 5c. This company is a reorganization of the old Basin Mng. Co., involved in litigation since 1907. Owns 5 patented claims in the Burke section, south of and adjoining the Hercules mine, between the Laclede on the west and the Stanley group. It is valuable to the Hercules Co. for tunnelling from the Hummingbird and Stanley into the Hercules mine.

BEAR CREEK MINING CO.

IDAHO

Address: Patrick Burke, pres., Wallace, Idaho.

Officers: P. Burke, pres.; R. E. Dunlap, v. p.; J. F. Morton, sec.-treas.; B. W. Jacobs, mgr.

Inc. Aug., 1916. Cap., \$250,000; shares 25c par. Annual meeting third Tuesday in August. Company bought the holdings of the Oro Fino Co. at receivers sale, June, 1916, and is a reorganization of that company.

Property: 11 claims, about 7 miles from Murray, in the Summit district, 3 miles from the railroad. Also has a 3-year lease on the Bear Top Mining Co.'s mill.

Development: about \$60,000 was spent by the Oro Fino Co. in driving two tunnels, some raises, etc. A new tunnel 400' lower is being driven, 1917. Company plans to install a flotation plant in its mill to treat the 4 years' ore supply claimed to be in sight.

BEAR TOP MINE

IDAHO

Formerly owned by Bear-Top Orofino Cons. Mng. Co., which owed \$162,000 and went into hands of receiver, in 1913. Under 5-year lease from 1917 to Henrietta Leasing Co., which see.

BELMONT-BANNER MINING CO.

IDAHO

Office: Hutton Bldg., Spokane, Wash. Mine at Delta, Shoshone Co., Idaho.

Officers: Conrad Wolfe, pres. and gen. mgr.; E. A. Wolfe, v. p.; I. E. Poole, sec.-treas.; above, with A. J. Davis and Gale Smith, directors.

Cap., \$1,000,000; shares \$1 par.

Property: 10 claims, one fractional, near Delta and about 12 miles from Wallace, shows a fissure vein of 3 to 4' surface width, in quartzite, carrying silver, lead and copper values. Mine has a tunnel over 500' long with a 60' winze sunk on the orebody.

BELMONT MINING CO., LTD.

IDAHO

Office: Wallace, Shoshone Co., Idaho. Mine in Two Mile gulch, Evolution district, 3 miles north of Osborn.

Inc. 1900. **Cap.**, \$100,000; shares 10c par, with 200,000 shares in treasury. Reorganized 1909, 1,000,000 shares at \$1 par, assessable; placing 500,000 shares in-treasury. Assessment levied Aug., 1916.

Officers: William Scheave, pres.; M. E. Hess, v. p.; Frank P. Hess, sec.-treas., with Ida Scheave, Christ Anderson, Dr. T. C. Witherspoon and Harold Scheave, directors.

Property: 13 claims, showing several contact veins in Burke and Revett quartzite. Ore is said to assay 2.5% lead, 2 oz. silver, 15% manganese with only a trace of copper.

Development: by tunnels and total work amounts to 2,600'. Continued development work is planned for 1917. Claims are in a silver-lead district and copper values incidental. Is a development proposition only.

BENTON MNG. CO.

IDAHO

Address: Burke, Shoshone Co., Idaho.

Officers: John Callahan, pres. and mgr.; F. P. Candee, sec.-treas.; E. G. Gnaedinger, cons. engr., with Fred Richardson and L. V. Tyler, directors.

Cap., \$1,250,000; shares \$1 par; issued 1,165,000 shares; assessable; 3 assessments totaling 10½ mills have been levied; last one, 3 mills, was 2 years ago. Listed on Spokane Exchange. \$1,000 in treasury in Oct., 1915. Annual meeting in April at Wallace.

Property: 6 claims on east side of Gorge Gulch, adjoining the Stanley and Moonlight, near Burke, supposed to have a continuation of the Stanley vein system.

Ore: silver-lead-copper-antimony, occurring in fissure veins, said to assay 60% lead, up to 12% copper and up to 65% antimony. Lead vein dipped out of winze at 60' depth and at 200' the McNeil fault was passed through. Crosscutting at this level exposed lead vein to the S. E., but main orebody is supposed to be deeper.

Development: adits, 200' winze from main adit level, with over 1,000' of drifting.

BEST CHANCE MINING CO., LTD.

IDAHO

Main office: 203 Paulsen Bldg., Spokane, Wash. **Mine office:** Wallace, Shoshone Co., Idaho.

Officers: Chas. H. Bell, pres.; W. A. Cox, v. p.; Chas. A. Gram, sec.-treas.; Elmer Harr, mgr. and purch. agt.; other directors, J. A. Scott and Chas. Harr.

Inc. March, 1909, in Idaho. **Cap.**, \$1,500,000; shares \$1 par; fully paid and assessable.

Lands: 12 claims, unpatented, in the Yreka mining district of the Coeur d'Alene, Idaho.

Fissure veins said to be 100' wide in Burke quartzite with 2,800' of underground work. Development work in progress in 1917. Is primarily a silver-lead property.

BIG CREEK LEASING CO.

IDAHO

Address: Kellogg, Idaho.

Officers: D. W. Price, pres. and gen. mgr.; R. R. Price, v. p.; A. O. Larson, sec.-treas.; Wm. Beaudry, mgr.; W. G. Thomes, supt.

Cap., \$50,000; shares \$10 par; all issued. An initial dividend of 50c per share paid, Sept., 1917, and a second dividend of 50c paid Oct., 1917. Annual meeting, July eighth.

Property: Company has a 7-year lease, to 1920, on the ground below the 500' level of the Yankee Boy Mng. Co. property (which see).

Ore was encountered in 1916 and 25 carloads shipped to the Tacoma smelter valued at \$48,000. Values are silver and copper.

See Big Creek Mng. Co.

BIG CREEK MINING CO.

IDAHO

Wallace, Idaho.

Officers: G. Scott Anderson, pres. and mgr.; W. W. Smith, sec.; above, with A. H. Featherstone and C. E. McCoy, directors.

Cap., \$1,250,000.

Property: near Kellogg, in the Coeur d'Alene district, Idaho, carries silver-copper ore (tetrahedrite). Shipments of 17 carloads in 1915-17 are said to have given a net return of \$44,010, with high silver values, 1-5% copper and 2-5% lead.

Crosscut being run 560' below leased ground was 2,000' long, September, 1917.

Property is equipped with compressor and electric power.

BLACK BEAR CONSOLIDATED MINING CO., LTD.

IDAHO

Officers: Peter Bernier, pres., Wallace, Idaho; L. L. Brainard, sec.; directors are Peter Bernier, Otto Grice, S. D. Lemieux, M. J. Sweeney and E. P. Howard.

Inc. in Idaho. **Cap.,** \$1,000,000; shares \$1 par; increased to \$1,250,000 and again increased, Jan., 1917, to \$2,000,000.

In March, 1917, stockholders voted to reorganize company as Black Bear Mines Co., exchanging stock share for share.

In Dec., 1915, the Rex Cons. Mng. Co. acquired control of the Black Bear Cons. by agreeing to take 250,000 shares of stock of that company, paying \$112,500 therefor in monthly payments extending over a period of 10 months. Option was allowed to lapse, due to a hitch in carrying out the plan called for by option; the \$10,000 initial payment was taken by Black Bear in exchange for treasury stock.

Property: 4 claims. 70 acres, patented, lying between the Frisco and Mace mines of the Federal Mng. & Sm. Co., near Wallace.

Development: No. 1 tunnel cut the main vein 250' from the portal and has a winze, 125' deep sunk in ore. No. 2, the main working tunnel, intersects the vein 2,530' from the portal and at a vertical depth of 1,180' below No. 1 tunnel. Workings on this level total 5,500' and are said to expose considerable ore. Vein said to be 5.7' wide, averaging 2.2 oz. silver, 7.7% lead and 16.5% zinc. Estimated ore reserves between tunnels No. 1 and No. 2 are 800,000 tons.

BLACK BEAR MINES CO.

IDAHO

Office: Wallace, Idaho.

Incorporators: H. J. Rossi, Afam Lieb, Dennis Goggin and Dr. L. E. Hanson.

Inc. in Idaho, March, 1917. **Cap.**, 2,000,000 shares, 20c par. Company formed to take over assets of Black Bear Cons. Mining Co., which see.

Company has lease on the Western Union Co.'s mill, which will be remodeled to treat their ore.

BLACK HAWK MINING & DEVELOPMENT CO., LTD. IDAHO

Controlled by Federal Mining & Smelting Co., which see.

BLAINE & EMMETT MINING CO., LTD. IDAHO

At Murray, Shoshone Co., Idaho. Is a silver-lead mine, copper being incidental and not recoverable. Described Vol. X.

BOULDER CREEK MNG. & MLG. CO., LTD. IDAHO

Idle. **Office:** 922 Old Nat'l Bank Bldg., Spokane, Wash.

Officers: Leo Greenough, pres. and mgr.; W. D. Greenough, v. p.; W. J. Beaton, sec.-treas.

Cap., \$1,500,000; shares \$1 par; assessable; 976,230 issued. Annual meeting, first Monday in December.

Property: 1 claim, 20 acres, about 2 miles S. of Mullan, developed by several tunnels, longest 1,200', said to show ore assaying 10-15% lead with gold-copper-silver values. Property considered promising.

BROWN LEASING CO. IDAHO

Office: Kellogg, Idaho.

Cap., \$25,000; shares \$1 par. Stock held by S. A. McCoy and J. A. McEachran, Spokane, Wash.; B. Swartz and T. Brown, Beeler, Idaho. Close corporation.

Inc. October, 1916, to do general leasing, mining, milling and smelting business.

BULLION MINING CO., LTD. IDAHO

Mine P. O.: Wallace, Idaho.

Officers: William Squance, pres.; R. A. Marshall, v. p.; Jas. H. Taylor, sec.-treas. and mgr., with Frank Taylor and J. M. Klingman, directors.

Inc. 1902, in Idaho. **Cap.**, \$1,500,000; shares \$1 par; all issued; 9 assessments, one-half cent a share, levied up to Nov. 1, 1912, yielding \$39,229.

Property: 16 claims, 2 patented, 320 acres, near Lookout, 2 miles from the Chicago, Milwaukee & St. Paul railway, and 4 miles from Borax station, on the Northern Pacific line, on the Idaho slope of the Bitter Root divide, with a good wagon road to Borax. Property has a quartz vein of 4 to 20' width, with average of 6 to 12', and nearly vertical dip, carrying shoots of copper ore, 2-4' wide, mainly chalcopyrite. Concentrates estimated to average 19.8% copper, 3 oz. silver, \$2.40 gold, 28.5% iron and 4% silica per ton.

Development: by shafts and 2 crosscut tunnels, one 200' vertically above the other. The upper one has 130' crosscut and 186' drift on vein. Lower tunnel cuts a 28' vein 350' from portal, with 4' of solid ore. Ore-body proved for 35' upward by raise and downward by shaft.

Equipment: includes steam power, a 12 h. p. hoist, Pelton wheel, and a 5-drill air compressor.

A trial shipment of 24 tons to the East Helena smelter, Sept., 1912, showed 56% copper and 1 oz. silver per ton. Concentration tests on 5.2% ore showed a 73% recovery. No production since 1912. Diamond drill work was done in 1913 and company plans driving lower tunnel to intercept ore at depth of 430'.

BUNKER HILL & SULLIVAN MNG. & CONCENTRATING CO.

IDAHO

Offices: 1022 Crocker Bldg., San Francisco, Calif., and Kellogg, Idaho.

Officers: Fred W. Bradley, pres., San Francisco; J. W. P. McFall, v. p.; Wm. H. Crocker, treas.; Geo. F. Holman, sec.; G. D. Abbott, asst. sec.; M. A. Folsom, executive head, Bunker Hill Smelter; Stanly A. Easton, mgr.

Inc. 1885, in Oregon. Cap., \$3,270,000, all issued; shares \$10 par. Not listed. Company is practically a close corporation. Transfer agent and registrar, asst. sec. of the company at San Francisco. Annual meeting, third Thursday in June.

General Balance Sheet (Year Ending, Dec. 31):

Assets—						
	Property & Plant	Supplies	Cash, Ore & Concts.	Dividend Reserve	Miscel.	Total
1916...	\$46,180,979	\$125,976	\$977,395	\$1,029,409	\$226,889	\$48,540,648
1915...	4,977,268	253,583	603,416	1,047,550	190,274	7,072,095

Liabilities—					
	Capital Stock	Surplus Account	Mine Revaluation	Miscel.	Total
1916.....	\$3,270,000	\$2,761,946	\$42,290,265	\$218,437	\$48,540,648
1915.....	3,270,000	3,691,165	.....	110,930	7,072,095

Income Account (Year Ending Dec. 31):

	Operating Revenue	Other Revenue	Operating Expense	Net Earnings	Dividends Paid	Balance
1916.....	\$6,223,162	\$579,355	\$4,437,477	\$2,437,550	\$1,716,750	\$929,219*
1915.....	4,217,927	584,106	2,957,361	1,819,888	1,062,750	662,692†

* Stands in books as deficit due to ore depletion charge of \$1,577,509.

† Surplus.

Re-valuation of mine increased the property account from \$4,977,268 in 1915, to \$46,180,979 or over 900%, which seems peculiar when ore reserves decreased from 3,573,000 tons in 1915 to 3,453,146 tons at end of 1916, and plant improvement (smelter) only cost about \$1,000,000. The temporary high price of lead (up to about 12c per lb.) could not have added this great value to the lead content of reserves. Some explanation would seem to be justified.

Net earnings available for dividends: \$2,437,550 in 1916; \$1,819,888 in 1915; \$1,017,829 in 1914; \$1,285,751 in 1913. Cash surplus on March 1, 1917, was \$1,700,000 of which \$1,000,000 was in a contingent reserve and the remainder set aside to finance the construction of the new smelter, now in operation.

Recent dividends: in 1910, \$3.15; in 1911, \$2.65; in 1912, \$2.30; in 1913, \$2.50; in 1914, \$3; in 1915, \$3.25; in 1916, \$5.25 per share; in 1917 to July 1, \$3.25; total dividends paid to July 1, \$19,552,500. As a result of apex litigation with the Caledonia Mng. Co., the B. H. & S. Co. controls that company, owning 1,305,000 shares out of 2,605,000 issued. See Caledonia Mng. Co. The Sierra Nevada is also a subsidiary of the B. H. & S. Co. The

Property: about 5,000 acres, patented, at Kellogg.

Geology: the larger part of the ore is principally a replacement of the Revett quartzite, in which the replacement is closely connected with fissuring. The principal ore minerals are galena with some pyrite and zinc blende, and in places a little argentite rich in silver. The orebodies are definitely related to a persistent fissure, strike N. 45° W., dip 38° S. W., locally known as the "foot wall fissure." The zone of fissured quartzite in which the orebodies occur has a maximum width of 300'; ore is found in the hanging-wall of the fissure. The orebodies are very irregular in form and may be several hundred feet in length and depth with width in places as much as 40'. For geology of this district see U. S. G. S. Prof. Paper 62, Geology and Ore Deposits of the Coeur d'Alene district.

Development: tunnels and shafts. The Kellogg tunnel, 8x9', in section, and about 2 miles long, is the main working level. It is equipped with electric haulage. Above the tunnel the orebodies have been explored to surface. Below the tunnel at 200' intervals are 5 working levels, Nos. 10, 11, 12, 13 and 14. Development work in 1916 totaled 3,944', costing \$9.87 per ft., as compared with 4,783', costing \$7.32 per ft. in 1915, and 2,754', costing \$10.77 per ft. in 1914.

Ore reserves: Jan. 1, 1917, were 3,453,146 tons. Milling ore averages 9 to 12% lead and 8.7 to 4.5 oz. silver per ton. Shipping ore runs from 15% to 78% lead and 17 oz. silver per ton.

Equipment: includes 3 concentrators, power plant, water power, machine shops, saw mill, etc. Replacement value of surface equipment is placed at \$800,000. Mill extraction is about 80% for lead and 70% for silver.

The company has a 25-year contract, dated March 20, 1905, to sell portions of its ore, assaying between 30 and 70% lead to the A. S. & R. Co., but friction between the two companies had been constant and in 1917, the B. H. & S. Co. built its own smelter at Kellogg. Initial daily capacity, 1,000 tons. Power obtained from the Washington Water Power Co. of Spokane. Equipment includes Dwight-Lloyd sintering machines and Wedge turret roasters, 3 blast furnaces, bag houses, and an electrolytic refinery to desilver the lead bullion.

Production:

	Ore Mined, Tons	Cost per Ton	Concts. Tons	Lead, Lbs.	Silver, Oz.
1916.....	475,784	\$2.36	76,284	77,298,879	1,406,260
1915.....	452,142	1.99	59,901	74,584,741	1,298,284
1914.....	440,819	1.98	56,163	70,663,236	1,161,324
1913.....	436,060	2.25	59,471	71,860,773	1,227,076

Cost of producing lead is between 3 and 4c per lb. Company issues a report containing considerable detailed costs, but little on underground conditions.

Company's right to smelt its own ores will be contested in the courts. The first step toward this end will be taken when argument upon the application for an injunction restraining the company from smelting its ores and to compel compliance with the 25-year contract with the American Smelting & Refining Co. was started in the Federal court in Portland on Oct. 18. The complaint filed by the A. S. & R. Co. is a voluminous document and gives much interesting information regarding the relations of the two companies and the great value of the Bunker Hill product in the profitable operation of plaintiff's smelting plants. The story begins in 1905, when the Bunker Hill contracted its ores running from 30 to 75% lead to the smelting company, it being optional with the smelter to take the product below 30% or above 75%. The contract was entered into following the purchase of the Tacoma smeltery from the Bunker Hill company, and it is alleged in the complaint that plaintiff would not have purchased the Tacoma plant had it not felt secure in obtaining the Bunker Hill ores during the 25 years covered by the contract. The contract provided for revision every five years, and at these periods the Bunker Hill company would be entitled to the same freight and treatment rate at which the majority of the ores of the Coeur d'Alene district was being shipped. In 1910, the end of the first five years, the Bunker Hill was given a concession which amounted to about 85c per ton, but the real clash occurred in 1915.

"On May 31, 1915, the Hercules contract with the A. S. & R. Co. expired and the smelting company refused to renew it on the same terms. It had been entered into three years before and presumably has some connection with the elevation of Harry L. Day to the presidency and management of the Federal Mining and Smelting Co. It was the most favorable A. S. & R. contract in the district, providing for a freight and treatment rate of \$14 per ton, said to be \$2 lower than the Bunker Hill. The refusal to renew the Hercules contract was soon followed by the retirement of Mr. Day from the head of the Federal and the negotiations by the Hercules people for the Northport smeltery. The day following the expiration of the Hercules contract, June 1, was the date for revision of the Bunker Hill contract. With the Hercules out of it, the majority of the ores shipped from the district were represented by the Federal, owned by the smelting company, and shipping under a lower contract than that of the Bunker Hill. Under the circumstances the demand of the Bunker Hill for a revision of the terms of its contract was refused.

"The following October the Bunker Hill & Sullivan company made definite announcement that it would build a smeltery for the treatment of its ores and those of other mines of the district. The smeltery was completed in July, 1917, but up to Sept., only one furnace has been blown in on account of inability to get coke. It is said that no ore from the Bunker Hill mine has yet been treated and that shipments are going forward as usual under the contract with the A. S. & R. Co. The Bunker Hill smeltery is under contract to treat Hecla ore, which with other smaller producers requires all present capacity.

CALEDONIA DEVELOPMENT CO.

IDAHO

Office: Wallace, Idaho. Chas. McKinnis, mgr., associated with others in the Caledonia Mining Co., which see.

Company formed to examine and acquire a new mine for the Caledonia Mining Co.

Cap., 1,500,000 shares, \$1 par; 500,000 in treasury.

In December, 1916, an option was acquired on the stock of the Jemison Mines Co., Mohave Co., Ariz., after examining its mine and its operations for several months. Stockholders in the Caledonia Mining Co. had the privilege to Apr. 30, 1917, of subscribing to 200,000 shares of treasury stock at 20c a share.

CALEDONIA MINING CO.

IDAHO

See Caledonia Dev. Co.

Office: Wallace, Idaho. **Mine office:** Wardner, Shoshone Co., Idaho.

Officers: S. A. Easton, pres.; C. F. Kratzer, v. p.; Chas. McKinnis, sec.-treas. and mgr.

Inc. July 9, 1907, in Idaho. **Cap.,** \$2,605,000; shares \$1 par; assessable; all issued.

Dividends: at rate of 3c a month, 1917; total \$2,753,150 to Nov., 1917, or 99c a share. Surplus, August 31, 1917, was \$719,183. Listed on San Francisco and Butte Exchanges.

Property: 5 unpatented claims, about 50 acres; adjoining property of the Bunker Hill & Sullivan M. & C. Co., at Kellogg, Idaho, shows a strong fissure vein with an oreshoot 1,000' long, that is in places 50' wide and carries cupriferous silver-lead ores, averaging 15 to 40 oz. silver, with a little native copper.

Development: by a 500' shaft and 2 tunnels, lower tunnel, 4,000' in length, giving a back of about 1,300'. The 1,000' level showed 7' of shipping ore, though broken faulted ground was encountered. Feb., 1916, reports show a drift being run from Keating level, 75' below the 1,000' level to pick up orebody.

The mine was idle from 1912 to July, 1914, on account of litigation with the Bunker Hill & Sullivan M. & C. Co. over apex rights. A compromise was effected whereby the capital stock of the Caledonia company was increased from \$1,500,000 to \$2,605,000, the B. H. & S. Co. taking 550,000 shares. The company is virtually a subsidiary of the Bunker Hill company. 150,000 tons of ore reported blocked out, Dec., 1915. Major portion of ore is being taken from between the 500' and 700' levels. Production is at the rate of 1,200 tons monthly, crude ore and concentrates in about equal proportions. Ore is treated at the mill of the B. H. & S. Co. plant.

Equipment: includes an electric hoist, air-compressor and electric pumps. Company employs about 35 men when active.

Costs per ton for 1916: mining \$2.61 on 46,177 tons mined; milling \$0.59 on 38,929 tons concentrates produced; shipping \$0.22 on 18,117 tons shipped. Net bullion value, \$1,302,113. Profits for 8 months ending Oct., 1917, \$905,000.

Production:	Copper, Lbs.	Lead, Lbs.	Silver, Oz.	Net Profits
1914(a).....	245,610	6,599,720	537,854	\$761,797
1915.....	659,660	11,142,580	1,212,730	760,324
1916.....	741,225	10,412,640	1,297,193	1,154,762
1917*.....	331,743	5,081,140	575,575	661,779

(a) For seven months after operations were resumed.

Ore reserves: estimated by company as sufficient for about a year's production.

* 1st half, 1917.

Management reported May 1, 1917, to stockholders that development work has failed to disclose new ore and that the downward extension of orebody has been faulted and cannot be located.

Company has acquired stock control in the Jemison Mines Co., which see.

CARBONATE CENTER MINING CO.

IDAHO

Mine office: Mullan, Shoshone Co., Idaho.

Officers: Archie Gillis, pres.; John H. Foss, v. p.; John E. Sherrard, sec.-treas.; preceding officers, John Erickson and Hans J. Rice, directors.

Inc. 1912, as successor of Tombstone Mining Co. **Cap.**, \$1,500,000; shares \$1 par; assessable. Last assessment of 1 mill per share called Nov. 5, 1914.

Property: 8 claims, near the Carney mine, on Stevens peak, south of Mullan, shows a promising vein of 8 to 15' surface width, carrying a little silver-lead ore. The mine has a 500' crosscut tunnel, with about 1,000' of workings, showing ore that has given assays up to 15% copper and 2.5 oz. silver per ton. Idle, but plans to resume operations.

CARBONATE HILL MINING CO.

IDAHO

Mullan, Idaho.

Cap., \$1,500,000; shares \$1 par; issued \$1,470,000. Listed in Spokane, Wash. Bonds on stock at 40c per share said to have been given to H. L. Martin, auditor Spokane and Int. R. R. Co. of Spokane; first payment of 5c per share being due Nov. 1, 1916, with equal payments thereafter until whole amount has been paid.

Property: 10 patented, 2 unpatented claims, 200 acres, 1½ miles S. E. of Mullan.

Development: by adit with 3,500' of workings. Orebody said to have been cut at 900' and drifted on for 200'. Development is said to indicate an ore zone 125' wide in which a footwall orebody shows 24' lead-zinc ore with zinc predominating, in the center 8' of ore, and on the hanging-wall or south side, 27' of milling ore.

CARNEY COPPER CO., LTD.

IDAHO

Mullan, Shoshone Co., Idaho.

Officers: J. L. Martin, pres.; A. P. McRae, v. p.; C. D. Miller, sec-treas.; preceding officers, W. C. Richardson and C. D. Martin, directors.
Inc. 1906, in Idaho. **Cap.**, \$1,500,000; shares \$1 par.

Lands: 11 claims, 4 fractional, 175 acres, carrying a good water right, is next north of the Reindeer, on the northern slope of Stevens peak, about 4 miles from Mullan.

Development: by 3 tunnels, the uppermost showing a body of chalcopryrite ore that has not been found in the lower tunnel. The upper, or No. 1 tunnel, is 450' long, with 3 crosscuts, and No. 2 tunnel, 1,500', with 1,300' of crosscuts and drifts, No. 3 tunnel is in 350', and will be driven about 300' to the ledge where commercial ore is expected. There also are several open cuts and pits, showing ore of about 3% copper tenor. Workings show up to 4' of solid ore, carrying chalcopryrite, with some chalcocite and bornite. No. 1 tunnel shows an ore shoot up to 40' width, and about 175' long, averaging about 2% copper, with small values in lead and silver, with a paystreak of 6 to 18" assaying 5 to 35% copper. Company has leased upper levels and ore is being stoped and shipped.

CHAMPION COPPER MINING CO.

IDAHO

Probably defunct. See Vol. XII. Property at Mullan, Idaho.

CHICAGO-BOSTON MINING CO.

IDAHO

Wallace, Idaho. Reported under bond and lease to E. R. Day.

Cap., \$1,500,000; shares \$1 par. Dr. L. E. Hanson said to own 1,000,000 shares recently acquired at 10c.

Owns 7½ claims on Lake Creek, 2 miles S. W. of Wallace, said to show two ore-bearing veins, one, the Tin Cup, having high-grade gray copper ore, from which shipments have been made. The second vein, the Kill Buck, is said to have 8 to 12' of milling ore, opened by No. 6 tunnel. Developed by 6 tunnels, lowest 1,200' long. Power is furnished by the company's water-power plant.

CLARINDA COPPER MINING CO.

IDAHO

Temporary officers: Judge John E. White, pres. and treas., Clarke Fork, Idaho; John P. Delaney, v. p. and sec., with Jas. E. White, Russell Grest and Thos. Compton, directors.

Inc. April 1, 1916, in Arizona. **Cap.**, \$1,500,000; shares \$1 par. U. S. Corporation Co., New York, registrar and transfer agents.

Property: 2 claims, 40 acres, in Coeur d'Alene district, 3 miles from Clarke Fork, Bonner Co., Idaho, show gold-silver-copper-iron ore in vein, said to be 6' wide at slight depth. Developed by 2 short tunnels and a main working tunnel, 124' long, May, 1917. A prospect.

COEUR d'ALENE ANTIMONY MINING CO.

IDAHO

Kellogg, Idaho.

Officers: M. E. Jolley, pres., Coulee City, Wash.; H. J. Hibschan, v. p., 1014 Paulsen Bldg., Spokane; C. M. Powell, sec-treas., Kellogg, Idaho.

Cap., 1,500,000 shares; 10c par; 731,016 issued.

Company in Sept., 1915, reopened antimony mine on Pine Creek, west of Kellogg, that had been idle for 10 years.

Development: by 150' shaft and tunnels, said to show two shoots of ore, the largest being 240' long and 4' wide. The high-grade ore is said to assay 35% antimony.

Development work being done, 1917.

Has 100-ton mill in operation, and is shipping both crude ore and concentrate, Aug., 1917. Will install flotation unit.

COEUR d'ALENE CRESCENT MNG. CO.

IDAHO

Officers: F. W. Mauser, sec.-treas., Spokane, Wash.; L. W. Bonney, pres., Seattle; J. B. Millspaugh, S. B. Osburn and F. R. Crocker, directors.
Cap., \$1,250,000; shares \$1 par; assessable.

Property: 6 unpatented claims and millsite, one mile N. W. of Osborne, Idaho. No development since Jan. 1, 1917.

COEUR d'ALENE DEVELOPMENT CO.

IDAHO

Controlled by Stewart Mining Co. and described thereunder.

COEUR d'ALENE EMPIRE M. & M. CO.

IDAHO

Inc. 1917, in Wash. to take over property of Coeur d'Alene M. & M. Co.

Directors: H. W. Greenberg, T. H. Holland, F. D. Garrett, Frank Johnson and A. Herman, all of Spokane.

COLONIAL MINING & MILLING CO.

IDAHO

Watson Beebe, sec., Wallace, Idaho.

Inc. in 1915 by Beebe Bros. of Wallace with the ostensible purpose of operating the Little Pittsburg mine on Pine Creek which was under bond to them.

Cap., \$1,000,000; shares 25c. It is said that half of this was appropriated by the promoters; the other half placed in the treasury and later 200,000 shares issued. Work was started with the accompaniment of a line of lurid advertising. A payment on the bond became due about March 3 and was not met; in addition to this the company in March, 1916, owed \$23,000, including \$5,000 back payrolls. There seems to be no hope that stockholders will recover anything. The company was a fake which fortunately died an early death.

COLUMBIA COPPER MINING CO.

IDAHO

Address: care Sharp & Irvine, Paulsen Bldg., Spokane, Wash.

Directors: B. E. Sharp, pres.; Jos. Huber, v. p.; Jos. Andrews, sec., and A. G. Kerns.

Inc. May, 1914, at Wallace, Idaho. **Cap.**, \$2,500,000; shares \$1 par.

Property: a consolidation of the properties owned by the Aeolian Cons. Copper Co., the Marguerite Mng. Co. and the California Group, all near Mullan, Shoshone Co., Idaho, and all long idle.

COMET GOLD & COPPER MINING CO., LTD.

IDAHO

Office: care Jos. F. Whelan, sec., 408 Sixth St., Wallace, Idaho. Mine near Mullan, Shoshone Co., Idaho. Archibald McCullom, pres. and gen. mgr.; A. L. Honeker, treas.

Cap., \$100,000; shares 10c par; assessable; ½ mill per share levied 1913 and 1914.

Property: 4 claims, adjoining the Springfield, east of Mullan, on Stevens peak, and near 2 railroads, shows 2 veins, of 10' and 15' estimated width, about 150' apart, carrying chalcopryrite and bornite, with iron and quartz gangue.

Development: by tunnel, cutting a hematite vein, with about 1,600' of workings. Property worked in a small way, with proceeds of assessments levied, but no orebodies of commercial value have thus far been developed.

COMSTOCK COPPER MINING CO., LTD.

IDAHO

Mine near Burke, Shoshone Co., Idaho.

Officers: E. S. Amsden, sec., Wallace, Idaho; Otto A. Olsson, treas.; John H. Nordquist, mgr., with C. W. Anderson and A. Swan, directors.

Inc. in Idaho. **Cap.**, \$1,500,000; shares \$1 par.

Lands: on Baldy mountain, east of Burke are developed by 800' tunnel and 700' of drifting on the vein. Is developing on a small scale, raising money by assessments of 1 mill per share.

CONSOLIDATED INTERSTATE-CALLAHAN MINING CO. IDAHO

Offices: 61 Broadway, New York. **Mine office:** Wallace, Idaho.

Officers: John A. Percival, pres.; M. G. Rodarmel, 1st v. p.; Milie Bunnell, 2nd v. p. and treas.; above, with J. B. Cotton, A. L. Riley, A. L. Warner, S. S. Titus, Otto Sussman, Jas. F. Callahan, P. H. Nelson, Frank Boutin and Louis Hanitch, directors; C. W. Newton, supt.; D. F. Haley, cons. engr.; Julian B. Beaty, sec.

Inc. June 12, 1912, in Arizona as a consolidation of the Interstate Silver-Lead Mining Co. and the Callahan Mining Co. **Cap.**, \$5,000,000; shares \$10 par; non-assessable; 464,990 shares outstanding June 1, 1916. Listed on N. Y. Exchange. Title Guarantee & Trust Co., New York, transfer agent; Registrar & Transfer Co., New York, registrar.

Financial statement: shows June 30,

Current Assets—

	Cash	Ore Account	Other	Total	Current Liabilities	Surplus
1916.....	\$143,573	\$596,289	\$101,709	\$841,571	\$34,860	\$806,711
1915.....	316,588	784,190	50,864	1,151,642	56,780	1,094,862

Comparative operating statement: year ending June 30,

	Income (a)	Op. Gen. Expn's	Year's Profit	Surp. from Last Year	Prop. Invest.	Divid's	Surplus
1916..	\$4,013,172	\$912,681	\$3,100,491	\$1,142,967	\$181,818	\$3,254,930	\$806,711
1915..	2,161,177	569,404	1,591,773	(b)200,686	.....	697,597	1,094,862

(a) All from ore and concentrates except \$27,076 for 1916 and \$14,894 for 1915.

(b) Operating deficit \$99,314; proceeds of bonds sold \$300,000.

Company's financial year has been altered to coincide with the calendar year, so no complete statement is available. During 12 months ended June 30, 1917, the net value of crude ore and concentrate shipments was \$3,007,861. Profit, less \$130,000 deducted for improvements, was \$1,836,471. With the surplus from 1915-16 there was available \$2,743,182, of which, \$2,324,950 was paid in dividends.

Initial dividend of \$116,860 was paid April 1, 1915; total for year was \$697,597.50. Dividends for calendar year 1915 amounted to \$5.50 per share, and for 1916, \$6 per share. Up to June 30, 1917, the total paid was \$13.50 per share, or \$6,277,365. So far company has paid over 40% per annum on par value of its \$10 par stock. The dividend for third quarter of 1917 was passed, as company wishes to have a large reserve with which to meet new taxes, etc.

Company is a consolidation of two prospects, called the Interstate and Callahan groups, the first named developed and the Interstate vein found while Walter Harvey Weed was consulting engineer, on whose advice the present consolidation was effected at a time when this part of the Coeur d'Alene district was regarded by many mining men as worse than unpromising. The mine has developed into one of the principal zinc-lead producers in the U. S.; in fact, the third largest, and one of the world's greatest.

Property: 79 claims, 1,004.84 acres, 601 patented; also the Nipsic group, 7 claims, the Blue Grouse (two combined have 225 acres); and a controlling interest in the Silver State Mining Co., adjoining the Interstate, all in the Coeur d'Alene district, Wallace, Shoshone Co.

Geology: the two fissure veins thus far worked in the property are the Interstate and the Callahan. The veins cut through Prichard slates, which

are intruded by a monzonite porphyry dike and by small diabase dikes. The Interstate vein varies from 3-20' in width, the Callahan from an inch to 8'. For geology of the district see U. S. G. S. P. P. 62, and 17th Annual report of the mining industry of Idaho, 1915, by Robt. N. Bell.

Development: totals 30,000'. The principal working level is tunnel No. 4, about 1,200' below the mountain top, where an oreshoot 1,200' long has been encountered, running from 1-54' in width. This ore extends from the uppermost tunnel down, with equally good values on the lowest level. The present shaft has been sunk 700', and Nos. 5, 6 and 7 levels have been opened at a point 223', 457' and 675', respectively, below No. 4 level. New work for year ending June 30, 1916, was 6,463', mainly crosscuts and drifts.

The 3-compartment shaft was sunk to No. 8 level by Oct., 1917, and a crosscut is being run from this level to cut the Interstate vein. Shaft will be sunk 225' more.

A factor aiding deep development (to 3,000', or 1,500' below No. 7 level) is the construction of the O. W. R. & N. Ry. branch from Mullan, up to Beaver creek. Ore for the proposed new mill at Enaville will be carried over this line.

Ore reserves: 350,000 tons, averaging 25% zinc. Development has not yet found lower limits of orebody, nor of ore shoots on Nipsic, Blue Grouse or Amazon-Manhattan veins, for which the outlook is decidedly promising.

Equipment: is modern and installed with a view to future big development. Buildings include saw-mill, bunk and rooming houses for 300 men. The concentrating mill, which treated at the rate of 11,100 tons of ore per month during 1917, was completely remodeled and equipped with 16" main feed elevator, screens, jigs, Traylor rolls, Akins de-slimmer, settling classifiers, two 3" pumps, concentrate bins, two 12' Dorr tanks, 30' Dorr settling tank, spitzkasten, tables, motors, Callow tank, Oliver filter press, tube mill and flotation unit. Shipments are at the rate of 4,700 tons of concentrates per month, and the recovery averaged 76% in Apr.-June, 1917. Ore is conveyed from the mill over an aerial tramway to Sunset, on the N. P. R. R. A new mill, which will double the present output of the property, is to be erected at Enaville at some future time.

Company owns the **Nipsic group**, bought 1916, the Nipsic Co. being dissolved, Aug., 1916. The showing of this mine in 1917 was reported as very satisfactory.

This tract of 7 claims, 6 patented, is located about a mile north of the portal of Interstate No. 4 tunnel, the main working level of the mine. The group lies between the Idora and Interstate-Callahan groups on the Beaver creek side of the Nine Mile divide.

The claims are crossed by two fissure veins in quartzite and slate, that average 3' in width and carry bands and shoots of lead and zinc ore, the lead ore carrying 4 oz. silver per ton to each 10% lead. The mine has been intermittently prospected since 1892, but no important orebody discovered. There are several tunnels, longest 1,200', with a total of 2,140' of workings.

The group is intrinsically valuable, but has an additional value to the Interstate Callahan, as it permits much deeper tunnel work than any now existing and gives an outlet on the Beaver county side of the mountain, with easy access to the North Fork.

Production: for year ending June 30, 1917, amounted to 160,401 tons, from which there was produced 70,720 tons of crude ore and concentrates. Costs for third quarter, 1917, were: mining, \$5.178; milling, \$1.334; a total of \$6.512 per ton.

Flotation was decided upon as the best system for treating this zinc-

lead-silver ore, so a contract has been made with the Minerals Separation Co. for the use of its patents. The plant has been installed and a 90% recovery or over is assured. Concentrate will contain 50% zinc, against 44.8% as at present. With additions to the plant (finished in Sept., 1917), the mill capacity is greater by 1,000 tons per month.

Management is able and progressive. With spelter at 8c and silver at \$1, Interstate-Callahan should continue to make big profits on an average monthly output of 5,000,000 lbs. spelter, 550,000 lbs. lead, and 20,000 oz. silver.

CONSTITUTION MINING & MILLING CO.

IDAHO

Address: Judge Geo. Turner, pres., 525 Seventh St., Spokane, Wash.; Frank H. Graves, v. p.; B. H. Kizer, sec.-treas.; Frank T. Post, Richard W. Nuzum and Thos. Thwaite, directors; Joseph Trainor, supt.

Cap., \$1,500,000; increased Jan., 1916, from \$1,000,000; shares \$1 par; assessable; all issued.

Property: 350 acres patented, on east fork of Pine Creek, 9 miles from Pine Creek siding on O. W. R. & N. R. R., Coeur d'Alene district, shows zinc-lead ore in veins 4' to 8' wide.

Development: by adits, one at vertical depth of 150' and the other at 400'. At 1,500' south of the latter a 550' crosscut tunnel cuts the vein 150' below tunnel No. 2. This orebody is said to be several hundred feet long. A shaft, sunk at the portal of tunnel No. 2, is 200' deep and from the bottom a 700' drift is said to have been run on ore.

Has complete equipment including hoist, compressor, motors, etc., using electric power.

Production: 100-ton mill reported in operation in April, 1917, treating a feed of 4½% lead, 10% zinc and 3 oz. silver per ton. It is run by electric power. Previous to construction of mill, shipments of 200 tons of hand sorted ore are reported to have averaged 11.6% lead, 26% zinc and 8 oz. silver. Crude ore and concentrate shipped to Anaconda Copper Co.'s zinc plant is netting \$20 to \$27 per ton. Output in 1917, 25 to 35 tons crude and 15 tons concentrate daily.

COPPER KING MINING & SMELTING CO.

IDAHO

Mullan, Shoshone Co., Idaho.

Officers: D. K. McDonald, pres.; Dave Holzman, v. p.; Hon. Harry W. Ingalls, sec.-treas. and gen. mgr., with S. Edelstein, B. Mabry, H. Schroeder and R. C. Vanderford, directors.

Inc. Oct., 1901, in Idaho. Cap., \$1,500,000; shares \$1 par; issued, 1,494,588 shares; assessable; assessment No. 15 of 10 mills per share, called July, 1917. Annual meeting, first Wednesday in Sept.

Financial statement for 14 months, ending July 20, 1917, showed an indebtedness of \$4,918.

Property: 18 claims, surveyed for patent, on the west fork of Deadman's creek in the Snowstorm copper belt, has 2 narrow fissure veins carrying galena and zinc ore.

Development: by 2 tunnels on the Copper King vein, on the Burke side of the mountain and No. 3, the lower tunnel, on the west fork of Deadman gulch, at depth of 1,700' on the dip of the vein. No. 2 tunnel is 2,000' and No. 3 about 5,000' long. Assays of the new strike in the crosscut tunnel were given by B. N. Sharp as 2.35 oz. silver and 14.3% lead on a 3' vein and 4.85 oz. silver and 24.7% lead on one foot in the center. J. V. Richards secured assays, over a 5' width, of 0.40% zinc, 1.40% lead and 0.48 oz. silver. Diamond drill exploratory work is in progress, 2,000' having been drilled to July, 1917.

Equipment: includes 12" and 24" Pelton wheels, taking water under a

500' head, with a 4-drill Franklin air compressor and a small electric light plant. Buildings include an engine house, boarding house, bunk house and-barn. About 10 men employed.

From reports of June, 1917, company is in the hands of stock manipulators.

COPPER PRINCE CONSOLIDATED M. & M. CO. IDAHO

Office: Coeur d'Alene, Idaho. Mine office: Herrick, Shoshone Co., Idaho.

Officers: Samuel R. Hite, v. p.; W. H. Batting, W. M. Ramsey, W. W. Parshall, John S. Craig, E. E. Dillinger and Boyd Hamilton, directors; Frank Drummond, supt.

Inc. July 30, 1910, in Idaho. Cap., \$4,000,000; shares \$1 par; non-assessable; cap. reduced, Sept., 1915, to \$400,000. Annual meeting, first Monday in September.

Property: 37 claims, unpatented, 740 acres, in 2 groups on the north bank of the St. Joe river, 6 miles and 20 miles, respectively, above the head of navigation. Property includes water rights. The Copper Prince group, formerly known as the Black Prince, has 13 claims, and the Idaho-Virginia, or Gold Ridge group, of about 24 claims, is about 6 miles east of the Copper Prince, and 3 miles from the C. M. & St. P. railway.

The Copper Prince group shows contact orebodies, between granite and Revett quartzite, of 20 to 30' estimated average width, carrying chalcopyrite, bornite and gray copper, giving assays of 3 to 41% copper, and 8 to 13 oz. silver per ton. Developed: by 500' of drift tunnels, driven from the sides of 2 canyons. The orebody has been traced by trenches and cross-cut tunnels, on each claim, for the entire length of property, a distance of 7,800'.

The Idaho-Virginia group is reported to have a 15 to 20' contact deposit, between granite and slate, carrying galena giving assays of 8 to 40% lead, and 14 to 46 oz. silver. Developed: by 2 shafts of 50' and 250' depth, and 3 crosscuts, intercepting a vein said to show galena ore of good quality. Buildings include a smithy, boarding house and a stable.

Company plans utilizing water power from Prince Creek, by 6 miles of 3' ditch and 1 mile of 3' flume.

Equipment: includes 4 boilers, 2 hoists, 2 six-drill air compressors, and a saw mill. Property has been under development for 6 years. Former president, S. B. Holbert, brought suit in 1916 against company to recover \$27,970 for services rendered and money advanced.

COPPER QUEEN MINING & MILLING CO., LTD. IDAHO

See Reindeer Queen Mining Co.

CROWN POINT LEASING CO. IDAHO

Inc. April, 1915, in Idaho. Cap., \$25,000; shares 50c par; 24,999 shares retained in treasury. Arthur Cooper, F. L. Rowley and C. R. Teel, of Kellogg, Idaho, incorporators.

Company has a long-time lease on the Crown Point mine in Government gulch, near Kellogg, Shoshone Co., Idaho.

Ore: occurs in veins and is said to run 40 oz. silver and 48% lead. Developed by tunnels and shaft.

Production: 2 cars monthly at last accounts. Mine is an old-time producer. Company plans further development and erection of mill.

CUSTER CONSOLIDATED MINING CO. IDAHO

Wallace, Shoshone Co., Idaho.

Inc. July, 1910, in Nevada. Cap., \$1,000,000; shares \$1 par.

Property: near the Tamarack & Chesapeake mine, was acquired by stock control by the Day Bros. Property a good one.

DENVER COPPER CO.**IDAHO****Address:** H. M. Ross, Spokane, incorporator.**Property:** 200 acres, in Pine Creek district, Idaho, on which the Admiral vein is said to be exposed by surface workings for 3,000'. A 15' shaft opened 8 to 10" of 6% ore. Deeper work is underway.**DOUGLAS MNG. CO.****IDAHO****A. Wyman, sec.,** Wallace, Idaho.**Cap.,** \$1,500,000; shares \$1 par; \$1,200,000 issued. Two dividends of 1c each paid in 1917.**Property:** the Douglas mine on Pine Creek, under option to the Anaconda Copper Mng. Co., for \$256,000. The operating company pays a royalty of \$3 per ton on all ore shipped; shipments amount to about 50 tons crude ore daily.**DREADNAUGHT MINING CO.****IDAHO****Address:** W. J. J. Smith, Wallace, Idaho.**Property:** near the New York and Manhattan claims of the Interstate-Callahan, Coeur d'Alene district, Idaho.**Development:** by tunnels. At depth of 730' No. 1 shoot is 42" wide and said to contain 10 oz. silver, 12% lead and 4% zinc. About 200' farther in a larger orebody is expected. All ore carries a little copper and gold. Shipments are contemplated at an early date.**DULUTH-MINNEAPOLIS MINING CO.****IDAHO****Address:** O. B. Wallace, mgr., Wallace, Idaho.**Officers:** G. W. McClelland, pres.; R. M. White, v. p.; P. M. Olson, sec.; J. J. Ecklund, treas., with M. G. Rodearmel and J. S. Graves, directors.**Property:** on Grouse gulch, Coeur d'Alene district, Idaho. Crosscuts said to have opened from 12 to 20' of lead-zinc ore, and conditions are reported as favorable.**EAGAN COPPER MINING CO.****IDAHO****Address:** Adair, Idaho.**Officers:** Roy A. Henkle, pres.; J. T. Dickinson, v. p.; L. L. Brainard, sec.-treas.; above, with Tom Eagan, F. E. Rice and F. C. Blakely, directors. Inc. 1916 in Idaho. **Cap.,** 1,250,000 shares; 10c par.**Property:** 2 miles from Adair, Idaho; has been under development by Tom Eagan since 1892. Claims reported to show copper ore in the upper tunnel, and for 200' in lower tunnel.

Present management plans to continue lower tunnel, 1917.

EAST CALEDONIA MINES CO.**IDAHO****W. A. Barter, sec.,** First National Bank Bldg., Kellogg, Idaho.**Officers:** Herman J. Rossi, pres., Wallace; W. H. Nichols, v. p., Butte; W. A. Barter, sec.-treas., with W. I. Hall, Kellogg; and Frank Pferman, Wallace, directors; Rush J. White, mgr.**Inc. March, 1915, in Idaho. Cap.,** \$1,000,000; assessment of 1c a share levied Aug., 1917.**Property:** 130 acres, including the Keating mine at Wardner, Shoshone Co., Idaho.**Ore:** silver-lead in 4 known veins, from 9-26' wide. Assays said to run from 1½% to 36% lead, with good silver values. Company claims to own or control 2,300' of the Silver-King-Caledonia vein system for a length of 4,500'.**Development:** several tunnels and the Keating 416' vertical shaft, to be sunk to 600'. The mine had been worked intermittently for several years before present company acquired control. Recent development is said to have opened up a 2' vein of lead-silver milling ore on the 400' level.

Equipment: hoisting plant, 60 h. p. engine, air compressor, pump, cable, shaft house and blacksmith shop. Plans development at depth after de-watering old workings.

EAST HERCULES EXTENSION MINING CO.

IDAHO

Office: 337 Rookery, Spokane, Wash.

Officers: J. B. Millspaugh, pres.; C. S. Crawford, v. p.; W. H. Macfarlan, sec.-treas.; W. H. Reeves, mgr., Cheney, Wash.

Inc. in Idaho. Cap., \$1,500,000; \$1 par.

Property: 8 claims, unpatented, 176 acres, 4 miles east of Burke, Idaho, and about 2½ miles from the Hercules mine, reported to show a quartz vein carrying gold, copper, silver values.

Development: by tunnels, 137' and 500' long. Annual assessment work only being done. Is a prospect.

EAST SNOWSTORM MINING CO.

IDAHO

Mine near Larson, Shoshone Co., Idaho. A fraud order was issued, 1911, by the postal authorities against C. E. Mitchell, promoter of this company, and also against the company. The title was changed, 1911, to "The Snowstorm Deep Mines, Ltd.," which has also been branded fraudulent. Property described Vol. X, Copper Handbook.

ECLIPSE MINING CO.

IDAHO

Was formerly the Lead King Mining Co., name changed Aug. 13, 1917, and stock pooled for one year.

E. W. Conrad, pres.-mgr., Spokane; **S. V. Osborn, J. B. Swearington, Pendleton, Ore.;** and **E. B. Heath, Centralia, Wash.,** directors. See Lead King.

EXCELSIOR MINING CO.

IDAHO

Burke, Shoshone Co., Idaho. Chas. Chriswell, supt.

Property: 6 claims, carrying a 15' vein, said to show copper carbonates and galena at surface.

Development: by 2 tunnels.

FEDERAL MINING & SMELTING CO.

IDAHO

Offices: 32 Broadway, New York, Wallace, Idaho, and Dover, Del. (Corporate office).

Officers: F. H. Brownell, pres.; H. A. Guess, v. p.; F. C. Druding, treas., with H. W. York, F. R. Raiff, W. E. Bennett, Edw. Brush, E. L. Newhouse, G. F. Hilton, Fred. Burbidge, Wm. J. Hall, Chas. Earl and Roger W. Strauss, directors; B. Hoyt, sec.; Fred. Burbidge, gen. mgr.; Wm. J. Hall, asst. gen. mgr.

Inc. 1903 in Del. (charter perpetual), amended Aug. 22, 1903. Cap., authorized \$20,000,000 Pfd., 7% Cum., and \$10,000,000 Com.; shares \$100 par. Outstanding, \$12,000,000 Pfd. and \$6,000,000 Com. Preferred stock has no voting power except in connection with the increase of preferred stock, but is preferred as to assets. One-sixth entire capital stock said to be held by American Smelters Securities Co. Federal Guaranty Trust Co., New York, transfer office; U. S. Mortgage & Trust Co., New York, registrar. Annual meeting, second Monday in April. Listed on New York and Spokane Exchanges.

Dividends:

Year	Pfd.	Com.	Year	Pfd.	Com.	Year	Pfd.	Com.
1903	1¼%	.....	1908	7%	.....	1915	4%	.....
1904	7%	4½%	1909	7%	1½%	1916	4¼%	.....
1905	7%	6(a)	1910-11	7%	.....	1917	5¼(d)	.....
1906	7%	6(b)	1912-13	6%	.....		
1907	7%	6(c)	1914	5%	.....		

(a) 4% extra.

(b) 11% extra.

(c) 8½% extra.

(d) To Sept., 1917. Preferred dividend rate reduced Aug. 18, 1914, to a 4% basis. Accumulated dividends on pfd. stock amounted to 9¼% up to Feb. 21, 1917.

Summary of Annual Reports—Income Account

	1916	1915	1914
Value of product.....	\$5,204,513	\$2,782,658	\$2,200,777
Cost production and other expenses.....	4,159,745	2,326,719	2,011,684
Operating profit.....	1,044,767	455,939	189,093
Miscellaneous earnings.....	613,311	352,662	702,462
Total earnings.....	1,658,079	808,601	891,556
Deductions.....	789,880	498,234	339,160
Net credit to profit and loss.....	868,198	310,367	552,396
Less dividend on preferred.....	509,409	479,444	599,305
Net amount carried to surplus account for the year.....	358,789	169,076	46,908
Balance at first of year.....	1,219,536	1,388,613	1,435,522
Balance at end of year.....	1,578,325	1,219,536	1,388,612

Comparative General Balance Sheet

Assets—	1915		1916		
	1915	1916	1915	1916	
Property.....	\$18,000,000	\$18,000,000	Cap. stk., pfd....	\$12,000,000	\$12,000,000
Investments(a)...	286,120	288,620	Cap. stk., com. . .	6,000,000	6,000,000
Supplies, etc. . . .	120,839	174,603	Accts. payable...	257,658	373,718
Accts. receivable.	521,531	655,496	Reserve for Dep.		303,657
Cash.....	548,703	1,136,982	Surplus.....	1,219,536	1,578,325
Total.....	\$19,477,194	\$20,255,702	Total.....	\$19,477,194	\$20,255,702

(a) Includes 28,000 shares Bunker Hill & Sullivan stock carried at par value.

Note—Mines and equipment carried at par value of outstanding stock, regardless of actual value of property.

The Federal has a contract with the A. S. & R. Co., dated Oct. 16, 1905, terminating Aug. 31, 1930, by which the Federal company must sell all of the silver-lead ores, slimes and concentrates, of its own or leased mining properties, and all owned or leased property of any company in which the Federal owns 75% of the capital stock to the A. S. & R. Co., and the A. S. & R. Co. agrees to take all such output.

The A. S. & R. allows the Federal 90% of the contents of the latter's lead ore at 90 % New York quotations, when lead sells at less than \$4.10 per 100 lbs.; when the price is over \$4.10 they divide the difference between \$4.10 and the market price. Contract for silver calls for 95%, based on Handy & Harman quotation. Contract for gold calls for 95% at \$20 per oz., provided ore contains 0.05 oz. per ton. Contract provides deductions of \$8 per ton for treatment charge plus freight to smelter (app. \$7.17 per ton) and 50c per ton for each 1% or fraction of 1% of zinc in excess of 10%. Federal cannot lease or dispose of its stock in a company owning or leasing mining property without previous written consent of the A. S. & R. Co.

Suit was filed Feb., 1913, by Sydney Norman, on behalf of the minority stockholders, to set aside the above "alleged unfair smelting contract" and to recover \$2,000,000 damages to Feb., 1913; said amount being the estimated difference between New York price of lead and the lesser terms of the contract. On July 1, 1914, this suit was dismissed in the Supreme Court of New York City, but it was appealed and being heard by the Appellate division, Nov., 1917.

Apex litigation with the Bunker Hill & Sullivan, started in 1908, was settled in 1910 by agreement between the two companies.

History: company entered upon the operation of its properties Sept. 1, 1903. Of the preferred stock, \$10,500,000, and of the common stock, \$5,250,000, were issued upon the acquisition of all the mining property formerly owned by the Empire State-Idaho Mng. & Dev. Co., by the Standard Mining Co., the Mammoth Mines in Idaho, and certain smelting property at Everett, Wash. The smelting property has since been sold without loss to the company. The above mentioned mining property consists of silver-lead mines in the Coeur d'Alene mining district.

In 1910, company acquired an option on a portion of the stock of the Govt. Gulch Dev. Co., lying east of the Black Hawk mines in the Wardner district. On account of default of the stockholders, 414,000 shares out of a million reverted to the Federal Mining & Smelting Co. The property of this company consists of 1 patented and 6 unpatented claims. Company also controls through stock ownership the Black Hawk Mng. & Dev. Co., Ltd.

The company exercised an option on 7/10 of the Cleveland group of the Idaho Investment Co., and started negotiating for remaining 3/10, also for the Green Hill ground. This resulted in the organization of the consolidated Green Hill-Cleveland Mng. Co., to which company Federal deeded its 7/10 interest, and the owners, thereof deeded their 3/10 interest in the Cleveland group, and also all of the Green Hill ground. Subsequently Federal leased to the Green Hill-Cleveland Mng. Co. all of the mining and milling plant of the Mace mines for an indefinite term, until the ores in the ground belonging to the new company are exhausted, receiving therefor a rental of \$180,000, payable out of the first profits of the new company, before any dividends were declared. Ownership of the Green Hill Co. lies 50% with the Federal company and 50% with the Green Hill interest. Owners of each half interest share equally in directorate and management of the new corporation, operations of which were started Nov. 1, 1912. Dividends received by the Federal from the Green Hill-Cleveland Co. amounted to \$352,000 in 1913, \$576,000 in 1914, \$192,000 in 1915, \$160,000 in 1916.

The Helena-Frisco property was purchased in Jan., 1913, for \$100,000. Operations proved unprofitable and the mine was closed down, Aug. 9, 1916. The mill, plant and buildings were sold to the Tamarack Custer Cons. Mng. Co. for \$150,000, the Federal company retaining all mineral rights.

In July, 1915, Federal purchased, at receiver's sale, the mine, concentrator, power line and supplies of the Iron Mt. Tunnel Co., at Superior, Mineral Co., Mont., for \$100,000. The mine is an old one, having been stoped for 1,700' above water level about 20 years ago. Operations proved disappointing and the mine was closed down, August, 1916. Salvage value of plant was \$78,331.

In the 1916 annual report the following active properties are named: the Wardner, which includes the Last Chance mine at Wardner; the Mace, or Standard-Mammoth, one mile west of Burke; the Morning, at Mullan.

The Wardner group consists of 40 patented and numerous unpatented claims, also several hundred acres of agricultural land. Mineral claims cover over 7,000' in length of the Wardner lode, developed by the Last Chance mine, north and west of the Bunker Hill & Sullivan; orebodies belong to the same vein as those worked by that company, and lie chiefly along the Jersey fissure zone. The Sweeny adit level is the principal level. It is about 700' above the Kellogg tunnel of the Bunker Hill & Sullivan. Ore is hauled to the Arizona portal, from there over a spur of the O.-W.

R. R. & Nav. Co.'s line to the mill at the mouth of Government Gulch. Below the Sweeny tunnel is an inclined shaft several hundred feet deep with several levels. The mine has been a steady producer for 25 years, but is approaching the end, together with the Mace. Only the prevailing high metal prices during 1916 have made profitable operations possible. Profit for 1916 was \$103,844 for the Wardner and \$169,661 for the Mace.

Negotiations for the purchase and development of the Independence mine in Wood River district, Idaho, for \$500,000, will come to a focus Nov. 15, 1917.

The Morning mine, $\frac{1}{2}$ mile N. W. of Mullan, is one of the large lead-silver properties in the district, and one of the best equipped. It is the most important mine of the Federal group, though its ores are the lowest grade of any property in the district and very difficult to treat.

Development: on the 800' level has proved the extension of the main orebody and enabled the increase in production to 300 tons per day. The ore is treated at the Wallace No. 1 mill, installed in 1917. This mine made a profit of \$1,006,020 during 1916.

For geology of the Coeur d'Alene district, see U. S. G. S. Prof. Paper, No. 62.

The North Star-Triumph mines, near Hailey, Idaho, acquired under bond, 1916, have a 300-ton concentrator with flotation system and electric separator under construction. The properties are said to carry a large tonnage of complex ore, containing gold, silver, lead and zinc. In 1916, \$314,923 was expended on development work and equipment.

Ore reserves and development work for past three years:

		Reserves Milling Ore Tons	Concls. Ore Tons	1st Class Ore Tons	Dev. Feet (b)
Wardner.....	Jan. 1, 1915	62,200	4,060	1,020	3,655
	Jan. 1, 1916	25,000	2,060	450	3,364
	Jan. 1, 1917	19,300	1,470	300	.....
Morning.....	Jan. 1, 1915	673,150	61,180	43,660	2,212
	Jan. 1, 1916	752,300	74,840	62,685	3,781
	Jan. 1, 1917	763,700	72,060	76,460	.....
Mace.....	Jan. 1, 1915	87,000	8,250	.....	85
	Jan. 1, 1916	87,700	8,350	4,390	1,154
	Jan. 1, 1917	7,200	800	520	.....
Frisco.....	Jan. 1, 1915	111,000	20,000(a)	.....	.....
	Jan. 1, 1916	181,600	41,730(a)	.....	1,314
Green Hill-Cl.....	Jan. 1, 1915	55,100	5,660	3,960	1,304
	Jan. 1, 1916	14,500	1,060	445	2,541
	Jan. 1, 1917	16,900	2,000	1,300	.....
Total.....	Jan. 1, 1915	988,450	99,150	48,640	7,256
	Jan. 1, 1916	1,107,600	131,370	68,180	12,432
	Jan. 1, 1917	807,100	76,330	73,580	.....
Increase or decrease.....	Jan. 1, 1916	119,150	32,220	19,540	5,176
	Jan. 1, 1917	72,400D	9,980D	10,610I	.....

(a) Includes lead and zinc. (b) For year ending.

The Federal company is amply provided with modern concentrating, pumping, hoisting, compressor and electric plants.

Employed an average of 1,223 men, 1916, at average wage of \$4.509 per shift.

Production:

Figures for 1916 not available, but profits from individual mines are given under their respective heads.

Year	Total Tons Mined	First-Class Ore		Milled Tons	Lead Concs. & Shipping Ore			Zinc Concs.	
		Tons	% Pb.		Tons	% Pb	Oz Ag	Tons	% Zn.
1915(a).....	461,252	29,338	30.4	408,315	66,610	40.20	14.77	8,839	42.46
1914.....	421,631	21,091	34.0	389,450	57,058	44.67	16.01	4,200	44.61

(a) Morning mine only operated for last 8½ months.

	First-Class Ore		Concentrates			Frisco (a)		Iron Mt. (b)		
	Wardner Morn.		Wardner Morn.							
	% Pb.	Oz. Ag.	% Pb.	Oz. Ag.	Pb.	Oz. Ag.	Pb.	Oz. Ag.		
1915.....	45.7	28.9	57.7	19.6	46.1	15.5	25.9	7.6	37.1	60.1
1914.....	51.2	29.6	59.1	22.4	44.7	14.7	...	...	...	...

(a) % zinc in zinc concentrates was 40.0%; (b) % zinc in concentrates was 87.6%.

The Last Chance and Green Hill-Cleveland mines are practically worked out, the former reverting to the Bunker Hill Co. whenever it fails to show an operating profit for 5 consecutive months. Inasmuch as \$12,000,000 7% preferred stock is in arrears \$1,000,000 and the common has received no dividend since 1909, and is now worthless, the sole property of value, the Morning mine, has a heavy load to carry.

The company is earning exceptional profits in 1917 owing to high lead and silver prices, and it is possible its net surplus on hand Jan., 1918, will cover unpaid preferred dividends, and the market price of the stock.

It is evident, however, that company's stock is merely a liquidating proposition.

FLORENCE MINING & MILLING CO.

IDAHO

Address: John B. Steffes, sec.-treas., Kellogg, Idaho.

Officers: Chas. Dallaire, pres.; J. D. Chisholm, Jas. Ezkiel and John Haalund, directors.

Inc. 1908, in Idaho. **Cap.**, \$1,000,000; shares \$1 par; assessable; 440,000 issued. Annual meeting, second Tuesday in July.

Property: 10 claims, 170 acres, due E. of the Alhambra and S. E. of the Sherman and Roanoke mines in the Yreka mining district, of the Coeur d'Alene. Ore occurs in vein in Revett quartzite, carrying lead, silver and copper. Orebody is 100' wide, has dip of 70° and S. E.-N. W. course. Developed by crosscut tunnels, 150' and 300' long, with a total of 800' underground workings. A lower tunnel has been started to intercept the vein at depth of 1,000'. The power line was installed during 1916 and a compressor is to be added to the equipment in 1917.

FRIEND MINING CO.

IDAHO

Address: 505 Jamieson Bldg., Spokane, Wash.

Officers: C. M. Weller, pres.; Wm. Schierding, sec.-treas and mgr., with T. Havens, David Bayth and Geo. Baxter, directors.

Inc. 1915, in Idaho. **Cap.**, \$150,000; shares 10c par; assessable; 2c called July 24, 1916.

Property: 3 claims, in Beaver Creek district, Coeur d'Alene district, Idaho, said to show a fissure vein, 7' wide, carrying zinc-lead-silver values. The mine is developed to vertical depth of 1,500' with 600' of drifting. Developing June, 1917.

GERTIE MINING CO.**IDAHO**

Office: 708 Hutton Bldg., Spokane, Wash. **Mine office:** Burke, Idaho.
Officers: L. W. Hutton, pres.; John Harvey, treas., with Mrs. E. C. Travers and A. A. Booth, directors; G. N. Crawford, sec.; A. Anderson, supt.

Cap., \$150,000, increased in 1914 to \$250,000; shares 10c par; 240,000 outstanding. Listed on Spokane Stock Exchange.

Property: 3 patented claims, 35 acres, adjoining Hecla on the S. E. and Maher Ahearn group on the W., near Burke. Also owns about 10 acres at mouth of crosscut tunnel. Company has been driving a long 6'x8' tunnel, now in over 4,100' with depth of 1,400', in the expectation of cutting a vein mined on the Hecla property. This vein is said to have shown 3 or 4" of clean galena, 300' from the Gertie lines and 250' farther back Hecla is said to have mined 3 to 5' of clean ore. A large vein was cut, Dec., 1915, but results were very disappointing and management decided to start work on a different fissure, March, 1916. In Nov., 1916, mine was closed, but reopened, June, 1917. Crosscut tunnel to Gertie claim is to be extended to Iron King to find the vein. Expenditures to date, \$75,000.

GIANT LEDGE MINING CO.**IDAHO**

Office: Spokane, Wash.

Officers: J. J. Taylor, pres.; J. Erikson, v. p.; W. W. Johnston, sec.-treas., Spokane; above, with D. S. Prescott and A. B. Shelton, directors.

Inc. 1913, as a reorganization of the Granite Allie Co. **Cap.,** 1,500,000 shares; \$1 par; 1,350,000 issued. Chas. G. Taylor, mgr.

Property: on Granite Gulch, 4 miles E. of Murray, Shoshone Co., Idaho. Several claims added in 1916.

Recent development: in July, 1917, a 160' crosscut from the 400' level of new shaft opened 40' of ore assaying \$5 gold, 2 oz. silver and \$42 lead per ton.

Equipment: 7-drill compressor, hoist, pumps, 1½-mile flume and electric power. A 150-ton mill was being built in 1917. Favorably regarded.

GIANT MINING & DEVELOPMENT CO.**IDAHO**

Address: 517 Bank St., Wallace, Idaho.

Officers: A. Rechsteiner, pres.; E. R. Turk, sec., with G. Malcrida and I. Davis, directors; P. Lievër, mgr.

Cap., \$100,000, paid up; stock assessable; 4 mills per share levied, August, 1917.

Property: 7 claims in Beaver district, Idaho. Three men employed.

GOLD HUNTER MINING & SMELTING CO.**IDAHO**

Office: Mullan, Idaho.

Officers: P. J. Hennessy, pres.; Dennis Ryan, v. p.; E. C. Hennessy, sec.; T. F. Keeley, treas.; C. L. Herrick, managing supt.; C. K. Cartwright, mine supt.

Cap., 200,000 shares; \$10 par. Is a close corporation.

Property: 7 claims and a fraction, patented, in Hunter district, Coeur d'Alene district, Idaho; also 20-acre millsite.

Geology: fissured zone in quartzite and shale. Lead-silver sulphide ore occurs as shoots with dip of 80° S. and course of N. 75° W. The mineralized area is 200' by 1,800'.

Development: by tunnels and shafts. Main tunnel 4,800' long. Winze down 1,200' below tunnel level will be sunk to 1,600'. Two shoots developed, the N. 12' wide, the S. 20' wide. Best ore coming from east part of Yolande and west part of West Hunter claims.

Equipment: includes 150 h. p. electric hoist, two 3,000 cu. ft. compressors, 100 g. p. m. pump, 340-ton mill using 9 air agitated flotation cells.

Results of operations:

	Tons Ore	Gross	Cost	Trans. and	Improve-	Net
			Mining	Treatment	ments	Profit
1915 . . .	118,764	\$614,590	\$333,904	\$214,315	\$34,707	\$31,662
1916 . . .	119,490	815,779	482,275	180,186	8,044	161,361

In 1914 there was a loss of \$45,926, but \$370,000 was spent in improvements. Gross earnings were \$421,318.

GOLDEN CHEST MINE

IDAHO

Address: Vivian Green, gen. mgr., 45 W. 34th St., New York; R. T. Horn, supt.

Property: near Murray, Coeur d'Alene, Idaho.

Geology: quartz vein in Prichard slate. Ore from upper levels was free milling, and the gold easily recovered. At depth the ore became pyritic and rebellious to simple treatment. Gold and tungsten occur in the same vein, but the scheelite is confined to the disturbed part of the vein and is almost free from gold. The gold shoots are free of tungsten, yet in mining, both become mixed to some extent.

Treatment: in Bull. 128 of the A. I. M. E., R. R. Goodrich and N. E. Holden describe tests made on this ore, tungsten with a little gold. Considerable clean scheelite is sacked direct for market. It was found that gravity concentration gave 53.7% tungstic oxide concentrate, with much pyrite, not a marketable product; flotation does not clean the concentrate properly and loses tungsten in the overflow; roasting and magnetic separation of the pyritic tungsten material yields over 60% grade; and the net extraction of WO₃ is about 90%.

GRAY COPPER MINING CO., LTD.

IDAHO

Osburn, Shoshone Co., Idaho. E. F. Hall, pres.; W. H. Herrick, sec. and mgr.

Cap., \$375,000; shares 25c par.

Property: 7 claims, 2 very hard miles from a railroad, on McFarren gulch, 12 miles from Osburn, shows a vein of 6 to 20' surface width, developed by a combination crosscut and drift tunnel, showing mainly gray copper ore, said to average 17% copper, 20 oz. silver and \$10 gold per ton. No recent returns secured. Probably idle.

GREAT EASTERN MINING CO., LTD.

IDAHO

Wallace, Idaho.

Officers: John Carlson, pres.; Edwin Erickson, v. p.; John C. Furst, sec.-treas. John Carlson, Chas. Solberg and John C. Furst, directors.

Inc. Sept. 19, 1900, in Idaho. Cap., \$1,000,000; outstanding \$800,000; shares \$1 par. Annual meeting in April.

Property: the Great Eastern group, 14 claims, patented in Lelande mining district, 4½ miles N. E. of Wallace, said to show silver-lead-zinc ore in fissure veins.

Development: by shafts and tunnels, longest tunnel 3,000'. Claims are still in the development stage, and have been for a number of years. Management states that \$6,000 was spent in 1915 on development work. Property is easily accessible to Northern Pacific and Union Pacific (O.-W.) railroads.

GREAT WESTERN MINING CO.

IDAHO

Burke, Shoshone Co., Idaho.

Officers: W. W. Russell, pres. and mgr.; Victor Huot, v. p.; G. T. Edmiston, sec.-treas.; preceding officers, F. P. Robinson, John J. Jenkins, R. R. Carnes and C. H. Kratzer, directors.

Property: 7 claims, patented, 3 miles from Burke, show vein traced for about 1,200' by trenching, carrying copper and lead ore.

Development: tunnels of 1,270' and 900' and a 207' shaft. Work was begun Aug. 12, 1904. A raise being driven, 1914, reported to have opened up a 12' orebody. Assays average 7% lead, 1.54% copper and 0.4 oz. gold.

Equipment: includes hoist and small Rand air compressor, driven by a 6 h. p. motor. Idle.

GREEN HILL CLEVELAND MINING CO.

IDAHO

See Federal Mining & Smelting Co.

GUELPH MINING & MILLING CO., LTD.

IDAHO

Head office: Kellogg, Idaho. **Mine office:** Sunset, Idaho.

Officers: Byrd Coyle, pres.; W. C. Boyle, v. p.; A. P. Corby, sec.; Eliza H. Steffes, treas.; J. I. Joy, T. J. Yarbrough, H. H. Rodes, J. B. Steffes and S. D. Lemieux, directors.

Inc. Mar. 6, 1916, in Idaho. **Cap.**, \$1,500,000; shares \$1 par; non-assessable; 1,300,000 outstanding.

Property: 5 patented claims, in Placer Center district, adjoining the Hercules, Ambregris, Sunset and Interstate-Callahan mines.

Geology: quartz vein in Burke quartzite, with dip of 55° and strike, S. E. to N. W. Ore occurs as streaks and contains lead carbonate and silver chloride.

Development: by 200' shaft to be sunk to 400', and by 2,200' of tunnels.

Equipment: includes 75 h. p. hoist, Sullivan compressor, Cameron pump, and electric power supplied by Washington Water Power Co. Expenses in 1916 totaled \$10,000.

HAMBURG-AMERICAN COPPER M. & M. CO.

IDAHO

Kellogg, Idaho.

Officers: Wm. Schaefer, pres.; D. W. Price, v. p.; J. A. Walden, sec.; W. W. Papesh, treas.; Elmer Brown, Paul Jacobs, H. Froehlich and Frederick Bell, directors.

Inc. Nov., 1908, in Idaho. **Cap.**, \$1,500,000; shares \$1 par.

Property: 8 claims, between the Handspike and Riverside, on the Little North fork, shows copper ore.

Development: by 749' tunnel. Mine 18 miles from O. W. R. & N. Co.

HAYES CO.

IDAHO

Operates a flotation plant for recovery of values from slimes from the bed of the south side of Coeur d'Alene river.

Officers: A. Hayes, pres., Kellogg, Idaho; S. A. Easton, treas.

Inc. 1917, in Idaho. **Cap.**, \$50,000; shares \$1 par.

Property: company has a lease on about 1,200 acres, including 3 miles of river bed.

Production: to Aug., 1917, 9 cars of slimes running about 22 oz. silver and 30% lead.

Plant is reported to have cost \$50,000 and is designed to treat 200 tons daily.

HEADLIGHT MINING CO., LTD.

IDAHO

Idle.

Office: 324 Hutton Bldg., Spokane, Wash.

Mine Address: Wallace, Idaho.

Officers: F. P. Markwell, pres.; Alex. Murphy, v. p.; Everett H. Pattison, sec.; Oscar Nordquist, treas.; above with C. A. Markwell and Angus Sutherland, directors.

Inc. 1900 in Idaho. **Cap.** \$1,800,000; shares \$1 par; non-assessable; 1,438,995 issued. Bonds \$50,000 issued.

Property: 13 claims, 10 patented, 130 acres, in the Leland mining dis-

trict, Shoshone Co., Idaho, reported to show lead-silver ore in fissure veins in quartzite. Developed by tunnels.

HECLA MINING CO.

IDAHO

Wallace, Idaho.

Officers: Jas. F. McCarthy, pres.-treas. and gen. mgr. Wallace; Frank Upman, v. p., with Sarah Smith Wilbur, Carl Landsee, F. J. Kipp, W. J. C. Wakefield and H. C. Lambach, directors. L. E. Hanley, sec., Wallace.

Original Hecla Mining Co., inc. in Idaho in 1891, with cap., \$500,000 and shares \$1 par, owned the Hecla and Katie May claims. **Reincorporated** July, 1898, in Wash. **Cap.**, \$250,000; shares 25 cts. par; all issued and fully paid. Security Transfer and Registrar Co., New York, transfer agent; Metropolitan Trust Co., New York, registrar. Annual meeting in April. Listed on New York Curb and Spokane Stock Exchange.

Balance sheet, Dec. 31, 1916, shows: assets, \$5,601,172, which includes property, \$4,423,263; improvements, \$633,039; inventory accts., \$44,587; accts. receivable, \$7,506; ore in transit, \$302,650; cash, \$186,624. Liabilities include: accts., payable \$111,949; reserves for depreciation, \$383,471; surplus, \$639,396.

Income statement for 1916 shows: net receipts from ore sales, \$2,543,-072; interests and misc., \$6,122; total, \$2,549,195. Expenditures were \$741,-187, which includes, mining and development, \$524,820; ore sorting, \$40,901; haulage mine to mill, \$19,539; milling, \$93,194; taxes and general, \$62,731. Net income, \$1,808,008; depreciation reserves, \$50,380, leaving net profit of \$1,757,628.

Dividends: for 1916 amounted to \$1,550,000; in 1917, \$1,500,000 to Oct. 20th, bringing total dividends to November, 1917, to \$6,895,000. Present dividend rate, 15c monthly.

Property: 29 patented claims, 347 acres, near Burke, also mill site at Gem. **Ore:** Chiefly silver-lead sulphides accompanied by sphalerite and pyrite, occurring in the Hecla lode; strike N. W.-S. E., with average dip 80° to N. E. General country rock is serictic Burke quartzite. The lode is intimately associated with a lamphrophyric dike, which has an average width of 2'. Ore averages 5' to 6' in width, occurs mainly in the quartzite on one or both sides of the dike, and, to a large extent, fills fissures. The pay shoot has an extreme length of 1,200'. For geology of Coeur D'Alene district, see U. S. G. S. Prof. Paper No. 62. Also paper by Oscar A. Hershey. Published by Mng. & Sci. Press.

The east vein has been proven to vertical depth of 900' and for over 900' in length on No. 3 level. Ore is narrower and silver values lower at 900'.

A new vein of zinc-silver-lead ore was cut, 1916, on the 300' and 600' levels and company is shipping about 200 tons daily of zinc-lead ore from development work. The Marsh Mng. Co's mill at Black Cloud has been leased to concentrate this ore.

Development: by tunnels and shafts; working shaft 1,600' deep with 20,000' drifts and crosscuts. Development work in 1916 amounted to 6,421'. Lowest level is at 1,600', where orebody has been drifted on for its full length. A 1,400' raise on the east vein on No. 3 level, was driven, 1916-17.

Ore reserves: estimated October 1, 1917, at 1,296,000 tons, sufficient at present rate of production to last over 4 years.

Equipment: the property is one of the best equipped in the district with hoists, compressors, machine shops, and a 500-ton concentrator, the latter at Gem, has a flotation unit, using General Naval Stores oils. Electric haulage is being tried out on the 1,600' level; if successful there, it will be extended to other levels. Company employs 175 men.

Production:

	Ore & Cncts. Shipped Tons	Lead Lbs.	Silver Oz.	Lbs.Pb.Oz.Ag.		Selling Price Cents	
				per T.	per T.	Pb.	Ag.
1916.....	40,832	40,217,573	1,195,841	985	29.30	6.936	67.3
1915.....	26,214	24,917,867	692,444	951	26.4	4.866	50.4
1914.....	20,051	18,957,823	509,200	945	25.4	3.866	55.0
1913.....	19,937	18,832,534	507,236	945	25.4	4.364	59.5

Production during 1917 averaged about 700 tons daily.

Costs per ton, 1915, were as follows:

Mng.	Dev.	Sorting	Perm.			Trans.	Gross		Profit
			Imp.	Misc.	Mill.		Rec.	Exp.	
\$1.68	8.7c	14.7c	14.7c	38.3c	35.7c	9.9c	\$7.05	\$2.65	\$4.40
Costs in 1916:									
\$1.90	19.3c	16.3c	50.7c	25.0c	50.6c	10.6c	\$10.1	\$2.95	\$7.21

Company has made a 5-year contract with the Bunker Hill & Sullivan Mng. & Concentrating Co., for the smelting of its lead-silver ores., at the Kellogg plant.

The Hecla mine, unsuccessful in its early years, has become one of the steady dividend payers of the district. The property is kept up to a high standard in condition and is most efficiently managed.

H. E. M. MINING CO.**IDAHO**

Consolidated with the Aurora-Sampson Mining Co., to form the Western Union Mining Co., which see.

HENRIETTA LEASING CO.**IDAHO**

Organized, 1917, by Wm. A. Beaudry, P. Weber, Ben. Harmon, Sidney Shonts and Frank H. Skeels. Wm. A. Beaudry, mgr., Wallace, Ida. Has a 5-year lease from 1917 with option to purchase at \$80,000, on the Bear Top mine, formerly owned by the Bear-Top Orofino Cons. Mining Co.

Property: about 5 miles from Murray, shows a vein in slate, carrying silver-lead ore in pockets and irregular shoots. Lessees operate on a royalty basis, paying 15% on lead settled for under 7½c per lb. and 20% for shipments netting above that figure.

HERCULES MINING CO.**IDAHO**

Address: Eugene R. Day, mgr., Burke, Idaho.

Is a partnership, not a corporation, the Day family owning a half interest and dominating the policy.

Property: The Hercules mine, a group of claims near Burke, also various stock interests as follows:

500,000 shares Northport Smelting & Refining Co.

168 shares Pennsylvania Smelting & Refining Co.

9,800 shares Hidden Treasure Co.

720,330 shares Idaho & Eastern Mining Co., a controlling interest.

912,779 shares Hummingbird Mining Co. a controlling interest.

505,333 shares Ambergris Mining Co., a controlling interest.

840,854 shares Basin Mining Co., a controlling interest.

The Hercules mine is the greatest bonanza mine of the entire district. It has one big vein in quartzite and slate, cut by two cross faults and one dike. The development is by tunnels, at various levels, the lowest, haulage, or Hummingbird tunnel, nearly level with Burke, with a shaft 530' below it, a total depth of 2,252' below the apex.

The output is shown in the following table.

OUTPUT OF HERCULES MINE FROM 1901 TO OCTOBER 28, 1916

Year	Average Price		Tons Mined	Content Milling Ore		Shipments		Content Crude Ore	
	Lead	Silver		Lead	Silver	Crude Tons	Concts. Tons	Lead %	Silver Oz.
1901	4.36	58.95	362			362		59.84	132.13
1902	4.10	52.16	5,003			5,003		62.34	83.92
1903	4.26	53.57	10,043			10,043		62.28	89.69
1904	4.32	57.22	12,266			12,266		56.40	77.55
1905	4.70	60.35	14,691			11,384	38	55.47	68.81
1906	5.66	66.79	74,998	7.34	6.90	9,379	8,178	57.53	58.55
1907	5.35	65.32	90,683	7.82	7.54	9,537	10,929	54.20	54.29
1908	4.23	52.86	90,087	9.53	9.32	6,395	13,050	56.61	52.55
1909	4.30	51.50	61,820	10.07	9.43	6,076	11,874	54.16	47.01
1910	4.49	53.49	161,550	10.70	9.86	6,627	19,138	46.00	38.87
1911	4.46	53.30	176,325	9.49	8.32	8,459	22,940	49.79	44.89
1912	5.15	60.83	180,286	9.20	7.90	11,402	22,595	44.06	40.44
1913	4.39	59.78	132,955	10.76	7.97	15,684	25,008	52.02	42.65
1914	3.87	54.81	192,361	12.45	10.58	20,364	39,282	57.32	52.61
1915	4.67	49.60	215,089	10.10	8.02	12,603	36,428	51.20	39.61
1916	6.85	65.66	231,568	10.88	8.73	20,400	49,144	47.29	35.40
Total			1,650,087			165,984	258,604		
Average 11 years				9.85	8.60			51.83	46.08
Average 16 years	4.70	57.27						54.16	59.93

Year	Content Concentrate		Value per Ton	Receipts	Profits	Dividends
	Lead %	Silver oz.				
1901			\$84.53	\$27,810	\$20,567	\$8,000
1902			55.12	266,785	169,527	94,200
1903			69.75	667,616	438,746	257,800
1904			63.55	731,107	430,418	544,000
1905			66.87	725,218	375,348	228,000
1906	57.53	58.55	74.51	1,272,000	787,534	890,000
1907	54.20	54.29	65.62	1,296,328	765,160	800,000
1908	56.61	52.55	48.46	907,071	383,751	448,000
1909	54.16	47.01	44.70	798,245	325,305	352,000
1910	46.00	38.87	36.52	874,955	418,542	384,000
1911	47.23	37.52	38.30	1,148,574	544,429	329,227
1912	48.18	39.34	43.36	1,415,462	715,763	704,000
1913	54.91	41.77	51.83	2,055,633	1,207,326	1,024,000
1914	55.76	46.56	50.76	2,991,148	1,868,761	2,176,000
1915	53.14	38.67	44.03	2,103,955	1,096,019	320,000
1916	47.95	34.33	54.22	3,090,703	2,368,682	1,432,000
Total				\$20,972,610	\$11,915,878	\$9,981,227
Average 11 years	52.33	44.49				
Average 16 years						

Production: in 1916 totaled 87,179 tons, worth \$7,272,258. Extraction costs were \$1,501,129, or \$17.20 per ton; freight and treatment, \$2,634,028, or \$30.20 per ton; net profit, \$2,931,136, or \$33.60 per ton.

Capacity of the Hercules mill at Wallace has been increased to 700 tons daily.

HIGHLAND SURPRISE CONSOLIDATED MINING CO. IDAHO

Kellogg, Idaho.

Officers: W. W. Papesh, pres.; M. J. Sinclair, v. p.; Chas. Weigand, sec.-treas.; preceding, with Chas. R. Mowry, George Lamielle and L. F. Macheski, directors; P. F. Rogers, mgr., Beeler.

Inc. 1912 in Idaho. **Cap.**, \$1,200,000; shares \$1 par; assessable; 1,158,000 shares outstanding, 1c assessment levied Sept., 1917. Company is a consolidation of the Surprise Mining & Milling Co., and the Highland Chief Group. Annual meeting, fourth of April. Listed on Butte Exchange.

Annual reports for fiscal year ending March 1, 1917, shows: net returns from ore shipped, \$92,978; misc. receipts and accts., owing, \$23,492; total expenses, \$83,760; net profit, \$10,016. Cash on hand, \$1,099. Cost of development amounting to \$11,956 is not included in mining costs, only the \$1,939 expended in diamond drilling being included.

Property: 21 claims, 3 patented, 400 acres on Pine Creek, 15 miles by road S. of Kellogg.

Ore: silver-lead-zinc sulphides in fissure veins in slate; veins strike N.; 60° E. dip 70°. Purchased 9 claims, 1917, lying east and on the strike of the Highland vein, tying up property to the Bunker Hill & Sullivan ground.

Ore: silver-lead-zinc sulphides in fissure veins in slate; average values 5 oz., silver, 8% lead and 20% zinc. A shoot of zinc ore opened 1916 is 640' long, 3 to 12' wide, and carries considerable iron.

Ore reserves: enough ore is estimated as blocked out to last until Sept., 1918. Shaft will be sunk 200' from No. 4 level on the ore, which should give another 2½ years ore supply.

Development: by tunnels, longest 2,000' with 4,750' of underground workings; greatest depth of workings, 325'. New work, 1916, totaled 1,175' all on the orebodies on No. 4 level, 1,027' of diamond drilling was also done.

Electric power obtained from the Washington Water Power Co. Concentrates hauled to the railroad at Pine Creek siding. Company employs about 35 men.

Equipment: includes 6-drill and 800 cu. ft. compressors, 35 h. p. hoist, two 80 h. p. boilers, pump, etc. Mill capacity increased to 125 tons per 24 hours in 1916 and flotation plant installed. Recoveries increased from 56% to 80% of the metallic contents of the ore. Late in October, 1917, a mono-rail to carry concentrate from the mill to the new railway up Pine Creek was completed. The cost of haulage will be reduced from \$4 to 25c per ton.

Production: for 1916 was 18,458 tons, netting \$92,978. Regular shipments being made to U. S. Smelting Co., 1917.

HILARITY MINING CO.

IDAHO

Cons. Jan., 1917, with the Pine Creek M. & M. Co., which see. W. H. Moffitt, sec., Wallace, Idaho. Jacob Lackman, pres., Nampa, Idaho.

Cap., \$1,000,000; shares \$1 par. A 6 months' option, dating from April 18, 1916, on majority of stock, has been taken by Spokane brokers. Listed on Butte Exchange.

Property: 7 claims in the Pine Creek district, covers about 1 mile along strike of vein said to be the extension of the Constitution Douglas.

Ore: lead-zinc. Development under way in 2 tunnels. Property is a prospect.

HORST-POWELL COPPER MINING CO.

IDAHO

Address: P. O. Box 2221, Spokane, Wash.

Officers: S. W. O'Brien, pres.; M. F. Mendelhall, sec.-treas.

Property: 5 claims and a 5-acre mill site, well timbered, on the Little North Fork river, Coeur d'Alene.

Development: by 3 tunnels, 300', 600' and 200' long, and 2 shafts, 50' and 100'. Vein is of 15' estimated surface width, opened up for 800' and proved to depth of 400' with slate footwall and quartzite hanging wall, carrying copper ore averaging 2-6%.

Equipment: includes steam and gasoline power, with a hoist and necessary mine buildings. Mill installed 1916. Property is connected with Idaho No. R. R. at Murray by 5-mile wagon road. Estimated 15,000 tons of copper ore on the dumps. Thirty men employed.

Under option until Jan., 1919, to the Empire Copper Co., the owners however controlling and operating the property.

HYPOTHEEK MINING & MILLING CO.

IDAHO

Address: Wallace, Ida. **Mine office:** Kingston, Shoshone Co., Ida.

Officers: J. H. Kerns, pres. and gen. mgr.; J. H. Guenther, v. p.; O. A. Olsson, sec.-treas. and asst. mgr.; with A. Hitchcock and W. W. Dawson, directors.

Cap., \$200,000; shares, 10c par. **Bonds:** \$105,000, 7%, 12-yr., authorized in 1914.

In quarter ended Apr. 30, 1917, net profit was \$14,730 from smelter returns totaling \$40,901. Ore and concentrate on hand was worth \$30,000. By January, 1918, it was expected that the indebtedness would be wiped out.

Property: 9 claims, located, 1886, by Octave Guay, shows 3 veins, 2 of 10 to 20' estimated width, the third vein, known as the Great Western, of 8 to 25' width, having a 12 to 18" paystreak carrying native copper and cuprite, assaying up to 16% copper, balance of vein carrying low-grade ore, estimated to carry 2% copper, with small gold and silver values with quartz gangue.

Development: by 1,000' tunnel and 3-compartment shaft to the 1,100' level. The 523' level (750' below surface) opened up a fine shoot of commercial lead ore in 1912. The 900' level also shows an ore shoot 6' thick and 400' long, from which small shipments were made in 1915. This is the deepest mining work in the Prichard slates of the Coeur d'Alene sedimentary series, a formation hitherto considered unpromising. The finding of chalcocite at this mine below 1,000' of Burke quartzite completely contradicts all former views. In Feb., 1916, a crosscut on the 1,100' level opened up a vein of solid galena ore from 18"-2' wide.

Property examined by J. V. Richards in June, 1917, who said that the ore shoot opened by the 700', 900' and 1,100' levels, was 400' long and averaged 3' in width. The ore is largely lead carbonate, assaying 10% lead and 1 oz. silver per ton. Half-way between 900' and 1,100' the shoot is cut off and but little ore is found at 1,100', or 100' below it, although the vein is strong. Reserves would not exceed 20,000 tons. In July, 1917, the company let a contract for drilling the ground north and south of the vein, also below 1,200'. Late in October it was reported that 4' of 20.5% lead ore had been cut by the drill.

Management has been accused of not giving enough information to shareholders. Apparently there is not much of a future unless drilling discovers other shoots.

The mine is electrically equipped and has a 200-ton concentrator with Chilean mill, Wilfley tables, Frue vanners, etc., A 3-mile aerial tram was installed to convey ore from the mine to the railway.

Production: 25 tons of crude ore and concentrate weekly.

IBEX MINING CO.

IDAHO

Mullan, Shoshone Co., Idaho. Controlled by the Amalgamated Stock Holding Co., of Wallace, Idaho.

Inc. April 15, 1911, in Idaho. Company still in existence, but comatose.

Owns 4 claims, adjoining Idaho, Boulder Creek and Bitter Root mines. three-fourths of a mile S. of Mullan and 300' from N. P. R. R. Property shows 4' iron vein adjacent to a diabase dike. Developed by 2 tunnels, the lower starting from Coeur d'Alene river to cut vein at 700' below outcrop.

IDAHO CARBONATE HILL MINING CO.

IDAHO

Address: W. D. Greenough, Millan, Ida.

Property: An option on the Carbonate Hill and Idaho Giant claims, also owning the Boulder Creek claims, adjoining, lead and zinc have been opened in the first-named.

IDAHO COPPER MINING CO., LTD.

IDAHO

Office: Wallace, Idaho. **Mine office:** Mullan, Shoshone Co., Idaho.

Officers: John H. Nordquist, pres.; A. N. Stroud, v. p.; Geo. F. Stoney, sec.; A. H. Featherstone, treas.; W. H. Herrick, gen. mgr.

Property: 6 claims, 3 patented, on the Continental divide, between Idaho and Montana, near the head of Willow creek, in the Hunter district, west of the Reindeer Copper & Gold M. & M. Co., Ltd. Claims carry about 4,500' of the strike of the extension of the Reindeer vein, and are developed through the 3,000' Reindeer crosscut tunnel. Requests for information ignored by Co.

IDAHO GIANT MINING CO.

IDAHO

Cap., \$100,000; shares 10 cts. par.

Property: the Idaho Giant mine adjoins the Carbonate Hill above Mullan, Shoshone Co., Idaho.

Development: mainly by tunnels, shows lead-silver ore in veins. The mine was bonded to Thos. Brennan, manager of the Hunter mine, for 5 years, starting April, 1915, with first payment of \$10,000 to be made at the end of 3 years.

IDAHO AND LOS ANGELES M. & M. CO.

IDAHO

Wallace, Idaho. An assessment of 5 mills per share was levied Aug. 18, 1917.

Property: 6 lode claims, in process of patenting, in Beaver and Placer Center mining districts, Shoshone county, said to show a well defined vein containing lead-silver-zinc and copper ore. Developed by 250' tunnel which is being extended in search of a continuous orebody.

IDAHO MONTANA MINING CO., LTD.

IDAHO

Office: J. H. Wixom, sec., Box 32, Wallace, Idaho.

Officers: Walter H. Hanson, pres.; E. H. McConnell, v. p.; Harry Harris, treas.; preceding, with F. P. Miller, directors; Harlan L. Heward, sec.

Inc. Aug. 18, 1905, in Idaho. **Cap.,** 1,000,000 shares; 10 cts. par; assessable; 386,349 shares outstanding. Annual meeting 1st Saturday in Sept.

Property: 10 claims, unpatented, 200 acres in Shoshone Co., Idaho, and Sanders Co., Mont., showing lead-copper-silver ore in quartz veins. Developed by 1,200' tunnel to depth of 540'. Mine has no equipment and is not yet producing; but development work was steadily prosecuted, 1917.

IDAHO NEVADA EXPLORATION CO., LTD.**IDAHO**

Wallace, Idaho. **Officers:** M. J. Mahoney, pres.; Jos. Peila, v. p.-gen-mgr.; E. R. Turk, sec.-treas., with A. B. Livingston and August Holst, directors. W. B. Lively, mgr.; S. L. Shonts, cons. engr.

Inc. 1914, in Idaho. **Cap.**, 1,500,000 shares; shares given to those agreeing to pay an assessment of 1 mill per share every 2 months.

Property: 3 lode claims, the Castle Rock, Smart Alec and Arlington, and a mill site, formerly owned by the Castle Rock Mining Co., about 3 miles S. E. of Wallace on Placer Creek. Ore occurs as chalcopyrite in a 4' vein in quartzite formation.

Developed to depth of 250', from whence a crosscut is being driven to intercept the main vein. During 1917, 250' of drifting and crosscutting was done and the winze sunk to the 250' level. Six men are employed.

Equipment: includes compressor and hoist. A carload shipment to Tacoma smelter in 1915 said to have assayed .04 oz. gold, 10.89% copper, 10.5% silica, 35.7% iron. Surface equipment and buildings destroyed by snowslide, Jan., 1916; since re-built.

IDAHO NORTHERN MINERAL CO.**IDAHO**

Mine office: Murray, Idaho.

Officers: F. Swanson, pres.; Vina Burton, sec.-treas., with A. Engquist and J. A. Sangren, directors.

Inc. in Washington. **Cap.**, \$1,500,000; shares \$1 par.

Property: 18 unpatented claims, in the Summit mining district, 5 miles from Murray, shows copper, lead, silver and gold ore in 2 well defined veins. Developed to depth of 400' by 1,500' tunnel. Property still in development stage.

IDORA MINING CO., LTD.**IDAHO**

Office: Jamieson Blk., Spokane, Wash. **Mine office:** Wallace, Idaho.

Officers: J. C. Broad, pres.; J. B. Carson, v. p.; C. E. Malette, sec.-treas. and mgr., with C. J. Orland and D. B. Fotheringham, directors. E. L. Latta, supt.

Inc. May, 1915, in Idaho. **Cap.**, \$150,000; shares 10 cts. par; 1,200,000 shares issued, assessable; 1 ct. levied in 1916. Annual meeting 1st Monday in April. Company had \$26,000 debts in August, 1915, which have since been partly paid off. Property formerly held by the Idora Hill Mining Co., was purchased for \$100,000.

Property: 9 claims, 1 patented, in Beaver district, Shoshone county, show lead-silver-zinc ore in 3½' quartz vein. Formation is Prichard slate. Average assays reported to run 50% lead, 25 oz. silver, 8% zinc.

Development: by 8,000' of underground workings to depth of 600', including a 5,000' tunnel.

Equipment: consists of electric power, compressor, 150-ton concentrating mill and a tramway. A new Janney flotation unit was installed in 1916. Shipped from 80 to 100 tons of ore a month, in 1916, to Globe smelter at Denver and the Northport smelter in Washington. Employs 15 men.

IMPERIAL MINING CO.**IDAHO**

Mine office: Burke, Shoshone Co., Idaho.

Officers: John H. Nordquist, pres.-gen. mgr.; J. N. Thennes, v. p.; H. G. Brown, sec.; with G. A. Lahaefer, E. Day, directors.

Inc. 1906. **Cap.**, \$1,000,000, increased 1908 to \$1,500,000; shares \$1 par. Assessment of 1½ mills per share levied 1913, 5 in 1915, and 8 in 1916.

Property: 6 claims and 3 fractions, 180 acres, adjoins the Copper King, on the west, near Burke. Developed by 5,000' of tunnels and crosscuts. After being closed down for 2 years, property was reopened in 1915. Over \$15,000 worth of development work was done, including diamond drilling

and raising, to prospect the orebody found in the upper or 4,000' tunnel, which was not encountered below. Contract for a new 400' tunnel was given in 1916.

Equipped with 3-drill electrically driven compressor.

INDEPENDENCE LEAD MINES CO.

IDAHO

Officers: Maurice W. Bacon, pres., Old National Bank Bldg., Spokane, Wash.; John H. Wourms, v. p.; W. E. Cullen, Jr., sec.; with R. A. Carnochan and C. Van Ordstrand, directors.

Inc. Nov., 1914, in Idaho, as a reorganization of the Independence Gettysburg Mining Co. **Cap.**, \$1,500,000; shares \$1 par; 1,400,000 shares issued. Stock listed on the Spokane Exchange.

Property: 8 patented claims and a ½ interest in the Key Lode claim, in the Coeur d'Alene district, 1 mile from Mullan, on the No. P. R. R. Claims adjoin the Gold Hunter M. Co. holdings to the E. and the You-Like and Morning mines of the Federal M. & S. on the W. Mine shows 3 veins believed to be the extension of the Morning-Evening, You-Like & Midnight orebodies, which have been profitably worked to depth of 2,800' on adjoining properties.

Development: mainly by 4 crosscut tunnels, 200', 400' and 1,800' long. The longest, or No. 4 tunnel, 370' vertically below No. 3, early in 1916 intercepted the You-Like vein, showing 8' of ore assaying 4 oz. silver, 3% lead with some iron sulphide. This tunnel is being continued north to reach the Morning vein. Employs 15 men.

INDEPENDENT COPPER MINING & MILLING CO.

IDAHO

Officers: John H. Nordquist, pres.; J. N. Thennes, v. p., gen. mgr. and agt., Wallace, Idaho; Otto A. Olsson, sec.-treas.; preceding, with James A. Beau, Aug. Mott, Chas. McKinnis, Forest Clark and Henry Bilberg, directors.

Inc. 1907 in Idaho. **Cap.**, \$1,250,000; shares \$1 par; issued \$950,000; assessment to date 1½ cts. per share. First meeting in 7 years held June, 1914.

Property: 3 claims, the Bullpen, San Quentin and Independent Fraction, in the Snowstorm copper belt, 8½ miles N. E. of Mullan in the Hunter mining district. Claims show quartzite cut by 4' fissure vein running N. 72° W., 80° S., the vein underground said to be 10' wide and to carry scattered bunches of 2% copper ore.

Development: includes 800' crosscut tunnel, with 300' or more of drifts at a depth of 300' below the outcrop. Development to date, 1,300' shows ore in various places, but not in commercial amount. Property inactive since 1908, but reopened 1913.

Equipment: includes 100-h. p. electric motor, etc. Is a prospect.

INDEPENDENT DEVELOPMENT CO.

IDAHO

Address: W. A. Smith, Wallace, Idaho.

Cap., \$100,000; shares, 10c par.

Proposed to recover tailings from the Coeur d'Alene river between Kingston and Dudley and to extract the lead and silver minerals by flotation. Said to be 500,000 tons worth \$3.54 per ton, that can be treated and marketed at \$1.64 per ton.

IVANHOE MINING CO.

IDAHO

Oscar Nordquist, mgr., Wallace, Ida. **Cap.**, \$1,500,000; shares \$1 par.

Property: the Ivanhoe and Palisades groups, patented, adjoining the Star group on the S., 3 miles N. W. of Mullan, Shoshone county, shows lead-silver-zinc ore. Mine supposed to have continuation of Morning vein. A crosscut from the Star main tunnel intersected the main vein at 1,400' vertical depth. Drifting on the ledge for 200' proved it to average 6' in

width with 2' of low-grade milling ore. Property has been under development since 1904. Employing 15 men at last accounts.

JACK WAITE MINING CO., LTD.

IDAHO

Address: United Supply Co., Spokane, Wash. Mine Office: Union, Ida.

Officers: E. Winsby, pres.; C. E. Chamberlain, sec.-treas.; C. I. Grimsme, supt.

Cap., \$1,500,000; shares \$1 par; assessable; 1c levied Oct., 1915. Stock listed on Spokane Stock Exchange.

Property: 3 patented claims on Tributary creek, 10 miles from Union, Ida. P. O. R. R. station at Waite, Ida., said to show a vein in slate dipping 60° S. W. and pitching N 70° W. Size of orebody is given as 300' by 10' and average of ore from 8 to 15% lead.

Development: by 2 tunnels, 1400' and 2900' long respectively. The greatest depth of workings, which total 5000', is 1300'.

Ore reserves are estimated as 100,000 tons.

In 1916, ore shipped returned 45% lead and 4 oz. silver per ton.

JUMBO MINING CO.

IDAHO

Wallace, Idaho. John Carlson of Gem, J. N. Morgan of Mace and John Wood, C. E. Conn and Chas. Minch of Gem, Idaho, incorporators.

Inc. Aug. 28, 1913. Cap. \$1,000,000, shares \$1 par. No returns secured.

KELLOGG SUNNYSIDE MINING CO.

IDAHO

Jacob Thorpe, pres., Kellogg, Ida.

Inc. April, 1916, in Idaho. Cap., \$150,000; shares 10c par. J. A. McEachran, S. A. McCoy and Geo. H. Wilson of Spokane, incorporators.

KELLOGG UNITED MINES CO.

IDAHO

Address: Kellogg, Ida. Directors: S. A. McCoy, J. A. McEachran, G. H. Wilson and G. W. Sommer of Spokane, Wash., and Theo. Brown of Kellogg.

Cap., \$500,000; shares 25c par. Is a consolidation of the Kellogg-Sunnyside Mining Co., Brown Leasing Co., and Coeur d'Alene Atlas Mining Co.

Property: 3 groups of claims, about 500 acres, in the Pine Creek district. Said to have 40,000 tons of lead-zinc-silver ore developed and 100-ton mill to be built.

Mine is in a promising district.

KEYSTONE MINES CORPORATION.

IDAHO

Property sold to Armstead Mines Corporation, (which see), 1917, for \$250,000. Stockholders received 13½c per share for their holdings.

KILL BUCK MINING CO., LTD.

IDAHO

Owned by estate of Jos. Clark and by Hon. W. A. Clark. Cap., \$100,000; shares 10c par; all issued; unlisted.

Property: 5 claims on Lake creek, adjoins Chicago-Boston holdings, 2 miles S. W. of Wallace.

Development: by extension of Coeur d'Alene Vulcan M. Co. tunnel, 3,500' southerly to cut vein, already opened 900' above. Shipped silver-lead ore many years ago but idle lately.

LACLEDE MINING CO.

IDAHO

Wallace, Ida. Officers: C. Fred Kratzer, pres.; O. W. Lewis, v. p.; Jas. A. Wayne, sec.-treas.; with E. H. Knight, J. M. Sheets, C. E. Sogn and E. G. Gnaedinger, directors.

Cap., \$1,000,000; shares \$1 par; increased, 1916, to \$1,500,000; all issued; assessable at the rate of 3 mills every 3 months.

Property: lies between the Interstate-Callahan and Tamarack & Custer, in the Coeur d'Alene district, Shoshone Co., Idaho.

Development: consists of 300' crosscut tunnel, a winze down 300' below the tunnel level, Feb., 1916, or 600' vertically below the apex of the vein, with drifts run each way every 100'. Ore occurs irregularly and thus far is not of commercial grade.

The Day interests are reported to have secured control, June, 1917, by purchase of 400,000 shares of stock at 9c a share.

LEAD KING MINING CO.

IDAHO

Address: E. W. Conrad, gen. mgr.-sec., Eagle Bldg., Spokane, Wash.

Inc. 1911 as successor of the Marie Mining Co., Ltd. **Cap.**, \$1,000,000.

Assessment of 1 mill per share levied, Nov., 1914.

Property: 13 claims, in McFarren gulch, about 1 mile south of Osburn, Idaho, said to carry 2 veins, one with outcrops, of high-grade galena, the other showing outcrops of silver-copper ore.

Development: mainly by 4 tunnels, longest 550', with open cuts and shallow shafts, showing silver-lead and gray copper ore, giving good assays.

Equipment: includes several small cabins for mine purposes. Company dormant since 1913.

LESLIE COPPER MINING CO.

IDAHO

Office: 508 Bank St., Wallace, Idaho. **Mine Office:** Wallace, Shoshone Co., Idaho.

Officers: Wesley Everett, pres. and mgr.; A. W. McLaughlin, v. p.; Hon. Herman J. Rossi, sec.-treas., with A. M. Stevens and O. E. Peppard, directors.

Inc. Feb., 1899, in Idaho. **Cap.**, \$100,000; shares 10c par.

Property: 11 claims, 220 acres, adjoining the Amazon-Dixie, also a mill site and 2 water rights, lying east of Mullan. Has several fissure veins, in porphyry, the main vein, of 12' average surface width, having a 35' shaft.

Development: mainly by tunnels, with about a mile of underground openings. The upper workings show galena and copper ore, and a lower tunnel is to give a back of 650'. The property carries mainly silver-lead ore, of concentrating grade, with a narrow copper paystreak.

LEWIS & CLARK MINING CO.

IDAHO

Mullan, Shoshone Co., Idaho. J. Wm. Grismer, pres.

Inc. 1907, in Idaho. **Cap.**, \$1,250,000; shares \$1 par; 375,000 shares in treasury.

Property: 19 claims, N. E. of the Snowstorm, has surface showing of red hematite, with silver-copper values.

Development: consists of 120' tunnel. Management attempting to raise funds for further development.

LITTLE NORTH FORK COPPER M. & M. CO., LTD.

IDAHO

Officers: T. R. Mason, president; Archie McDonald, sec.; John Locke, treas. Jas. H. Hoskins, supt.

Inc. Sept., 1903, in Idaho. **Cap.**, \$1,500,000; shares \$1 par, assessable; 1 mill per share called Sept., 1914.

Property: 10 claims, known as the Handspike Mine, on Little Copper creek, near Little North Fork, 12 miles from a railroad. Claims lie above the Horst-Powell holdings.

Development: by the 232' No. 1 upper tunnel, showing ore assaying up to 28.8% copper, 1 oz. silver and \$1.20 gold per ton, and the No. 2 lower tunnel of 1,500' showing a 12 to 18" paystreak of argentiferous copper ore that averages \$8 to \$30 per ton. Property claimed to have \$200,000 worth of copper ore in sight.

In 1914 Jerome Day took an option on the property, which was not exercised and management is reported to have resumed development work, 1916. No later returns.

LOMBARDY MINING & MILLING CO.

IDAHO

Kellogg, Shoshone Co., Idaho.

Officers: Peter Albinola, pres. and gen. mgr.; Hon. Herman J. Rossi, v. p.; Edw. Albinola, sec.-treas.; H. O. Bemis, mgr.

Inc., 1898, in Idaho. **Cap.**, \$1,000,000; shares \$1 par. Annual meeting, fourth Thursday in April.

Property: 15 claims, one mile N. of Kellogg, Ida. A bedded vein, estimated to average 27" wide with shale footwall and quartzite hanging has been traced for 800'. Ore is said to carry variable values in copper, up to 47% lead and 33 oz. silver per ton.

Development: by tunnels of 360' and 900', and 200' shaft, with about 2000' of workings. Management expects to crosscut at 200' and drift into the orebody cut on tunnel level.

Equipment: includes 85 h. p. electric motor operating hoist and drills.

LOOKOUT MOUNTAIN M. & M. CO.

IDAHO

Office: Kellogg, Idaho. **Officers:** R. L. Brainard, pres.; Wm. Boro, v. p.; W. L. Penny, sec.-treas.; above with Frank Boro and W. T. Roach, directors.

Inc. 1916. **Cap.**, \$1,500,000; shares \$1 par.

Property: 7 claims and 2 fractions, about 140 acres, in the Pine Creek district of the Coeur d'Alenes, Idaho, said to show several veins in quartzite carrying lead-silver values.

Development: by 2 tunnels, lower one 250' beneath upper, about 100' long, to be extended to 500'. Management hopes to cut the downward extension of the veins encountered in upper tunnel, which are reported to average 14" in width and to carry 4% lead and 4 oz. silver.

LOST CABIN MINING CO.

IDAHO

Address: Wallace, Ida. Wm. M. McCarter, Spokane, Wash., pres.; C. C. Landis, supt.

Inc. 1916 in Idaho. **Cap.**, \$250,000; shares 25c.

Property: 5 miles from Murray, Shoshone county, said to carry lead-zinc ore.

Development: by 200' crosscut tunnel.

LUCKY CALUMET COPPER MINING CO., LTD.

IDAHO

Office: Wallace, Idaho. **Mine office:** Mullan, Shoshone Co., Idaho.

Officers: John H. Nordquist, pres. and gen. mgr.; Chas. H. Solberg, v. p.; Otto A. Olsson, sec.-treas., Eagle Block, Wallace, Idaho; with A. J. Olsson, directors; Al. J. Grills, supt.

Inc. Oct., 1906, in Idaho. **Cap.**, \$1,500,000; shares \$1 par; assessable. Last assessment 5 mills per share, levied in 1914.

Property: 10 claims, patented, 181 acres, on Snowstorm hill, between the Independent and Snowstorm mines, and about 5 miles N. E. of Mullan. Property shows 2 fissure veins of 10 to 50' width, in quartzite.

Development: by 3 tunnels. The upper one, of 1,700' length, has a quarter-mile of drifts and crosscuts, which develop what is supposed to be the extension of the Snowstorm vein, showing low-grade ore carrying disseminated carbonates and bornite of 2 to 3% estimated copper tenor. The lower tunnel, a crosscut, from the head of Gentle Annie gulch, is 3,600' long and has opened up a good body of ore, presumably the National, at depth of 1,200'. Property is worked intermittently with proceeds of annual assessments, but information is hard to obtain from this as well as all other Nordquist companies.

Equipment: includes electric power, with 2 motors, and a 5-drill air compressor.

LUCKY FOUR MINING CO.**IDAHO****Office:** corner E. 73rd and E. Glison Sts., Portland, Ore.**Officers:** Chas. Hyle, pres.; Henry Wingert, sec.-treas.**Cap.,** \$50,000; 5c par; \$29,285 issued.

Owns four lode and one placer claim in Summit mining district, Shoshone Co., Idaho.

LUCKY FRIDAY MINING CO.**IDAHO****Wallace, Idaho.****Officers:** Franklin Pfirman, pres.; Jas. A. Wayne, sec.; J.H. Wade, mgr. Is a reorganization (1914) of the Lucky Friday Mines Co.**Cap.,** \$1,500,000; shares \$1 par; assessable; 170,000 shares in treasury.**Property:** 4 claims, adjoining the Hunter mine on the south.**Development:** by 90' shaft, 625' upper crosscut tunnel and 700' lower crosscut tunnel, developing a 10' vein, with 4' paystreak giving assays up to 3.5% copper, 29% lead and 89 oz. silver per ton.**Equipment:** includes electric drilling plant, trackage and ore cars. Development work resumed in 1915 and lower tunnel being driven 100' further to reach the main ledge.**LUCKY SWEDE GOLD & COPPER MINING CO.****IDAHO****Office:** 625 Cedar St., Wallace, Idaho.**Officers:** Morris Pearson, pres.-gen. mgr.; Otto A. Olsson, sec.-treas.; L. F. Macejowski, Harry Pearson and Ida Pearson, directors.**Inc. May, 1909. Cap.,** \$1,000,000; shares \$1 par; assessable; last assessment 3 mills per share, levied 1913; 300,000 shares issued.**Property:** 14 claims in the St. Joe district, S. E. of Mullan, near the C. M. & St. P. R. R., shows 3 veins with surface ores giving good assays in copper and gold.**Development:** by tunnel with about 600' of workings. Company's last assessment provided funds for a new 1,500' tunnel to start near the railway line and cut a copper vein expected to be reached at depth of 1,000'.**Equipment:** includes compressor, installed 1913, and a Pelton wheel. No recent returns.**MAINE-STANDARD MINING CO.****IDAHO****Address:** Wallace, Idaho.**Officers:** Alexander Murphy, pres.-mgr.; J. W. Gator, v. p.; E. H. Pattison, sec.-treas.**Cap.,** \$1,500,000; shares \$1 par.**Property:** 5 unpatented claims in Yreka district, Coeur d'Alene region, Ida. Apparently idle.**MARSH MINES CONSOLIDATED.****IDAHO****Office:** 601 Empire State Bldg., Spokane, Wash. **Mine office,** Wallace, Idaho.**Officers:** W. M. Lee, pres.; Edw. Pohlman, v. p.; W. T. Smith, treas.; Jos. McCarthy, sec.; J. V. Pohlman, mgr.; preceding are the directors. F. L. White, supt.

Is the successor of Marsh Mining Co., which was incorporated 1909 in Washington.

Cap., \$1,500,000, increased to \$2,000,000 at time of reorganization in July, 1916; shares 25c par. Annual meeting in March. Stock listed on Spokane Exchange and New York Curb. Assessments 1911-1917 aggregate \$180,000.**Statement for 1916 (4 months' work)** shows receipts, \$139,111, and expenses \$140,262. Debt of company is about \$20,000.

The Marsh Mining Co. and Green Mountain Mining Co. are being liquidated, all assets being transferred to Marsh Mines Consolidated.

Reorganized July, 1916, as the Marsh Mines Consolidated. All stock

was exchanged for stock of the new company share for share. In addition, for each three shares of Marsh, stockholders subscribed for one share of new stock at 15c a share. One of the chief reasons given by the Board for shutting down the mines in 1916 was that litigation with the Federal Mining & Smelting Co. threatened. The latter company owns mining properties to the south and west of Marsh, and at the time the mine was shut down and for some time previous, Marsh had been mining certain orebodies which extended underneath the surface of the Federal Mining & Smelting Co. ground. Marsh contended that it was the rightful owner of these orebodies under the apex laws. The operations were at a depth of 900' below the main tunnel level and approximately 1,300' below the surface. An exact examination of the rights of the Marsh Co. under these conditions could not be determined without a great deal of exploration work and survey. The Federal Co. threatened Marsh with an injunction and with a suit for damages for removing the ore. This controversy has been settled.

Under the agreement with the Federal Mining & Smelting Co., Marsh was given a lease for a period of 10 years on the Mono, Russell and O'Neil mining claims of the Tiger-Poorman group, which include the vein in controversy. This agreement provides for a complete settlement of all claims for alleged trespass.

Operations were suspended for a year. In March, 1917, a new Gould pump was installed on the 900' level, the mine was unwatered and milling was resumed in May.

Exploration work on the "Got-em-now" vein, exposed in the Gertie tunnel, which traverses the Marsh property, is now under way. This vein was cut 512' from the portal of the Gertie tunnel and at a depth of 350' to 400' from the surface. It is a promising fissure vein. In the event that ore is encountered, it can be quickly mined by utilizing the present working shaft of Marsh now 900' deep and splendidly equipped to handle a large output.

Property: 7 claims, about 100 acres in O'Neil gulch, N. E. of Burke and adjoining the Tiger-Poorman mines. Claims show simple fissure veins in quartzite. The vein is 2' wide in the upper 175' tunnel, averaging 5' on the 5th level. It carries silver-lead ore with zinc in shoots, the orebody thus far developed being 300' long and 4½' wide. The shoot is short, limited by a fault, and must be developed in depth to get tonnage.

Development: includes a main working tunnel and 940' shaft with levels at 399, 550, 687 and 904'. Tunnel cuts the vein at 625' and a drift follows it for 475'. The vein runs north 70° west and dips 78° south. A rich lead-silver vein was cut, 1917, on the 900' level and is producing a small quantity of ore. The shoot is narrow, 8", but is promising.

Ore reserves: estimated at 26,000 tons, equal to 8 or 10 months' production. Arrangements under way to deepen shaft to 1,100', but a winze is also to follow the shoot found at 900'.

Equipment: includes 1,150' Ingersoll-Rand and 690' Franklin compressors, 300-h. p. Nordberg electric hoist, 40-h. p. Lidgerwood and two Ottumwa hoists, Gould and Cameron pumps, Ingersoll, Waugh & Wood drills, etc., with complete electrical equipment.

Company leases and operates the California or Pittsburg mill in Nine Mile Canyon, 2½ miles from Wallace. Freight on Northern Pacific costs 15c a ton. The mill, remodeled at cost of \$34,000 in 1915, handles 150 to 225 tons daily, saving 90% of the lead and 85% of the silver. It contains 2 sets of 14"x30" rolls, 7'x10' tube mill, trommel lines, 4 Wood screens, 7 new concentrating tables, Pachuca agitator, Callow flotation cells, two 24'x10' Dorr thickeners, etc.

The mill is now operated jointly with the Hecla Mining Co., the Marsh Co. treating 200 tons daily for 10 days each month, the remainder of the period under control of the Hecla. This tenancy by Hecla is subject to cancellation on 30 days' notice.

Smelting contract with the A. S. & R. Co. runs for a period of 10 years from July, 1916.

Production: in July, 1917, 2,200 tons of ore, yielding 200 tons of concentrate assaying 52 to 58% lead and 22 to 28 oz. silver, also 100 tons of concentrate containing 21% lead, 33% zinc, and 12 oz. silver per ton. Output yielded \$14,000 net.

Net returns from ore shipments have been as follows: 1911, \$30,313; 1912, \$114,648; 1913, \$139,429; 1914, \$81,944; 1915, \$143,640; none in 1916. The Marsh mine and mill were closed down May 15, after operating a little more than 4 months in 1916, and producing 17,828 tons of ore, worth \$139,111, which just balanced expenses.

Marsh seems to be over its troubles and is in a fair way to make profits. When indebtedness is paid off, and if development continues good, 1918 should see payment of dividends. Employs 55 men.

MIDWAY SUMMIT MINING & MILLING CO., LTD. IDAHO

Idle and probably dead.

Office: 419 Chamber of Commerce Bldg., Spokane, Wash. Mine near Burke, Shoshone Co., Idaho. Geo. Herron, mgr.

Inc. 1911 in Idaho. **Cap.**, \$1,500,000; shares \$1 par. Applied for patents on 11 claims, 1914, in Lelande and Hunter districts.

Development: over 6,000' of work has been done on property, without disclosing ore in commercial quantities. Drifting on 1,100' level, 1915. No information for 1916-17.

MINERAL FARM MINING CO. IDAHO

Offices: Paulsen Bldg., Spokane, and Mullan, Idaho.

Officers: C. J. Carlson, pres. and mgr.; Wm. Sellars, v. p.; C. D. Miller, sec.-treas.; with J. H. Pelletier, director.

Inc. 1904 in Idaho. **Cap.**, 1,500,000 shares; \$1 par; assessable; outstanding 800,000. Annual meeting, first Monday in September. Listed on Butte Exchange. Income \$5,000, and expenditure \$4,500 in 1916.

Property: 8 claims, 7 patented, 170 acres, 1 mile west of Mullan, has a fissure vein in Revett and Burke quartzite, on which work was started in 1908.

Development: 3 tunnels, 60', 800' and 1,445' in length, with 3,700' of underground workings.

MISSOULA COPPER MINING CO. IDAHO

Mullan, Shoshone Co., Idaho.

Officers: A. McLeod, pres.; C. A. Barnes, v. p.; R. J. McLeod, gen. mgr.; preceding with Harry Cheney, J. N. Thennes and John Brown, directors.

Inc. 1901, in Idaho. **Cap.**, \$1,000,000; increased 1907, to \$1,500,000; shares \$1 par, assessable; issued, \$1,350,000. Shares listed on Spokane and Vancouver Stock Exchanges. Annual meeting, first Tuesday in November.

Assessment levied in April, 1917, to pay for having examination made of property.

Property: 10 claims, about 175 acres, at the head of Deadman gulch, adjoining the Lucky Calumet, and about 1½ miles N. W. of the Snowstorm, in the Hunter district. Property has a strong fissure vein, of 85' maximum width, in Revett quartzite, carrying native copper, cuprite, azurite, malachite, bornite and chalcopyrite, with values mainly in sulphides, ranging from about 1%, on the hanging wall, to 8% on the foot-wall, ore averaging

about one-half oz. silver per unit of copper. The property also carries some argentiferous galena.

Development: consists of a 1,400' upper tunnel and a 2,800' lower tunnel, with a connecting shaft and nearly 1 mile of workings. The main tunnel runs N. 30° E. for 1,900', then N. 70° E. for 700', passing from purple St. Regis slates at the portal into Revett quartzite. (Geology described U. S. G. S. Bull., 540, E. p. 48, 1913.)

Equipment: includes a 100-h. p. electric plant, with an 8-drill air compressor and necessary mine buildings.

March 1, 1914, ten of the largest stockholders formed an ironclad pool with 650,000 shares, deposited with Union Trust & Savings Bank of Spokane to March 1, 1916. In April, 1914, a lease and bond was given to Snowstorm M. Co. at \$600,000, said agreement calling for expenditure of \$2,000 for each month the option ran. Snowstorm expended \$36,000, and option was cancelled on Sept. 12, 1915, claiming that development and values were disappointing.

Missoula stockholders assert that property contains apex of National vein. The Missoula vein is flat, dipping about 37° S. and towards National vein which was struck in long crosscut at vertical depth of 1,400', and is said to show dip similar to Missoula's. It is said that National Co. feared to raise lest it prove apex in Missoula ground. Property should be consolidated with the National Co. Both companies are failures at present, but if combined might succeed.

Diamond drilling was under way in October, 1917.

MONTANA-IDAHO COPPER CO.

IDAHO

Office: Paulsen Bldg., Spokane, Wash. **Mine office:** Harbona, Ida.

Officers: H. F. DeBower, Chicago, pres.; J. L. Dirks, Spokane, v. p.; W. J. Kirby, sec.-treas., directors. Otis Hill, gen. mgr.

Inc. 1914 to take over holdings of Monitor Cons. C. M. Co. **Cap.**, 6,000 shares; \$100 par. Stock listed on Spokane Exchange.

Property: 25 claims, 10 patented, ¼ to 1½ miles from Adair, Ida., on main line of C. M. & St. P. Ry. First copper location in the eastern Coeur d'Alene. A fissure vein of 10 to 30' width, with N. E. strike and nearly vertical dip, has a paystreak carrying mainly massive chalcopryrite ore, balance of vein carrying disseminated chalcopryrite, mainly of concentrating grade. Occasional native copper is found. Shipment of selected ore returned 30.5% copper, 7 oz. silver and \$1.50 to \$5 gold per ton. The bottom level of the mine, which is wet, shows good ore.

Monitor mine was closed down 1910 after the entire plant had been destroyed by forest fires.

Company is driving tunnel to cut vein at 1,800' depth, or 1,100' below lower level of old Monitor shaft. Company has developed its own water-power for compressor plant.

MONITOR CONSOLIDATED COPPER MINING CO.

IDAHO

Stockholders sold property to Montana-Idaho Copper Co., 1914, for \$102,000, payable in shares of new company at par, stock to be exchanged April 17, 1917. See Mont.-Idaho C. Co.

MOONLIGHT MINING CO.

IDAHO

Burke, Idaho.

Officers: Eugene R. Day, pres.; Jas. J. Murphy, v. p. and mgr.; E. Hedin, sec.-treas.

Property: 9 patented claims, adjoining the Hercules mine on the east. The main tunnel through which the property has been worked is an extension of the old Trade Dollar tunnel, 600' below the upper workings and 900' below the outcrop. The vein was cut-in 1914 and drifting was started, but

vein was found to be cut off by a fault. A crosscut was then started 1,400' back. About 800' of drifting has been done, but little ore has been found. Working, April, 1916, but no 1917 returns received.

NABOB CONSOLIDATED MINING CO.

IDAHO

Address: H. C. Barnett, mgr., Kellogg, Idaho.

Inc. 1917 in Idaho. **Cap.**, \$3,500,000; shares \$1 par; 1,750,000 shares held by Stewart Mining Co., which organized and financed the Nabob Cons., which in turn absorbed Nabob Mining. (See Vol. XII, Mines Handbook).

Property: 3 patented and 22 unpatented claims in the Pine Creek section, near Kellogg, Idaho. Principal claims are the Denver, Mascot and Nabob.

Development: by tunnels; Denver No. 1 tunnel said to follow 18" to 10' of ore assaying 18% zinc, 12% lead and 5 oz. silver per ton for 220'; No. 2 tunnel, opening for 150', 3' of 15% zinc, 15% lead and 7 oz. silver ore. Reserves are estimated at 22,000 tons positive and 46,000 probable ore. The Federal company's mill has been leased, but Nabob is to have its own mill later.

NABOB MINING CO.

IDAHO

Absorbed by Nabob Consolidated Mining Co., which see.

NATIONAL COPPER MINING CO., LTD.

IDAHO

Address: August Paulsen, pres., Spokane, Wash. Mine at Mullan, Shoshone Co., Idaho.

Officers: A. P. McCrae, v. p.; Chas. McKinnis, sec.-treas.; Jas. F. McCarthy, mgr.; foregoing with Harry White, H. H. Stambaugh and R. C. Steese, directors.

Inc. Sept. 22, 1906, in Wash. **Cap.**, \$2,500,000; shares \$1 par; increased from 1,250,000 shares in July, 1913; 1,800,000 issued; 800,000 shares treasury stock were sold at 50c. Assessments of 19½c per share have been levied to date, a total of \$342,000.

Statement of accounts from March to Aug., 1917, shows receipts \$27,639, of which \$25,000 was from assessment No. 16. Expenditures totaled \$23,773. Cash on hand, \$3,866. Stock listed in Spokane.

Property: 9 patented claims, 180 acres, in Deadman gulch between Mullan and Larsen, on the north side of the Coeur d'Alene valley. It is about 1½ miles west of and in the same belt as the Snowstorm copper property, which it closely resembles in character. Ore occurs in a fault vein in thickly-bedded white Revett quartzite with talcose slips bordering the ore. The vein runs nearly E.-W. and dips steeply to south. The surface gives no indications of the great orebody 1,700' beneath it and in fact the ore-bearing quartzite does not show in the upper workings.

During the "boom" days of 1906-07, the company sank a 400' shaft and drove an adit tunnel developing a fissure vein and a strong fault, but found no ore in commercial quantity. Dec., 1912, a large body of silver-bearing copper ore was cut at a distance of 4,800' from the portal, about 1,000' lower than the old tunnel and shaft. The crosscut tunnel is driven about 4,000' through very hard and tight Wallace slates and St. Regis quartzites to a fault separating the St. Regis from the more favorable Revett quartzite. This fault showed mineralization, but no commercial ore. Beyond this fault the beds of white Revett quartzite run N. W.-S. E., dipping steeply, 80° S. E. About 200' from the big fault zone just noted, there is a nearly vertical quartz vein, filling a fault in Revett quartzite, the beds north of this vein running slightly north of west and dipping at but 45° south. This vein carries copper ore and a drift east disclosed the orebody which gave the mine its shortlived prominence. A sample cut across the orebody where it was 85' wide showed an average value of 2½% copper, 5 oz. silver and 80c in gold.

Development: by a 1,200' upper tunnel, 4,800' lower crosscut tunnel with about 1,000' of drifting on the vein, a 400' shaft with 400' of drifting and a winze sunk to the 1,500' level. In Feb., 1916, company reported sufficient ore above the 1,200' level to run the mill 2 years. Leached areas on the 800' and 1,000' levels make the extent of orebody uncertain.

New work done in 1917, totaled 736'. Shaft was sunk to 1,500' level and 284' of work done at that depth.

An estimate of 545,000 tons of ore available above the 1,000' level, made 1913, was changed to 170,000 tons because of an unexpected barren streak.

A 500-ton concentrator, flotation plant, 2-mile trolley line and other works were completed in April, 1914. The dry crushing plant can handle 500 tons in 16 hours and crush the ore to $\frac{1}{8}$ ". The storage bins have a capacity of 1,100 tons, receiving the ore over a 2-mile electrically driven railroad. The various motors at the mill total 615-h. p.

Mill was only operated in April and May, 1914. In Oct., 1915, operations were resumed, the mill crushing 4,243 tons of 0.83% copper ore carrying 1.99 oz. silver per ton; in Jan. making 22% concentrate valued at \$10,815, a loss of \$1,300 on operating expenses for the month.

Operations were suspended in June, 1916. In August, 1917, a crosscut from shaft at depth of 535' below main working tunnel, passed through 35' of ore of better grade than in upper workings, which confirms theory that better ore would be found at depth. Management considers that profits can be made treating this new ore and the mill is being operated again.

Property represents an investment of \$400,000 without a dollar's profit, the mill having been built before a producing mine had been developed. Deep development alone can open up a large tonnage, but management announced this would not be done unless new work above the 1,200' level justified it.

NELLIE MINING AND MILLING CO.

IDAHO

Listed in Vol. XII as Nellie Mining Co.

Owned by Jack Alger and Capt. A. P. Horton of Osborn and O. R. Young of Wallace, Shoshone Co., Idaho. Ernest Kelly, supt.

Property: $1\frac{1}{2}$ miles from Osborn, on O. W. R. & N. R. R., has a fissure vein with gray copper ore (tetrahedrite) in quartz, the ore being said to carry 100 to 240 oz. silver per ton.

Development: by 3 tunnels, shafts and 10,000' of stoping and raises. A crosscut on the 500' level opened up a vein 3' wide, showing good milling ore. Shipped 20 tons of high-grade ore in Sept., 1914, from leasing operations. Has water power plant for pumping and hoisting work, and a small mill. Company plans active development.

NEVADA STEWART MINING CO.

IDAHO

Wallace, Idaho.

Directors: A. J. Devlin, Dr. C. R. Mowery, Dr. Herbert Mowery, M. J. Sinclair and H. E. Huemann.

Inc. Nov. 19, 1915, in Idaho. Cap., \$150,000; shares 10c par.

Property: 7 claims in Pine Creek district, near Kellogg, Shoshone county, adjoining the Highland Surprise on the west, shows lead, silver, zinc ore in veins. A 500' crosscut tunnel driven, 1916.

Equipment: includes electric power and air compressor. Plant burned in 1917, but rebuilt.

NONPAREIL COPPER MINING CO.

IDAHO

Idle and supposedly dead.

Office: Wallace, Idaho. Mine near Mullan, Shoshone Co., Idaho. Amos M. Stroud, pres. and gen. mgr.; Jas. A. Wayne, sec.

Inc. in Idaho. Cap., \$1,500,000.

Property: 4 full and 3 fractional claims, on the west fork of Willow creek, across from the Carney mine, 3 miles S. E. of Mullan.

Development: by 4 tunnels. Surface ores have given assays up to 1.5% copper, and 8 to 19 oz. silver per ton. Has not replied to requests for information.

NORTH AMERICAN MINING CO., LTD.

IDAHO

Idle. Wallace, Idaho.

Officers: John Presley, pres.-mgr.; L. B. Whitton, sec.-treas., with A. Schmit and B. Knutson, directors.

Cap., \$1,500,000; shares \$1 par.

Property: 880 acres, in Coeur d'Alene district, Shoshone Co., Idaho, adjoining the Bunker Hill & Sullivan, and believed to carry the continuation of the B. H. & S. main fissure. Developed by two tunnels and equipped with water power, compressor drills, and surface buildings. Company was trying in 1916 to raise necessary funds to continue the main tunnel another 1,200' by means of spectacular advertisements written by an "advertising agent."

NORTH BUNKER HILL MINING CO., LTD.

IDAHO

Address: N. T. Hardy, mgr., Kellogg, Idaho.

Officers: Elmer Brown, pres.; J. L. Trowbridge, v. p.; N. T. Hardy, sec.; D. W. Price, treas.; with Chas. Cartwright, A. W. Vangilder and Lloyd Drais, directors.

Inc. Feb. 16, 1907, in Idaho. **Cap.,** \$1,250,000; shares \$1 par; 1,053,721 issued; assessable.

Property: 3 patented claims, 60 acres, at Wardner, Coeur d'Alene district, Ida., joined on the E. by the East Caledonia, on the W. by the Caledonia, and on the S. by the Bunker Hill & Sullivan Mines.

Development: sinking on orebody in Sept., 1917, at 300' from E. end line. In the tunnel, 150' from the portal, shaft has an incline of 52° to the S. Sinking is to continue to 400' to cut a vein which is over 60' wide in the East Caledonia and contains a 6' band of high-grade lead-silver ore.

NORTH FRANKLIN MINING CO.

IDAHO

Address: Norman Ebbey, pres., Wallace, Ida.

Inc. in Idaho. **Cap.,** \$1,000,000; shares \$5 par.

Property: 7 claims adjoining the Morning mine on north, near Mullan, Idaho. Idle.

NORTHERN LIGHT MINING & MILLING CO.

IDAHO

Office: Wallace, Ida. **Mine office:** Kellogg, Shoshone Co., Ida.

Officers: W. G. Nye, pres.; Fred W. Sachse, v. p.; Tom J. McGrath, treas.; Benj. E. Harmon, sec.-gen. mgr.; directors. S. E. Harmon, mine supt.

Inc. Jan., 1915, in Idaho **Cap.,** \$75,000; shares 5c par; assessable; one assessment levied Aug., 1915; 1,400,000 shares outstanding. Annual meeting second Saturday in May, at Wallace, Idaho.

Since June, 1915, \$45,000 has been expended on development; \$7,500 cash on hand, 1917.

Property: owns 2 claims and has 7 adjoining claims under bond and option, about 234 acres, 2½ miles south of O. W. R. N. Ry. on Pine creek, about 5 miles west of Kellogg, and 3½ miles west of the new Bunker Hill smelter at Bradley.

Bond on the 7 claims amounts to \$49,000 and has 3 years to run.

Property contains two veins: No. 1 vein is said to be 6' wide and to carry clean high-grade lead with 0.33 oz. silver, 1% lead, free from iron and zinc. Amount ore blocked out in this vein is estimated at 19,500 tons running 7% lead and 2.5 oz. silver. Extension of this vein into claims held under option shows 7,500 tons developed through 185' shaft.

No. 2 vein, 247' S. of No. 1, varies in width from 5 to 12' with continuous oreshoot developed for 200' by drift on 400' level, a 60' raise and 175' winze, from 400' level, also 100' of openings at bottom of winze, called 500' level. On 400' level 20,000 tons of ore are estimated as blocked out, averaging 5.5% lead, 9.5% zinc and 2.1 oz. silver. Winze and raise are being continued to prove continuity of ore and a 200-ton mill will be erected if ore continues. Ore on dump and available for milling is 3,000 tons. Shipping ore on dump is 50 tons.

Development: by 500' tunnel and 400' vertical shaft, with 2,400' drifts and crosscuts, 100' feet raises and 70' winze.

Equipment: includes hoist at main shaft, Ingersoll-Rand compressor, electric power, Gould and Cameron pumps, air hoist in winze, machine drills, etc.

Transportation: a complete survey for railroad up Pine creek was made 1916, by the O. W. R. N. Ry. Co. to serve the mines of this district all of which were recently examined by Albert Burch in interest of the railroad company to determine if sufficient ore is in sight to warrant 9-mile spur line. Recent construction of Bunker Hill smelter and that company's intention to build an electrolytic plant for the treatment of lead-zinc ores indicates possibility of road being built, 1917. In fact, the railroad company has since made written agreements with the mining companies to pay a bonus of \$1.50 per ton on the first 100,000 tons of ore shipped. Construction was expected to start in Sept., 1917.

Mine examined and reported on by Merriam Bros. of Wallace, Idaho, Albert Burch and S. L. Shonts, Wallace.

OLD VETERAN MINING CO.

IDAHO

Office: Barnard Blk., Wallace, Idaho.

Officers: M. J. Farrell, pres.-gen. mgr.; Allan G. Kennedy, v. p.; L. L. Brainard, sec.-treas.; with F. H. Harper and B. J. Farrell, directors.

Inc. March, 1915. Cap., \$150,000; shares 10 cts. par; assessable; 750,000 shares of stock were sold at 2cts. per share, upon which assessments of 2 cts. are to be levied every two months.

Property: 7 claims, 2 miles above Burke, Shoshone Co., shows several fault fissures. Developed by 1,500' of tunnels. No. 3 tunnel was 350' long at last accounts, and in Aug., 1917, it was reported that a few inches of copper ore had been cut.

ONTARIO MINING CO.

IDAHO

Officers: M. A. Folsom, pres.; Stanly A. Easton, treas. and gen. mgr. An apex suit brought by the Stewart Mining Co. was decided in favor of the Ontario Mining Co., giving the latter company a verdict for \$48,245.

Property: on Ontario Creek, adjoining the Stewart in the Kellogg-Wardner district, Shoshone county, shows quartz fissure veins carrying pyrite, sphalerite and galena ore, and proved to be the southern extension of the main Stewart orebody. The vein system is faulted, as in the Stewart, and the ore crushed, making mine operations troublesome.

Development: by 800' crosscut tunnel from which a shaft was sunk to 320' depth.

Equipment: includes a 200-ton mill.

Profits in 1914 were \$239,175; in 1915, \$223,724.

Production: in 1915, 81,208 tons of ore. No later returns.

OOM PAUL CONSOLIDATED MINING CO.

IDAHO

Office: Wallace, Idaho. **Mine office:** Burke, Idaho.

Officers: Jas. F. McCarthy, pres.-mgr.-treas.; F. H. Richardson, v. p.-supt.; L. E. Hanley, sec., with Edward Ryan, J. B. Sloan and Walter Mackay, directors.

Inc. April, 1907, in Idaho. **Cap.**, \$1,600,000; shares \$1 par; assessable; 5 assessments of 1c each levied; 1,397,598 shares issued. Stock listed on Butte and Spokane Stock Exchanges.

Property: 10 patented claims, 200 acres in Coeur d'Alene district, near Burke, shows silver-lead ore in fissure veins traversing a quartzite formation.

Development: by 2,761' crosscut tunnel, driven to cut the downward extension of the ore found above. A vein was cut but contained no values.

Equipment: consists of an Ingersoll-Rand compressor. Work suspended, July, 1917, because of disappointing results.

PANDORA COPPER MINING CO., LTD.

IDAHO

Address: Box 170, Wallace, Ida. **Mine office:** Larson, Shoshone Co., Ida.

Officers: Walter H. Hanson, pres.; John C. Weatherhead, sec.-treas. and gen. mgr.; preceding officers and C. M. Baillie, directors.

Inc. Oct., 1906, in Idaho. **Cap.**, \$1,000,000; shares \$1 par; assessable; issued, \$450,000. Annual meeting, fourth Wednesday in October.

Lands: 10 claims, 150 acres, adjoining the Snowstorm mine on the east, and supposed to carry about 3,000' of the Snowstorm ore zone. Property shows St. Regis and Revett quartzites, with copper impregnations in the latter.

Development: includes 1,750' main, or working tunnel, which has not yet crosscut the vein. Only assessment work done since 1915.

PARAGON CONSOLIDATED MINING CO.

IDAHO

Office: 436 Sibley St., St. Paul, Minn. **Mine office:** Paragon, Idaho.

Officers: Geo. S. Monson, pres.; M. O. Nelson, v. p.; F. O. Hammer, sec.-treas., with W. W. Dunn, Geo. J. Rank, R. C. Patterson, directors. L. W. Stedman, mgr., and N. A. Stockett, supt.

Inc. Nov., 1908, in Minnesota. **Cap.**, \$1,500,000; shares \$10 par; non-assessable; outstanding, \$1,202,700. Bonds: authorized \$100,000; outstanding, \$25,000. Annual meeting in November.

Property: 43 claims, 19 patented, about 850 acres, in the Coeur d'Alene district, shows fissure and contact orebodies. Values are in lead, zinc, silver and gold. Extent of workings, about 16,000'.

Ore is concentrated in a mill, capacity about 100 tons, leased from the Black Horse Co. Mainly zinc concentrates are shipped. Power is developed at water-fall nearby, but operations have been hampered by scarcity of water. The mine has been an intermittent shipper during the past few years.

PARK COPPER & GOLD MINING CO., LTD.

IDAHO

Office: 616 Cedar St., Wallace, Idaho. **Mine office:** Mullan, Shoshone Co., Idaho.

Officers: Thos. Brennan, pres.-mgr.; Nellie J. Stockbridge, sec.-treas.

Cap., \$1,500,000; shares \$1 par.

Property: 7 claims, on the southern side of Stevens Peak, 5 miles from a railway. The property is said to have a fissure vein in quartzite, of about 60' in average width, capped by a 40' gossan of mixed hematite and siderite, carrying kidneys of high-grade copper carbonates and chalcopryrite, with occasional native copper.

Development: by two 25' shafts, and 3 tunnels, the two upper tunnels showing ore, while No. 3, the lower tunnel, of 1,680' length, with a back of about 1,000', shows no ore. The mine has about one-half mile of workings. Idle.

PATUXENT MINING CO.

IDAHO

Address: Wallace, Idaho.

Officers: Jas. F. Callahan, pres.; J. H. Wemes, v. p.; F. C. Boutin, sec.

Property: adjoining the Cons. Interstate-Callahan on the S., in the Coeur d'Alene district, near Wallace, reported to show a 4' vein of high-grade lead-zinc ore, in a fissure zone 50' wide.

Development: totals 3,000' of tunneling, crosscutting and drifting.

PHEDORA SILVER-LEAD MINING CO. IDAHO
Kellogg, Idaho.

Officers: Wm. Schaefer, pres.-gen.mgr.; Geo. Moison, v. p.; W. W. Papesch, sec.-treas.; with Elmer Brown and Chas. Bollinger, directors. **Officers,** with exception of vice-president, reported to have resigned June, 1916.

Property: 12 lead-silver claims, adjoining the Jack Waite, in Eagle district, near Murray, Shoshone Co., Idaho, has been under development since 1909.

PHOENIX MINING & MILLING CO., LTD. IDAHO
Wallace, Idaho.

Officers: Norman Ebbley, pres.; Jos. Whelan, sec.

Cap., \$1,000,000; shares \$1 par; assessable; 800,000 shares outstanding. Annual meeting, 2nd Monday in May.

Property: 14 claims, in Coeur d'Alene district, near Wallace. Unproductive.

PINE CREEK DEVELOPMENT CO. IDAHO
Kellogg, Shoshone Co., Idaho.

Inc. in 1916 by W. W. Papesch, Geo. H. McKinnis, J. A. Rock and others, to operate the Sherman group on Pine Creek, Kellogg, under 2-year bond and lease.

Property: 6 claims, owned by the Sherman Mining Co. and developed by 1,000' of underground workings, said to show zinc and lead values.

Mine now leased to Sherman Development Co., which see.

PINE CREEK MINING & MILLING CO. IDAHO
Office: Wallace, Idaho.

Officers: Dr. C. S. Stone, pres.; H. Williams, v. p.; O. W. Lewis, sec.-treas.; R. S. Merriam, mgr.; above with J. A. Wayne and Geo. Steward, directors.

Inc. April, 1916, in Idaho. **Cap.,** \$150,000; shares 10 cts. par.

Property: 11 unpatented claims, known as the Lee group on Pine Creek, in Yreka mining district, adjoining the Hilarity claims reported to carry lead-silver ore. Will be developed, 1917-18. Consolidated Jan., 1917, with the Hilarity Mng. Co., Ltd., (which see).

PITTSBURGH LEAD MINING CO. IDAHO
O. B. Wallace, mgr. **Directors:** Henry L. Collins, G. B. Oberall, of Pittsburgh; W. M. Rumley and Christopher Murphy, of Chicago, and Senator A. Kerns. Merged with California Cons. Mng. Co. and Panhandle M. & M. Co., July, 1916.

Cap., \$1,000,000; all issued.

Properties: of the three above named companies are in Nine Mile Creek section, or Placer Center district.

Pittsburgh property: formerly a shipper but idle several years, comprises a small group only. **California Consolidated:** the Black Cloud group, 4 patented claims, idle since 1901, but owns mill 2 miles above Wallace, leased and operated until recently by the Marsh Co.

Panhandle group: 2 patented claims on Nine Mile Creek.

PLACER CREEK MINING & MILLING CO. IDAHO
Officers: F. C. Bailey, mgr., 2903 Sinto St., Spokane, Wash.; J. W. Wentworth, pres.; Geo. Yancy, v. p.; Ray E. Bigelow, sec.-treas., with Elmer West and R. G. Mack, directors.

Cap., \$1,000,000; shares \$1 par; 400,000 shares treasury stock and 50% of the issued stock reported under 1-year option from April 18, 1916, to F. C. Bailey, who is developing the mine.

Property: 5 claims, on Placer Creek, 6 miles from Wallace, Shoshone Co., Idaho, developed by a 1,400' tunnel, said to cut the vein at a vertical depth of 600'.

POLARIS MINING & DEVELOPMENT CO.

IDAHO

Address: Wallace, Idaho.

Officers: W. E. Mann, pres.; P. J. Gearon, mgr.; L. C. Wilson, sec.-treas., above with P. Schmitz and H. M. Davenport, directors.

Inc. Dec., 1915, in Idaho. Cap., \$50,000.

Property: 3 patented claims between Osborn and Kellogg, in the Coeur d'Alene, Idaho. Ore: lead-silver with some copper values.

Development: by tunnels and 165' winze.

Production: several carloads shipped reported to average 140 to 200 oz. silver and 3%-6% copper.

PORTOMA MINING CO.

IDAHO

Office: 213 Board of Trade Bldg., Portland, Ore.

Officers: D. C. O'Reilly, pres.; F. A. Knapp, sec.-treas.

Cap., \$100,000; shares 5 cts. par; \$53,000 issued.

Operating a group of claims in Shoshone Co., Idaho.

PRINCEMONT MINING CO.

IDAHO

Address: Marble Creek, Ida. J. D. Olley, supt., at Noxon, Mont.

Officers: S. B. Holbert, pres.; E. F. Holbert, v. p.; W. M. Ramsey, sec.-treas.; with W. H. Bating, C. F. Briggs and W. J. Williams, directors:

Inc., 1916, in Idaho. Cap., \$2,000,000; shares \$1 par; non-assessable; 1,650,000 issued. Annual meeting second Monday in September.

Property: 43 claims, 875 acres, as follows: Copper Prince of 13 claims on C. M. & St. P. R. R., Ida., also the Idaho-Virginia group of 24 claims, near St. Joe, Ida.; and the Pilgrim group of 6 claims near Noxon, Sanders Co., Mont. These properties contain copper and gold ores, others lead and silver ore and others only copper.

The Copper Prince and Idaho-Virginia properties are fully equipped; the former developed by 600' tunnel and 125' shaft and the latter by 162' shaft. The Pilgrim is opened by tunnels.

PURITAN MINING CO.

IDAHO

Idle. Address: Wallace, Idaho.

Officers: Frank Boutin, pres.; Theo. Anderson, v-p.; Jas. F. Callahan, treas.; Chas. A. Solberg, sec.; above with O. B. Olsson and John H. Roberts, directors:

Property: a group of lead-silver claims in Placer Center mining district, Shoshone Co., W. of the Tamarack & Chesapeake.

Development: by 1,100' tunnel. Patent applied for in 1914. No recent information published.

RAINBOW MINING CO.

IDAHO

Letters returned, 1917. Control under option to S. Edward Brown of Kellogg until July 25, 1916.

Cap., \$1,000,000; shares \$1 par; 800,000 in treasury.

Property: on Little North fork of the Coeur d'Alene river shows quartz vein 10'-25' wide with silver, lead and zinc ore.

Development: to be by tunnels to cut lode at a depth of 450'.

RAINBOW MINING & MILLING CO., LTD.

IDAHO

Office: Peyton Bldg., Spokane, Wash.

Officers: Geo. Austin, pres.; S. Hofslund, v. p.; R. P. Woodworth, sec.-treas., with Terrett Towles, A. A. Nourse and A. Bronson, directors.

Inc. June, 1907, in Idaho. **Cap.**, \$300,000, increased 1913 to \$500,000; shares 25 cts. par, assessable; 800,000 in treasury, Aug., 1917. Annual meeting, June 1st.

Property: 19 claims, 7 patented, 360 acres, in 2 groups. The Rainbow No. 1 group, 3 miles west of Wallace on Shields creek, has St. Regis and Burke quartzite cut by the Sunshine and the Rainbow veins. The Sunshine vein carries grey copper ore with iron and quartz gangue. Development, 2,200', includes a 40' tunnel on the Sunshine vein and the main No. 3 tunnel on the Rainbow vein. Latter follows vein N. 75° W. for 1,350', exposing 3" to 4' of vein filling with black footwall seam containing tetrahedrite, galena and chalcopyrite. Another tunnel on the opposite side of the creek is 450' long. Commercial ore expected at greater depth.

Equipment is ample. Railroad is $\frac{3}{4}$ mile away.

The second group, of 5 claims, bought 1910, is about 3 miles from the Handspike mine, and 15 miles from a railway, at the mouth of Bootjack creek, a tributary of the North fork of the Coeur d'Alene river, in Secs. 23 and 24, T. 31 N., R. 1 W., in an unorganized district. This property shows a vein of 12' estimated average width, traceable 6,000', carrying lead and copper ore, associated with iron carbonate, in a quartz gangue. Development by crosscut and drift, by tunnels 575' long.

Improvements include 5 buildings and an air compressor on No. 2 group. Company is developing steadily with funds derived from stock sales on the assessment plan.

RAY JEFFERSON MINING CO.

IDAHO

Address: Daniel L. McGrath, mgr., Wallace, Idaho.

Officers: E. R. Day, pres.; H. L. Day, v. p.; with Geo. K. Garrett, directors.

In May, 1916, control passed to the Day interests, owners of the Hercules, Tamarack-Custer mines, and of the Northport S. and R. Co. Company sold treasury stock to finance construction of mill and installation of electric haulage system, 1916. The company had \$100,000 in treasury May 1.

Property: 38 claims, 600 acres in a compact group, adjoining the Consolidated Interstate-Callahan holdings and including the Hill group. Is reported to show the Interstate-Callahan, Amazon and Manhattan veins, one with an orebody 400' long. The Carlisle is a cross vein running northerly and intersecting the Interstate. The latter is supposed to be the Hercules vein.

Development: by the Blue Grouse and Carlisle tunnels. The Mountain Goat tunnel opens a shoot 300' long, showing 3' of shipping ore and 9' of mill ore on the Callahan vein. The Carlisle tunnel has 400' of drifting on the vein of this name, carrying 5' to 10' of mill ore for the entire distance. About 50 men employed. A 400-ton mill and 30-drill compressor were installed in 1916. The mill is not in operation, pending further development work.

The Beaver Creek branch of the O. W. R. & N. R. R. was completed to the Ray Jefferson property in Feb., 1917.

RED MONARCH CONSOLIDATED MINING CO.

IDAHO

Offices: 417 Hutton Bldg., Spokane, Wash., and Wallace, Idaho.

Officers: Conrad Wolfe, pres., gen. mgr.; W. G. Collins, v. p.; Gale Smith, sec.-treas., with G. I. Toevs, Orris Dorman, F. R. Wolfe and Ralph Smith, directors. Henry Hewer, supt.

Inc. in 1915, in Washington. **Cap.**, \$2,000,000; shares \$1 par; assessable. Annual meeting, first Tuesday in April.

Property: 43 claims, about 800 acres, in Beaver Creek district, 9 miles

north of Wallace, adjoins Cons. Interstate-Callahan on the west; claims are on S. W. slope of Sunset Mt. and on opposite side of the mountain from the Interstate. Said to show 5 well defined fissure veins of silver, lead, zinc ore in Frichard slate and Burke quartzite. Veins are parallel, strike N. 70° W., dip 80° to the S. W.

Development: up to the time acquired by the present company, Nov., 1915, consisted of 2,000' of prospect tunnels and open cuts. Ore had been found in one tunnel, 650' long, at a depth of 500'. Company is now driving two tunnels from Missoula Gulch, one north to attain a depth of 1,000' within a length of 1,000', and one south to attain a depth of 2,000' within a length of 3,000'.

Equipment: includes an Ingersoll-Rand compressor, capacity 2,000 cu. ft., operated by a 250-h. p. G. E. motor.

Property is considered promising.

REINDEER QUEEN MINING CO.

IDAHO

Office: Wallace, Idaho. **Mine address:** Mullan, Idaho.

Officers: E. B. Crawford, pres. and mgr., Mullan; J. C. Glahe, v. p.; J. H. Wixon, treas.; W. B. Heidfelt, sec.; preceding with A. R. McRae, P. P. Weber and S. D. Le Mieux, directors.

Inc. Sept. 19, 1913, in Idaho. **Cap.**, \$200,000; shares 10 cts. par, assessable. Company is a consolidation of the Copper Queen and the Reindeer Queen companies, whose holdings are contiguous and cover extensive copper exposures. The new company assumed all obligations of the old corporation and exchanged stock, share for share. The consolidation makes possible the speedy development of the orebody already cut by the Reindeer tunnel, which has been extended as a drift along the vein into the ground heretofore owned by the Copper Queen.

Property: 15 claims in the Mullan copper belt, including the Stevens Peak (or Copper Queen) group and the Reindeer group of 6 claims, all at the head of Willow Creek. The outcropping shows a big copper-stained fissure vein, 5 to 20' wide.

Development: by a crosscut tunnel which has cut the vein at a depth of 800', showing bornite and chalcopyrite ore opened by a drift on the vein. Some lead-silver ore occurring in Burke quartzite was encountered in drift, May, 1917.

Equipment: includes compressor, 200-ton mill and electric power.

Examined by Rush J. White, 1915.

REX CONSOLIDATED MINING CO.

IDAHO

Offices: 25 Broad St., New York, and Wallace, Ida.

Officers: L. E. Whicher, pres.; Raymond Guyer, v. p. and gen. mgr.; R. M. Atwater, Jr., treas.; with C. C. Burger, John Gorlow, Robert Sweeney, E. Cohen, Harold Pierce, and Henry Sachs, directors; H. Pelz, sec.; N. C. Sheridan, supt.

Inc. July, 1915, in Delaware. **Cap.**, \$1,500,000; shares \$1 par; increased to \$2,000,000 in Oct., 1916; 1,900,000 outstanding; reduced to \$1,205,000; shares 25 cts. par, Oct. 22, 1917. U. S. Corp. Co., 36 Nassau St., New York, transfer office and registrar. Annual meeting, third Monday in February. Listed on Spokane and Butte exchanges, Boston and New York Curbs.

Annual report for year 1916 shows assets of \$2,142,231, which includes property, \$1,869,445; investments, \$39,070; cash, \$51,684; development and equipment, \$182,031. Current liabilities were \$34,361.

Property: 15 claims and a mill-site, 185 acres, in Nine Mile section, Coeur d'Alene, including the Sixteen-to-One mine near the Cons. Interstate-Callahan and Success mines, held under bond and lease. Was extensively

developed years ago by the Finch-Campbell interests of Spokane, but increase of zinc values at depth made operations unprofitable. About 4 years ago the mine was reopened by another company and much money spent in equipment for deep exploration. In Dec., 1915, this company took an option on the property of the Black Bear Cons., which see; after paying \$10,000, the option was relinquished.

On Sept. 29, 1917, it was decided to complete purchase of the property and Rex mill and further develop at depth; also to acquire the Friel tract in the Miami zinc belt of Oklahoma, which has been extensively drilled.

The claims are in the slate belt, long considered valueless as an ore formation, until W. H. Weed attacked this view and demonstrated its falsity by work at the Interstate-Callahan. The claims contain 3 strong veins, the Rex, Okanogan, and Delaware, which converge at depth.

Development: through a main working tunnel, 900' long. Below this a 2-compartment shaft has been sunk to No. 9, or 1,380' level. A crosscut at this depth cut the 3 parallel veins. The Okanogan vein is strong and measures from a few inches to 10' in width. The Delaware outcrops stronger than the Rex or Okanogan and lies 350' S. of the latter. Underground work totals over 10,000', at a cost of over \$350,000. From a relatively small area in the upper workings there was produced more than \$800,000 of silver-lead ore. Most of the zinc remains.

Equipment: 75-h. p. electric hoist and 3 air hoists underground, 15-drill compressor of 1,050 cu. ft. capacity driven by 200-h. p. motor and mill costing \$200,000. On lead ore the mill has a capacity of 350 tons daily, and on zinc-lead ore, 200 tons; the latter capacity is to be enlarged. Plant includes flotation and an Oliver filter. At upper terminal of the 6,600' aerial tram of 400 tons capacity, a modern sorting plant is operated. Surface improvements include repair shops, bunk and boarding houses, dwellings, etc.

Production: lead-zinc concentrates worth \$16,000 in August and \$24,000 in September, 1917. One car of zinc and four of lead concentrates per month are now being shipped.

RIVERSIDE MINING CO.

IDAHO

Address: T. R. Mason, pres., Kellogg, Idaho. Owned in Kellogg and Spokane. Claims in National Forest Reserve, at headwaters of the North Fork of Coeur d'Alene river.

Property: shows a 7' vein with 18" of high-grade silver-lead ore.

Development: 460' crosscut tunnel with 100' back.

ROBERTA MINING & MILLING CO.

IDAHO

Mine near Gem, Shoshone Co., Idaho.

Officers: Jos. Lutey, Jr., pres.; E. V. Moran, sec.; W. C. Orton, treas.; Thos. Roberts, mgr.; preceding with Curtis Lewis and Alex. Penaluna, directors.

Property: 12 claims, patented, well timbered, on Nine Mile Creek, carry 4 known veins.

Development: by tunnels, lower 300' long, to be driven 2,000' to give a back of 800' and to cut 4 veins, one of which shows lead and copper carbonates at surface, giving assays up to 6% copper, 10% lead, 16 oz. silver and \$3 gold per ton. Company's holdings are in the lead belt of the Coeur d'Alene.

SAINT JAMES MINING & MILLING CO.

IDAHO

Mrs. Theresa James, mgr., Wallace, Idaho.

Inc. 1911, in Idaho. Cap., \$50,000; shares 5 cts. par.

Property: the St. James mine, comprising the Ula and Try Me claims on Sunset peak near Wallace. Ore: carries lead, silver, and zinc. No. 2

tunnel started Nov., 1915, cut vein at 300', showing 8' of milling ore. Drift toward shaft is in 700' with 600' to go, making a vertical depth of 900' on the vein.

SHERMAN DEVELOPMENT CO.**IDAHO**

Office: Wallace National Bank Bldg., Wallace, Idaho.

Officers: Charles McKinnis, E. R. Day, H. R. Allen, A. Swan, and D. A. Swan, directors.

Inc. in Nevada. Cap., \$500,000; shares 25 cts. par.

Has lease on the Union mine near Burke, probably that described under Pine Creek Development Co.

Development: proposed to explore 700' deeper by extending Hidden Treasure tunnel 1,800' in Sherman ground. At 900' depth 3' of lead-zinc shipping ore has been opened and shipments made.

SIERRA NEVADA CONSOLIDATED MINING CO.**IDAHO**

Subsidiary of Bunker Hill & Sullivan Mining & Concentrating Co., which see.

Officers: Stanley A. Easton, pres.; C. W. Simmons, sec.

Production: in 1915, 15,159 tons.

Net profits in 1914 were \$159,339; in 1915, \$46,364—a decrease in 1915 of \$112,985.

Company began production in July, 1913, selling its output under contract to April 29, 1915, to the American Sm. & Ref. Co. Management being unable to extend contract satisfactorily, discontinued production and only moderate exploration and maintenance work has been done since. Said to have considerable ore reserves.

Not operating in 1916.

SILVER CLIFF GOLD AND COPPER MINING CO., LTD.**IDAHO**

Idle. Office: Wallace, Idaho. Mine near Larson, Shoshone Co., Idaho. Jas. D. Young, pres., treas. and gen. mgr. Edw. C. Young, sec.

Cap., \$1,500,000; shares \$1 par; an assessment of 5 mills was levied Sept. 15, 1917.

Property: 18 claims, 7 miles from Mullan, developed by 3 tunnels, the lower of 850' and longest of 1,500', showing copper ore with some lead and fair gold value.

Equipment: includes a Pelton wheel and an 8-drill air compressor. No report received 1916 or 1917.

SILVER MOON MINING CO., LTD.**IDAHO**

Office: Ed. Ehrenberg, Box 297, Spokane, Wash.

Officers: Eugene Sage, pres.; H. C. Lambach, v. p.; G. Ehrenberg, sec.-treas.; with Geo. Steward and Ed. Ehrenberg, directors.

Inc. Sept., 1906, in Idaho. Cap., \$1,500,000; shares \$1 par; assessable; \$46,903 issued.

Property: 9 claims, north side of Canyon Creek, 4½ miles from Wallace, adjoining the Frisco mine, shows 2 veins of lead ore in quartzite.

Development: by 2,133' crosscut tunnel and 1,533' of other work, to depth of 600'. Prospecting being continued, while 2 veins cut in tunnel are to be opened.

Equipment: includes a 200 cu. ft. compressor, electrically driven.

Property is a prospect; reported that "buyers must be prepared for a long pull"—which is undoubtedly true.

SILVER MOUNTAIN MINING CO., LTD.**IDAHO**

Office: Potlatch, Idaho.

Officers: L. Tice, pres.; E. D. Wilkins, v. p.; W. E. Horstkotte, sec.; G. L. Fulton, treas.; directors; Arthur Horstkotte, mgr.

Property: 9 claims, 4 patented, near the Alice mine, on St. Joe Gulch, shortly west of the Morning Mill, about $3\frac{1}{2}$ miles from Mullan. The mine has 3 tunnels, and a 900' crosscut tunnel intersects an 8' vein carrying ore said to give assays of 2% copper, 3 oz. silver and \$1.80 gold per ton.

Equipment: includes a small steam plant and an air compressor. Development with a small force.

SILVER TIP MINING CO.

IDAHO

Office: care Coleman & Rietze, 50 Broad St., New York. **Cap.,** \$150,000; shares 10c par.

Property: 140 acres in Coeur d'Alene district on Montana side of divide, north of Wallace and 2 miles from Snowstorm mine and Big Eight.

Development: 800' of tunnel work. Is a prospect.

SILVERADO MINING CO.

IDAHO

Office: C. D. Muxen, sec.-treas., Old National Bank Bldg., Spokane, Wash.

Officers: Dr. W. B. Pickrell, pres.; W. Wood, v. p.; preceding with John Wyand, Gus Eiler, H. A. Long, directors. W. L. Zeigler, supt., Osborne, Idaho.

Inc. in Wash. Cap., \$2,500,000; \$1 par; about 1,850,000 shares issued. Has a \$4,000 mortgage.

Property: a group of claims near Osborne reopened in 1915, after several years' idleness, shows fissure vein in shale, running downward into the underlying quartzite.

Development: 4,000' tunnel, 400' of it a drift on a 1-3' vein showing 6"-18" silver-lead and gray copper ore. A 120' winze shows persistence downward.

Reserves in September, 1917, were sufficient for several months' milling. At 4,000' in main tunnel and at depth of 1,400', there has been opened 100' of ore $3\frac{1}{2}$ " wide, assaying 0.4% copper, 10.4% lead and 13.4 oz. silver per ton.

Equipment: includes compressor and electric power. A 100-ton mill with flotation plant was working one shaft daily in September, 1917. Has 6-drill compressor and electric power.

Mill seems to have been erected before enough ore was developed, as there was a suspension during the year.

SNOWSHOE MINING CO.

IDAHO

Mullan, Shoshone Co., Idaho.

Officers: P. J. Gearon, pres.; Paul Lucia, v. p. and gen. mgr.; H. G. Loop, sec.-treas.; with J. A. Bean and A. P. McRae, directors.

Inc. Sept., 1903, in Idaho. Cap., \$1,000,000; shares \$1 par; assessable; fully issued; 13 assessments of 5 mills each and one of $2\frac{1}{2}$ mills levied to March, 1917. Shares are listed on the Spokane and Butte Exchanges. Annual report to Jan. 1, 1916, shows cash on hand, \$2,000. Expenditure in 1916 amounted to \$10,380.

Property: 7 claims, patented, adjoins the Snowstorm on the east and supposedly carries the extension of the Snowstorm fault, at the head of Gentle Annie gulch, near the top of Snowstorm mountain, in the Hunter district, 1 mile from railway. Claims show Revett quartzite, mineralized for 30' in the Snowstorm fault, with some cuprite, azurite and chalcopyrite, giving assays up to 9% copper and 8 oz. silver per ton.

Development: by crosscut tunnels, longest 2,000', and drifts, a total of about 5,000' of underground workings, showing a mineralized zone of 30 to 40' width, carrying various copper ores sparsely disseminated. Drifting on the N.-S. fissure opened up a body of high-grade copper ore, 8"-2' wide,

at 650' depth and about 1,600' from portal of No. 2 tunnel. The upper cross-cut tunnel, 700' long, intersected a vein up to 60' wide and running from 1-20% copper, at a vertical depth of 250'. A second crosscut, 696' vertically below No. 1, cut the vein 1,700' in without disclosing any values.

No. 2 tunnel has been extended 1,000' since Jan. 1, 1917.

Equipment: includes an air compressor, power house and several buildings. Further development planned and necessary.

SNOWSTORM APEX MINING CO.

IDAHO

J. H. McIntyre, M. E. Delgrove and B. V. May of Spokane, trustees. Inc. 1908 in Wash. **Cap.**, \$1,500,000; shares \$1 par.

Property: on Snowstorm mountain, east of Mullan, shows 2 veins opened by a shallow shaft and a 130' tunnel, with about 200' of workings.

Leters returned in 1917 from Mullan.

SNOWSTORM EXTENSION COPPER MINING CO.

IDAHO

Address: A. J. Richardson, treas., 216 Wright & Callendar Bldg., Los Angeles, Calif. **Mine Address:** Mullan, Shoshone Co., Idaho.

Inc. Oct., 1909, in California, as successor of Snowstorm Extension Mining Co., Ltd. **Cap.**, \$1,000,000. Assessment of 2 mills per share, delinquent March 3, 1914.

Property: 9 claims, adjoining the Snowstorm on the east, supposedly carry the extension of the Snowstorm ore zone. Pits and trenches have shown ore of about 3% copper tenor, markedly similar to that of the Snowstorm.

Development: by a drift tunnel, starting from North Fork creek, 2,000' long at last accounts, planned to be driven to secure an eventual back of 1,630', on the dip of the vein.

SNOWSTORM MINING CO.

IDAHO

Company being dissolved, July, 1916. Succeeded by Snowstorm Mines Consolidated (Montana), which see.

Office and mine: Larson, Shoshone Co., Idaho.

Officers: Leo Greenough, pres.-gen. mgr.; J. W. Greenough, v. p.; R. E. Walter, sec.-treas., preceding, with J. B. Greenough, J. C. Broad, M. D. Hall and H. E. Chaney, directors.

Inc. July, 1900, in Idaho. **Cap.**, \$1,500,000; shares \$1 par; non-assessable; issued 1,499,500 shares. For fiscal years ending June 30, earnings were \$5,677 net in 1905; \$144,322 in 1906; \$493,013 in 1907; \$243,262 in 1910; \$25,691 in 1911; \$15,787 in 1912; \$141,639 in 1913; \$152,904 in 1914 and in 1915 there was a net deficit of \$57,891. Company reported a surplus of \$172,761 June 30, 1915 and profit of \$119,677 for 1916.

Dividends: \$90,000 in 1906; \$360,000 in 1907; \$150,000 in 1908; \$202,000 in 1909; \$179,940 in 1910; \$44,985 in 1911; \$74,975 in 1912, \$142,452 in 1913 and \$22,492 in 1914, a total of \$1,169,640 to end of fiscal year, 1914.

The property of this company was fully described in Vol. XI, Copper Handbook. By Sept., 1914, ore reserves had been exhausted and mining ceased, but development work was continued until June, 1915, at which time the mine had been thoroughly explored down to and including the 2,200' level. Exploration was fruitless.

In view of the fact that the company owned complete surface and underground mining equipment and had about \$160,000 cash on hand, the management deemed it desirable to continue in other mining activities rather than dissolve. Since then it has been searching for other properties. It had an option on 650,000 shares of the Missoula Copper Co. and did considerable development work on the property, but last reports state it had surrendered its option to the National Copper Co. for \$27,000.

Production: (for fiscal years ending June 30)

Year	Ore, Tons	Copper, Lbs.	Silver, Oz.
1905	.....	4,950,000	.....
1906	.....	6,233,940	.....
1907	76,224	6,850,000	525,000
1908	87,503	8,000,000	596,000
1909	119,816	10,363,438	734,968
1910	91,368	7,125,105	605,075
1911	84,464	2,653,036	267,263
1912	29,964	2,074,447	204,870
1913	.....	4,522,605	368,906
1914	.....	4,632,943	286,695
1915	.....	775,980	45,090

SONORA MINING & MILLING CO.

IDAHO

Dr. W. A. Smith, sec., White & Bender Bldg., Wallace, Idaho. Norman Ebbly, C. W. Gibbs, A. H. Featherstone, E. O. Hering, all of Wallace, are heavily interested. Funds are raised by occasional 2 mill assessments.

Property: 12 claims, patented, over the hill from the Marsh mine above Burke. Is an old mine on which work has been prosecuted since 1896, spending \$75,000 and doing 3,200' of work prior to 1908, when a 6' vein was cut at 1,400' from portal and at depth of 800'. In 1914, a contract with John Moffat was made to "find" the vein for 100,000 shares of stock.

In 1914 a shaft and winze was sunk on the Cooney vein at 1,950' from the tunnel mouth, the ore-shoot proving elusive on the Sonora vein. In 1916, company let contract for 200' extension of the 1,500' tunnel, hoping to crosscut another vein. Another extension of 100' was driven late in 1916.

STANLEY MINING CO.

IDAHO

Burke, Idaho. **Cap.**, \$1,500,000; shares \$1 par; treasury, 200,000 shares. Listed in Spokane. Controlled by Day family, principal owners of Hercules Mining Co.

Property: 12 patented claims, west of Benton and N. E. of Humming Bird, in George Gulch, N. of Burke, said to show antimony ore. Authentic information is scarce. The Humming Bird crosscut tunnel, run by the Hercules, passes through Stanley ground. In June, 1916, was shipping antimony-gold ore.

STAR ANTIMONY CO.

IDAHO

Address: Kellogg, Idaho.

Officers: Burke A. McIntosh, pres.; W. W. Papesh, mgr.; J. S. Ross, sec.-treas.

Inc. March, 1916, in Idaho. Cap., \$10,0000; shares 1c. par.

Property: the Brown & Fennell claims and others, eleven in all, on Pine Creek, Coeur d'Alene district, Idaho. Ore carries antimony sulphide as stibnite.

Development: by 3 tunnels, equal to 1,500'. Exploration under way in 1917.

Production: 3 carloads in 1916, assaying 52.4 to 54.8% antimony. Mine assayer reports 50c. to \$15.36 gold per ton.

STEWART MINING CO.

IDAHO

Office: 61 Broadway, New York. **Mine office:** Kellogg, Idaho.

Officers: H. C. Todd, pres.-treas.; C. W. Saacke, v. p.; C. T. Lark, sec.; C. L. Williams, asst. treas.; Wm. A. Beaudry, gen. mgr.; with Judge Nash Rockwood, directors.

Inc. Aug. 29, 1902, in Idaho. Cap., \$1,250,000; shares \$1 par, increased July, 1916, to \$3,000,000; shares \$1 par; 2,738,362 outstanding. No bonded indebtedness. C. L. Williams, New York, transfer agent. Metropolitan

Trust Co., New York, registrar. Annual meeting in August. Listed on New York Curb.

Balance sheet of June 30, 1917, shows: total assets, \$3,430,544, which includes plant and equipment, \$2,981,927; ore and concentrates, \$16,143; acct's receivable, \$45,309; demand loans secured by collateral, \$78,125; cash, \$20,389. Current liabilities, \$21,996. Surplus was \$670,186.

Profit for fiscal year 1915 was \$654,694, almost \$200,000 less than dividend requirements. Earnings in 1914 were \$854,436. Company controls the Coeur d'Alene Development Co. through ownership of 562,498 shares out of 1,000,000 shares.

Dividends: paid at the rate of 10c quarterly from 1913 to Dec., 1915, with extra dividends amounting to 32½c in 1913; 62½c in 1914; 70c in 1915. Rate was reduced to 5c quarterly in 1916.

Property: the Stewart mine at Kellogg, 8 claims, partly patented, 150 acres, 2,000' along the outcrop of the contact, carries silver-lead ore averaging \$6.06 per ton. Country rock is soft Burke quartzite. Output during 1914 and 1915 averaged 500 tons daily, but reduced to 125 tons in 1916. The mine is practically worked out, and as extensive development work in 1915 failed to locate any new orebodies, management purchased properties at Tuscarora, Nevada, and the Coeur d'Alene Development Co. property, which adjoins the Stewart.

The Tuscarora property is estimated to contain from 400,000 to 600,000 tons of \$14 ore, for which a 300-ton mill has been erected.

In Idaho the Nabob and Denver mines were bought. In September, 1917, 2 to 4' of ore in the Nabob assayed 13% lead and 5 oz. silver per ton. A mill is to be erected near the Denver mine. On May 27, 1917, W. A. Beaudry reported on the Nabob and Denver claims in the Pine Creek district. Country rock is one of the Algonkian sedimentary series, known as Pritchard slate. Veins of these mines are true fissures cutting the bedding planes of the slate at nearby right angles. Faulting is common, though not troublesome. Lead occurs as galena and zinc as sphalerite. The Denver is developed by tunnels, and ore blocked out amounts to 22,000 tons, probable ore, 46,000 tons.

Tests on ore assaying 5.4 oz. silver, 13.3% lead, 14.5% zinc, 7.3% iron and 50% silica, 10.1% zinc and 21 oz. silver; also ore containing 34.2% zinc, gave by gravity concentration, a concentrate assaying 59.5% lead, 10.1% zinc, and 21 oz. silver; also ore containing 34.2% zinc; both suitable for smelting. Estimated costs for all operations are \$5.75 per ton, leaving a profit of \$11.33 per ton. Mine yielded 100 tons daily in May, and 300 tons in November, 1917. Treating 100 tons daily, the monthly profit should be \$34,000. The Nabob contains 10,000 tons of positive ore, assaying 8% lead and 2 oz. silver per ton.

Mill: the Stewart mill at Wallace, 12 miles from the mine, has a daily capacity of 500 tons. **Equipment:** includes crusher, 4 sets of rolls, 2 Huntington's, 12 Wilfley tables, 18 Frue vanners, 36 Harz jigs, 4 Deister slimers. A flotation unit was added in 1914. General Naval Stores flotation oil is used. Concentration ratio is 6 into 1, the product averaging 50% lead and 50 oz. silver per ton.

Production and Costs in 1915: (1916 not published.)

Tons extracted.....	189,615
Gross yield.....	\$2,140,363
Cost of extraction.....	612,796
Cost of transportation mine to mill.....	29,392
Cost of smelting.....	563,833
Cost of reduction.....	76,592
Cost of repairs.....	3,317

Management has been searching for new properties for some time, and various mines have been investigated and considered, including the Old Sport Group of the Quatsino Copper Co., comprising 26 patented claims, 2,000 acres, Vancouver, B. C., on which \$100,000 was spent before the option was relinquished.

Litigation with the Ontario Mining Co., was decided adversely, April 1915, and the Ontario company granted \$48,000 for ore illegally extracted.

Notwithstanding the spectacular career of the Stewart Company under the Heinze regime, the mine made good, paying \$1,000,000 a year dividends for two years.

The Stewart mine is earning \$9,000 per month net and company is to treat tailings.

Coeur d'Alene Development Co.

Property: 10 patented claims, developed to 400' level and equipped with a mill. Ten years ago a rich orebody produced about \$150,000 worth of ore, but property was abandoned when this vein was worked out. Extensive development work under way.

SUCCESS MINING CO.

IDAHO

Office: Wallace, Idaho.

Officers: P. J. Gearon, pres. and gen. mgr.; Jas. Gearon, v. p.-supt.; L. C. Wilson, sec.-treas.; with E. H. Becker and C. M. Carroll, directors. **Cap.,** \$1,500,000, shares \$1 par; all outstanding stock listed in Spokane and Butte; traded in on New York Curb.

Balance sheet: Dec. 31, 1916, showed: assets, \$1,680,354, which included: property, \$1,514,002; cash, \$150,871; ore in transit, \$2,450; other current assets, \$15,010. Liabilities included: surplus, \$137,151; current, \$43,203.

Profit and loss statement: income, \$702,902; operating expenses, \$471,862; profit, \$231,040; balance from 1915, \$251,111; total available, \$482,151; from which \$345,000 was paid in dividends, leaving surplus of \$137,151.

Dividends: suspended April 20, 1913, totaled \$345,000 to that date; resumed April 30, 1915 and \$550,000 paid in 1915; \$345,000 to July 26, 1916; none since.

Property: is one of the oldest located properties in the Wallace district; first operated by the Granite Mining Co., taken over in 1905 by H. F. Samuels, who organized the Success Mining Co., continued under his management until 1915, when control passed to "practical" mining men and brokers, and large blocks of stock, aggregating over 1,000,000 shares, were worked out through the New York, Duluth, Spokane and Butte exchanges.

The company has had considerable publicity during the past year, due to stock manipulation, said to be aided by the management, and to friction between the management and several publications on mining news. This has been aggravated by the seeming aversion of the directors to take stockholders into their confidence, especially in connection with the new smelter contract with the Grasselli Chemical Co., effective May 1, 1916. The distrust of the management culminated, April, 1916, in the Success officials being summoned to court to show why stockholders should not know the terms of contract. This covers 2,000 tons monthly for 3 years, with minimum zinc content of 38%, and maximum lead of 5% at certain prices.

Litigation with the adjoining Alameda company, which claimed payment for ore, said to have been extracted from its ground by Success, was decided in favor of Alameda Co., but the Success Co. appealed and won. This was followed by the Alameda appealing, but the court dismissed case in May, 1917.

Property: 8 claims on Nine Mile Creek, 2 miles N. W. of Wallace. Company also operates the Red Bird mine in Custer county, where 828-

727 tons of 10.73% lead and 7.86 oz. silver ore is estimated in reserve. A 100-ton mill was to be erected in 1917.

Ore: zinc with lead-silver content. According to U. S. G. S. Prof. Paper, No. 62, there is no vein, the ore occurring in masses of irregular form and size, which are chiefly replacements of quartzite in places where it has been most thoroughly fissured. The ore is strictly confined to the sedimentary rock; surrounding country rock is monzonite.

Development: by tunnels to 700' level, and by shaft from 700' to 1,500' level, the latter recently opened. New work in 1915, 1,575', included 200' of shaft sinking. Considerable time and trouble were required to locate the ore on the 1,200' level.

Ore reserves: under date of Jan. 24, 1916, the president reported "tonnage now in sight is better than at any time during the past year, and is estimated sufficient to run the mill at the present rate for about 18 months." Grade of ore not given. Examination made in March, 1916, said to show 21,500 tons ore, blocked out above the 1,200' level, and in addition 87,200 tons of probable ore, no grade given.

The nature of the ore occurrence almost necessitates having but small reserves. Present conditions indicate the possibility of opening up new ore at depth. In May, 1917, it was reported that the orebody had been cut on the 1,500' level, showing 6' of high grade zinc ore and considerable lead.

Equipment: includes a 250-ton mill. Flotation is used.

Production: in 1916, was valued at \$693,045 from zinc, lead, silver and flotation slime.

The reticence of the management regarding operations and costs, its connection with the stock promotion, and the many conflicting reports issued, are all poor policy and have tended toward giving a feeling of uncertainty to stockholders and the investing public. If the management is sincere, a little frankness would do no harm.

It was reported in September, 1917, that company's books were to be examined by court order. Overhead charges are said to be excessive and in each month for a year there have been losses. Ore sales for 7 months in 1917 were \$226,000 against \$555,000 in that period of 1916. The whole affair is highly unsatisfactory.

TAMARACK & CUSTER CONSOLIDATED MINING CO. IDAHO

Wallace, Idaho. **Officers:** J. J. Day, pres., gen. mgr. and treas.; E. R. Day, v. p.; H. L. Day, sec.; R. M. Walker, E. H. Knight, F. M. Rothrock, E. Boyce, directors.

Inc. in Nevada, 1913. **Cap.**, \$2,000,000; \$1 par; unissued, \$223,500.

Financial statement shows net profits for 1914, \$187,063; for 1915, \$346,796; for 1916, \$338,746.

First dividend of 2 cts. per share was paid May, 1916; total in 1916 was \$71,050.

Property: about 40 claims and fractions, acquired from the old Tamarack & Chesapeake and Custer companies, on Nine Mile Creek, Coeur d'Alene district, Shoshone Co., Idaho. The Hercules mine nearby is controlled by the same interests.

Ore: contains 9% lead and 7 oz. silver, part direct smelting and part concentrating. Mill recovery is reported to be about 83% without flotation.

The company with the Hercules interests built and is operating the new lead smelter at Northport, which is to be enlarged to handle custom products. Direct information is not available but it is said that the gross ore reserves are about \$9,000,000. One ore-shoot on the Leonard tunnel level is reported to have been proved for 1,500' with ore on both faces.

Little is available concerning this company for 1916, the policy of reticence that has resulted in much criticism in the past being continued. Early in 1917 the 500-ton Frisco mill at Gem was purchased from the Federal Mining Co., for \$150,000, also the 8,000' Hercules aerial tram. To this line was added 2½ miles to connect the mine and mill. In June, operations were resumed after suspension since March. The remodeled mill includes a flotation plant. About 350 men are employed. In July, 1917, mine produced 3,000 tons of crude ore and concentrate valued at \$150,000.

TEDDY MINING & MILLING CO., LTD.

IDAHO

Kellogg, Shoshone Co., Idaho. J. B. Cox, sec.

Cap., \$1,000,000; shares \$1 par.

Property: 7 claims and a mill site, 1 mile E. of Kellogg, shows 2 veins, 1 of about 15' width, carrying copper ore with quartz gangue, and 1 of about 12 to 35' width, carrying silver-lead ore giving assays up to 12% lead and 30 oz. silver per ton.

Development: by crosscut tunnels of 100' and 550'. There are several mine buildings.

Mine is being operated under 2-year lease from March, 1916, by C. W. Browne, Dr. T. R. Mason and J. W. McCrea, of Kellogg. The lease covers only the ground above the intermediate tunnel, which was extended 40' to intercept the main vein.

TERRIBLE EDITH MINE.

IDAHO

A group of claims in the Eureka district, near Murray, Idaho, under lease to C. and W. H. Conn, of Butte, Mont.

Development: by 1,300' crosscut and 600' of drifting developed zinc ore of shipping grade. Several shipments of 50% ore were made and 150 tons monthly contracted for. The mine is also said to show promising bodies of galena with silver and gold.

TUCKER MINING & MILLING CO.

IDAHO

Address: Box 68, Wallace, Ida.

Officers: Peter Bahn, pres. and gen. mgr.; J. Pearson, v. p.; W. Turner, sec.-treas.; above are directors.

Inc. June, 1908, in Idaho. **Cap.**, \$1,000,000; shares \$1 par; assessable; issued, \$600,000; given in exchange for the property. Annual meeting in June.

Property: 7 claims, unpatented, 140 acres, in the Hunter district, 3 miles E. of the Snowstorm, shows Revett quartzite, cut by a diabase dike with veins, 1 to 4' in surface width, said to carry copper-gold-silver ore.

Development: by a 1,000' tunnel, shows low-grade copper ore at depth of 100' in E. crosscut tunnel. At 400' depth owners expect to cut the vein.

TUSCUMBIA MINING CO.

IDAHO

Address: Morton Webster, sec.-treas., Wallace, Idaho. **Officers:** George May, pres.; George W. Dougherty, v. p.; with D. L. McGrath, Wallace, D. J. Whaley, M. L. Whaley and A. A. Whaley, of Stevensville, Mont., directors.

Inc. 1910 in Idaho. **Cap.**, 1,500,000 shares; 50c par. Mine was under lease for 2½ years from April, 1915, to Gust Ehrenburg, of Spokane, and Albert Nelson, of Wallace.

Property: 4 claims, 76 acres, covers nearly 3,000' of the apex of the Tuscumbia (Sunset) lode, and 1,000' more or less of the Idora lode. The Tuscumbia is a strong, persistent vein in Pritchard slate, varying from 6 to 20' in width and branching at times. It carries shoots of silver-lead ore and of zinc.

Development: by tunnels, the lowest now worked being the Idora

crosscut tunnel. The Hill tunnel, 4,000' long, has not cut the vein; it is 1,015' below the Idora tunnel.

Mine has been stoped and orebodies largely mined out above the Idora tunnel, but the vein is believed to give promise of large bodies of milling ore at deeper levels. The property also has title, through ownership of apex, to an important orebody of the Idora mine. Deep development can be done by tunnels, as the Roy or Hill tunnel is 1,300' below the Tuscumbia apex and 1,015' below the Idora tunnel.

Property considered very promising, but company needs financing to provide funds for deep and extensive development work.

UNITED LEAD CO.

IDAHO

Name changed to Silverado Mining Co., which see.

VIENNA-INTERNATIONAL MINING CO.

IDAHO

Address: R. A. Marshall, sec., Wallace, Ida.

Officers: A. H. Featherstone, pres.; C. R. Mowery, v. p.; R. A. Marshall, sec.-treas.; with A. B. Livingston and D. Rosenbaum, directors.

Annual meeting was held on Sept. 4, 1917.

Property: 6 claims, 3 patented, and a mill site, near the mouth of Flora gulch, on Placer creek, 6 miles S. of Wallace, shows banded shales and quartzites of the middle part of the Newland formation, striking N. 50 to 60° W., and dipping 70° S. Principal vein has a quartz-siderite orebody, 3 to 5' wide with strike almost E.-W. and vertical dip. Ore on the dump shows galena, pyrite and chalcopyrite in a quartz-siderite gangue of too poor a grade to be profitably concentrated.

Development: by a 400' shaft, and 2 tunnels of 700'. New management plans unwatering the shaft, sinking to 500' and drifting on the 400' and 500' levels.

WALLACE MINING, MILLING & REALTY CO.

IDAHO

M. R. Evans, mgr., Wallace, Idaho.

Property: 9 claims on Placer creek, alongside of city limits of Wallace, said to show a big vein with scattered galena ore.

Development: by 1,500' tunnel. Is equipped with electric power, compressor, etc.

WARDNER LEASING CO.

IDAHO

Address: J. D. Owen, Kellogg, Ida.

Officers: W. A. Beaudry, pres.; D. W. Price, v. p.; J. D. Owen, sec.-treas.; with R. A. Carnochan, directors.

Inc. April, 1917, in Wash. Cap., \$500,000; shares \$1 par; assessable; 410,000 issued.

Property: has 25-year lease on 60 acres of patented ground in Wardner townsite. Company has definite development plans and sufficient funds. Contiguous properties are the Caledonia, Last Chance and Bunker Hill & Sullivan, all well known producers.

Development: in Aug., 1917, the shaft was down 100', making 5' daily.

WEST HECLA MINING CO.

IDAHO

Office: 601 Empire State Bldg., Spokane, Wash.

Officers: Morton Webster, pres.; R. H. Bailey, v. p.; J. V. Pohlman, sec.-treas.; with A. A. Booth and T. A. Russell, directors.

Inc. in Wash. Cap., \$1,500,000; shares \$1 par; assessable; 1,450,000 issued.

Property: 8 patented claims opposite the Hecla mine, Burke, Ida.

In Sept., 1917, company was prospecting in quartzite for the Hecla lead-silver vein. Workings to depth of 650' totaled, 1,750'.

WEST HUNTER MINING CO.

IDAHO

Address: A. M. Strode, Mullan, Idaho.

Cap., 1,500,000 shares; 10c par; 600,000 shares in treasury.

Property: 1 patented, 7 unpatented claims about one-half mile from Mullan, in the Coeur d'Alene district. The claims show a large body of quartz sprinkled with galena, which has been exposed by surface workings.

In Aug., 1917, a crosscut tunnel was being extended to cut ore exposed on the surface.

WEST NINE MILE MINING CO.

IDAHO

Chas. Heilbronner, pres. and gen. mgr., Wallace, Idaho. H. C. McAllister, treas. Olin & Co., fiscal agents.

Property: 4 claims west of the Success and Alameda mines on west fork of Nine Mile Creek.

Development: by 400' tunnel shows a vein said to carry occasional bunches of ore. In June, 1917, 200' additional tunneling was to be done. T. W. Clayton and F. C. Moore recommended sinking on the surface showings.

WESTERN UNION MINING CO.

IDAHO

Idle. Letters returned unanswered in May, 1917, from Wallace, Idaho.

Officers: D. H. Anderson, pres.; B. L. Collins, sec.; L. L. Woodford, treas.; D. H. Anderson, R. F. Collins, J. E. Burbank, G. W. Allen, W. Holm, W. Bjorklund, E. Hagman, directors; E. Roberts, supt.

Inc. Jan., 1916, in Idaho. **Cap.**, 2,000,000 shares; 10c par; 1,500,000 shares issued in exchange for stock in Aurora-Sampson and H. E. M. companies; 500,000 shares in treasury for future development.

Property: 30 claims of the Aurora-Sampson and H. E. M. companies near Wallace, in the Coeur d'Alene district. Owns the H. E. M. 100-ton concentrating mill at Wallace, which has a flotation unit using Naval Stores oils.

Development: aggregating 8,500' includes the H. E. M. lower tunnel, which at 2,300' and at a vertical depth of 1,000' encountered a large orebody in Aurora-Sampson ground. Drifts on the vein extend 800'. Values are lead and silver. The H. E. M. mine has 8,000' of underground workings. Management proposes active mining work and ore extraction.

WISCONSIN MINING CO.

IDAHO

Letters sent to Kellogg returned unanswered in May, 1917.

Officers: Louis Bolduc, pres.-treas.; P. Mason, v. p., with J. Bolduc, F. Jones and J. W. Thompson, directors; J. S. Ross, sec.

Inc. 1912. **Cap.**, \$1,500,000; shares \$1 par. Company is practically the successor of the Gold Leaf Consolidated Mines and the Coeur d'Alene Consolidated Mining Co., the shares of the old companies being made transferable share for share in the new company, upon payment of back assessments.

Property: 4 claims, unpatented, 2½ miles east of Kellogg, has 800' of tunnels and crosscuts and one 90' vertical shaft, developing a vein of 5 to 6' width, carrying copper ore and a little lead.

Equipment: includes a 2-drill compressor, run by water power from Moon creek, and a hoist. Development work only was done in 1915.

WONDERFUL MINING CO., LTD.

IDAHO

Office: Otterson Blk., Wallace, Idaho. A. H. Featherstone, sec.-treas. Stock is assessable.

Property: 4 claims, patented, near Mullan, Shoshone Co., Idaho., W. of the Bullion mine, on the eastern slope of Stevens peak. A 1,200' cross-cut tunnel is developing a vein said to give a fair showing of galena and copper ore.

YANKEE BOY MINING CO.**IDAHO**

Scott Anderson, pres. and mgr., Wallace, Idaho. Property leased, in part, to Big Creek Leasing Co., which see. The Yankee Boy mine is in the Big Creek section, near Kellogg, Shoshone Co., Idaho.

Development: includes an 1,800' tunnel and a 500' raise. A 4' vein cut in 1916 is said to average 200 oz. silver per ton with copper-lead values. Samples said to have assayed 123 oz. silver; 8.4% lead; 14% iron; 0.8% copper.

Equipment: includes gasoline engine, compressor, etc.

Production: in 1913 was 271 tons with gross value of \$35,461 and 381 tons in 1914 returning \$38,646. Net profit for 1914 was \$4,557. No later returns available.

CUSTER COUNTY**CHAMPION MINING CO.****IDAHO**

Idle. R. T. Badger, sec.-treas., Utah National Bank Bldg., Salt Lake City, Utah. **Mine office:** Mackay, Custer Co., Idaho.

Officers: Edw. R. Hall, pres.; C. T. Mixer, v. p.; preceding, with O. D. Mallory and J. E. Frick, directors; H. A. Brown, supt.

Inc. 1905 in Utah. **Cap.,** \$100,000; non-assessable.

Property: 9 claims, unpatented, in the Alder Creek district, 6 miles from a railroad. Developed by tunnel, with about 1,500' of workings, showing silver, lead and copper ores.

CLAYTON MINING & SMELTING CO.**IDAHO**

Clayton, Custer Co., Idaho.

Lands: 18 claims, showing argentiferous copper and lead ores. Has water power and a smelter rated at 50 tons. Reported sold to Idaho Smelting & Mining Co., in 1914.

COPPER BASIN MNG. CO.

Main office: 804 Newhouse Bldg., Salt Lake City. **Mine office:** Mackay, Idaho.

Officers: John Pingree, pres.; H. W. Weiler, v. p. and supt.; R. P. West, sec.-treas.; F. H. Vahrenkamp, managing director and cons. engr.

Cap., \$1,000,000; shares \$1 par; increased from 100,000 shares. Levied 2c assessment Aug. 18, 1917.

Property: 15 claims and 3 fractions, 24 miles from Mackay, Idaho, at Copper Basin, Mont. Claims to have an orebody on the 100' level, 200' long, 50' wide with a 65' winze still in ore from which assays from carload lots run 10½% copper, 13% iron and some silver.

Production: 30 to 50 tons daily. Company had 40 teams hauling in summer, 1917.

CUSTER SLIDE MINING & DEV. CO.**IDAHO**

Officers: R. L. Holland, pres.; D. Y. Butcher, sec.; Wm. H. Fitts, gen. mgr.; all of Colorado Springs, Colo.

Property: 700 acres in Yankee Fork district, Custer Co., Idaho, including the Montana and Sunbeam groups, also mill, power plant and dam of the Sunbeam Cons. Mines Co. The Montana mine was operated during 1916 and some rich gold ore is said to have been found. Mine is an old producer. Active operations began in 1917, the past two years being devoted to preliminary work. An aerial tram connects the mine with the Sunbeam mill.

EMPIRE COPPER CO.**IDAHO**

Office: F. G. Taylor, sec. and transfer agt., 322 Eccles Bldg., Ogden, Utah. **Mine address:** Mackay, Custer Co., Idaho.

Officers: L. R. Eccles, pres.; J. M. Eccles, v. p.; Jos. Scowcroft, treas.; F. A. Behling, mgr.; above and John Pingree, directors.

Inc. June, 1907, in Maine. **Cap.**, \$1,200,000; shares \$1 par; 1,000,000 shares issued. Stock listed on Salt Lake City and Kansas City Stock Exchanges. Annual meeting 3d Tuesday in May.

Dividends: paid since May, 1913, \$680,000. Is on regular 5% quarterly dividend basis, 1917.

Property: the White Knob Copper Mine, 3 miles south of Mackay on the Salmon River branch of the Oregon Short Line, with 39 claims, 18 patented, 700 acres, also mill and smelter sites of 480 acres, and a railroad right-of-way, in the Alder Creek district, Custer County, Idaho.

Geology: property carries a great number of lenticular contact replacements, in quartz porphyry and granite porphyry. The property is remarkable for its peculiar ore deposits, varying greatly in size and shape, occurring in the metamorphosed garnetized margin of contact, garnetization existing in some instances for fully six hundred feet from the contact. The geology has been carefully studied and is described by Kemp in the Transactions Am. Inst. of Mg. Eng., 1907, and in Genesis of the Mackay Copper Deposits, by Jos. B. Umpleby, Econ. Geol. The ore is largely a cupriferous pyrite with much chrysocolla derived from its alteration. The average assay of the 68,475 tons of ore mined in 1916 was copper, 4.008% gold, .04 oz.; silver, 1.97 oz. per ton.

Development: mine has a glory hole, 125 to 200' wide, but mining is mainly by tunnel. The property is opened by some 46 tunnels and five shafts, and has a total of underground workings in excess of 15 miles. The greatest vertical depth has been attained in the Cossack tunnel, which is some 5,000' long, having a depth of 1,800'; some ore showing. A raise of 1,000' is now being run to connect with the Alberta tunnel. Only shipping ore is being extracted and plans are under consideration for the erection of a mill to treat the low-grade ores that have been and are now being developed.

Equipment: includes air compressors having a capacity of 36 drills, steam driven; machine shop, blacksmith shop, bunk houses, boarding-house and commissary.

At present the mine is reached by an 85-mile branch of the Oregon Short Line R. R. Co., running from Blackfoot to Mackay, and is connected by the 7 $\frac{3}{4}$ miles Empire Railroad, owned by the company, of 36" gauge, equipped with two 33-ton and one 35-ton Shay mountain climbing locomotives and 34 cars. The line has a maximum gradient of 9%, with a rise of 2,000', and has one 6% grade on a 34° curve. A 3-mile aerial tramway of 1,000 tons daily capacity will be in operation before 1918.

Smelter at mine is not in operation, ore being shipped to the A. S. & R. Co.'s plant at Garfield, Utah, for treatment.

Year	Tons Mined	Lbs. Copper	Oz. Gold	Oz. Silver
1916.....	69,475	4,990,147	2,860	123,353
1915.....	54,295	4,702,119	3,155	125,135
1914.....	18,251	2,012,244	962	53,768
1913.....	34,722	3,565,479	1,812	92,805

The average number of men employed during the past year on company account has been 150, and in addition about an equal number have been engaged by the 50 sets of lessees working on the property.

Because of strong metal prices, average royalty paid by lessees during the past year was 32 $\frac{1}{2}$ % of the net smelter returns.

LOST PACKER MINING CO.

IDAHO

Office: 564 E. First South St., Salt Lake City, Utah. **Mine and works office:** Ivers, Custer Co., Idaho.

Officers: Jas. Ivers, pres.; J. T. Finlen, v. p.; Henry Welsh, sec.-treas., with J. Frank Judge and H. A. McCornick, directors; J. P. Boyle, mgr.

Inc. 1903, in Utah. **Cap.**, \$150,000; shares \$1 par; changed 1916 to 600,000 shares, 25c par. Stockholders privileged to purchase new shares at ratio of 3 for each old share held. Company declared a dividend of 25c. a share, Oct., 1913. Stock listed on Salt Lake City Exchange.

The Packer Co. was inc. June, 1917, as a holding company to take over 80% or more of the Lost Packer Mng. Co. stock.

Property: 34 claims, 4 patented, in the Loon Creek district, 112 miles west of Mackay, the nearest rail point. The mine and smelter are in the mountains 7,100' above sea level, but an auto road runs to the mine. Claims said to show a number of iron outcrops, covering two contacts, two miles apart, one a limestone diorite contact, the other between limestone and quartzite. These outcrops are of favorable character.

Development: by drift tunnels, No. 1 having a back of 450', No. 2 a back of 700', and No. 9 a back of 870', later showing rich ore, and planned to have a back of 2,000', ultimately. Tunnels are drifts on a vein of 2 to 7' average width, with maximum width of 15 to 18', carrying ore said to average 9 to 16% copper, and 2-8 oz. gold per ton, with a paystreak of 2" to 5' width, proven to average about 2' for a distance of 500', and depth of 400'. Mine is developed to 1,000' level. See U. S. G. S. Bull. 530 G.

Company employs 80 men at the mines and 400 horses are required to handle supplies and output.

Equipment: about \$225,000 has been expended on surface improvements and equipment, including the smelter, but excluding the 50-ton oil flotation concentrator, built in 1915. The property has water power, with an electric light plant, assay office and necessary mine buildings.

The smelter has a 100-ton water-jacket blast furnace, making matte of about 45% copper, 25 oz. silver and 8 to 10 oz. gold per ton, with slags running only about 0.2% copper. The smelter ran 24¼ days in the summer of 1913, smelting 1,800 tons of ore, and producing 380 tons of matte. Total production to end of 1915 was \$800,000. Management estimates 20,000 tons of ore in old stopes expected to net \$4.97 per crude ton.

No 1916 production, as company was developing only.

LOST PACKER MINING & SMELTING CO.

IDAHO

Mine near Ivers, Custer Co., Idaho. John T. Clarke, treas. and managing director.

Inc. 1907, in Wyoming. **Cap.**, \$3,000,000; shares \$5 par, as a holding company, to gradually acquire the outstanding stock of the Lost Packer and other mining companies.

PACKER CO., THE.

IDAHO

Offices: Mackintosh Block, Salt Lake City, Utah, and Suite 625, No. 149 Broadway, New York.

Officers: Chas. Read, pres.; E. G. Rowe, v. p.; with W. A. Black, T. E. Guhin and A. J. Miller, directors. J. H. Woodmansee, sec.-treas. Register & Transfer Co., N. Y., register and transfer office.

Inc. June 12, 1917, in Me. **Cap.**, \$600,000; par \$1; \$500,000 issued.

Organized as holding company to take over 80% or more of Lost Packer Mining Co. stock (which see).

RAMSHORN MINE.

IDAHO

At Bay Horse, Custer Co., Idaho. Presumably belonging to Ramshorn Mining Co. Was reported by State Inspector of mines in 1912. to be the best developed source of dry silver ore in Idaho.

Shows well-defined fissure veins in black altered slate of igneous material. Vein varies from a few inches to several feet in width and carries

quartz and spathic iron with ore shoots containing streaks and spots of tetrahedrite carrying high copper and silver values.

Examined 1913 by Frank Leland and said to be under option to him.

RANKIN CREEK PLACER MINES CO. IDAHO

Address: A. S. Thatcher, pres., 1455 Michigan Ave., Salt Lake City, Utah. T. B. Meldrum, sec.-treas.

Inc., 1917 in Utah. Cap., \$25,000; shares 25c par; 60,000 in treasury.

Property: 80 acres in Yankee Fork district, Custer County, reported to carry free gold. About 1,000' of placer ground previously worked averaged \$3 per cu. yd. There is an old mill on the ground. Active development to start Sept., 1917.

RED BIRD MINING & SMELTING CO. IDAHO

Inc. 1913 to take over assets of Idaho Smelting and Mining Co. J. B. Jones, sec.-mgr.

Property: consists of extensive holdings near Clayton, Custer Co., 60 miles N.-W. of the Oregon Short Line terminal at Mackay, including the Ella group at Clayton, Red Bird group on Squaw Creek, Silver Rule group on Slate Creek, Skylark group at Bayhorse, and a 100-ton smelter at Clayton. The Red Bird mine is the principal property, containing lead-silver-copper-gold ore. Ore occurs in well-defined veins opened to maximum depth of 900' by shafts and crosscuts. The smelter was closed down, Nov., 1915, after an unsuccessful run of one month, during which it turned out 2,700 bars of bullion, containing good silver values. Development work has apparently also been discontinued.

ELMORE COUNTY

BOISE ROCHESTER MINING CO (INC.) IDAHO

Address: Atlanta, Elmore Co., Idaho, and care of Leo. J. Falk, pres., Boise, Idaho; S. G. Smith, supt.

Property: the Bagdad Chase Gold M. & M. Co., also known as the Pettit mine. Claims show a fissure vein 3-12' wide developed for 800' by tunnel. Ore is said to average \$9 per ton in gold and silver for this entire distance.

Ore is delivered to 40-stamp mill by Bleichert tram. Treatment consists of amalgamating, concentrating and cyaniding.

ELMORE COPPER CO. IDAHO

Address: 137 South La Salle St., Chicago, Ill. Wm. O. Reuss, pres.

Inc. in Idaho. Cap., \$5,000,000; \$1 par; non-assessable.

Property: 8 claims, 160 acres, 10 miles from the Boise cutoff railroad, said to show ore throughout entire holdings.

Development: by 980' of drifts and crosscuts and 200' shaft, showing an orebody.

FREMONT COUNTY

WEIMER COPPER CO. IDAHO

Office: care Jesse Knight, Provo, Utah. Mine near Dubois, Fremont Co., Idaho.

Property: 18 claims, 360 acres, on Birch Creek, in Skull canyon district, shows a crushed zone 100 to 200' thick between quartzite and limestone, which carries high-grade ore in pockets and in cross fissures, of 3" to 2' width, running at right angles to the main contact deposit.

Development: by an open cut and 2 tunnels of 300' each. Idle for several years.

IDAHO COUNTY

BLACK PINE MINING CO.**IDAHO**

Office: 926 W. Lehigh Ave., Philadelphia, Pa. Mine office: Elk City, Idaho.

Officers: S. J. Rieben, pres.; Louis H. Michel, v. p.; Dr. Wm. H. Kuich, treas.; R. T. Moyer, sec., with J. B. Shourds, Dr. Fred. Bridgland, E. Thompson and Jas. McGrath, directors.

Inc. Feb. 13 in Arizona. Cap., \$1,000,000; shares \$1 par.

Property: 41 claims, 700 acres, includes Black Pine and Crown Point mines, at Elk City, Idaho Co., Idaho.

Ore: gold-silver, in veins believed to be a continuation of the Mascot lead. Ore said to average \$12 per ton in gold, silver, lead and zinc.

Development: by 1,400' tunnel.

Equipment: 50-ton mill and concentrators. The mill is to begin operations, Sept., 1917. Management plans to thoroughly prospect the ground.

BLUE GROUSE MINE.**IDAHO**

Owned by V. W. Brasch, Paulsen Bldg., Spokane, Wash.

Property: in the Orogrande district, 1½ miles N. W. of Orogrande, Idaho County, said to have the extension of veins opened up in the adjoining Umatilla mine.

Development: 600' of tunnels, said to show veins 4½ to 10' wide, averaging \$12 per ton in gold and silver.

BLUE JACKET MINING CO.**IDAHO**

Mine P. O.: Lucile, Idaho Co., Idaho.

Officers: W. B. Clark, pres., Johns Hopkins University, Baltimore, Md.; B. N. Baker, v. p.; J. M. Lawford, sec.-treas.; with F. T. Homer and Frank E. Johnesse, directors; F. E. Johnesse, gen. mgr. and supt.

Inc., Oct. 20, 1908, in Idaho. Cap., \$50,000; shares \$1 par, fully paid. Annual meeting, first Monday in January. Company is a close corporation.

Property: 7 claims, patented, about 132 acres, in Crooks Corral mining district, Idaho Co., Idaho.

Geology: ore occurs as replacement along contact between diorite and andesite porphyry. Orebody is from 50 to 70' wide, runs east and west, and dips at an average angle of 35°. It has been opened up by a 300' shaft, numerous tunnels, crosscuts and drifts, aggregating 3,395'. These workings block out 33,000 tons of ore, carrying 3.7% copper with 1.5 oz. silver and \$1.80 gold per ton. The orebody is more or less oxidized down to the 700' level, though the greater part of the ore in the lower levels is original sulphide and the enriched portion lies between the 1st and 4th levels. Reserves estimated at 542,000 tons. Property has no mill, hoist or reduction plant of any kind and has been closed down since 1909 awaiting railroad transportation, which is still 40 miles away. Property is a good one and officers able and responsible.

CLEARWATER GOLD & COPPER MINING CO.**IDAHO**

Mine office: Clearwater, Idaho Co., Idaho.

Officers: Samuel Seidenfeld, pres.-mgr., 1027 W. 10th Ave., Spokane, Wash.; Herman A. Bush, v. p.; J. H. Wourms, sec.-treas.; Dennis Reardon, supt.

Inc. 1907, in Idaho. Cap., \$2,500,000; shares \$5 par, assessable; 489,000 outstanding.

Lands: 16 claims, including the Cunningham group, on the north fork of the Clearwater river, 50 miles south of Wallace, nearest rail point Amador, with 6 miles of wagon road and 11 miles of trail. Property shows a vein said to be traceable 5 miles, 1 mile on company's lands, carrying oxi-

dized ores near surface, with chalcopyrite and chalcocite at depth, giving assays of 5% copper, \$1.50 gold, and 1 to 2 oz. silver per ton.

Development: by 3 tunnels, lower tunnel, 1,900' long, cutting the ledge at the face 300' below surface. Management estimates 18,000 tons of ore on dumps, June, 1915, and total reserves at 400,000 tons, averaging 4½% copper.

Equipment: includes hoist and air compressor. \$250,000 bond issue contemplated to provide funds for aerial tramway, necessary equipment and development work.

GOLDEN GATE PLACER MINES.

IDAHO

Office: Pendleton, Ore.; B. Parlett, sec. **Cap.,** \$75,000, shares \$1 par. Operating mine in Idaho Co., Idaho.

HAMILTON MINING CO.

IDAHO

Office: 307 Benton St., Portland, Ore.

Officers: R. E. White, pres.; A. N. Hamilton, sec.

Cap., \$2,400; shares \$1; all outstanding.

Property: on the South fork of Salmon River, Idaho Co., Ida. Company reported, October, 1917, to have purchased the Grand Central mine, consisting of 2 claims in Cable Cove district, near Sumpter, Baker county, Oregon, formerly owned by Mollie Gibson Gold M. & M. Co.

Development: by 500' of tunnels, said to show an ore bearing vein from 2-4' wide. The tunnel is to be extended 400'.

HARTWIG MINING CO.

IDAHO

Mine at Pollock, Idaho Co., Idaho.

Officers: Wm. Hartwig, pres.; G. W. G. Geiger, sec.; W. J. Moore, treas.; preceding officers, C. Brinkman, Fred Goldsmith and Gustave Peters, directors.

Inc. Jan. 3, 1906, in Iowa. Cap., \$72,000; shares \$25 par; fully issued.

Property: 5 claims, patented, 72 acres, and a 5-acre mill site, in the Rapid River district, near Salmon river, said to carry several contact deposits between limestone and diorite, of which 4, under development, are of 30' estimated average width, traceable 400', carrying oxidized and chalcopyrite ores, reported by company to average 14% copper, with traces of lead and zinc, 3 oz. silver and \$10 gold per ton. Figures undoubtedly too high for an average of the orebody.

Development: 75' shaft, and 3 tunnels of 1,000' aggregate length, an 875' lower tunnel cutting the ore zone, which shows but little ore. Property has 4 buildings but no power equipment. Idle some years, owing to lack of transportation facilities.

IDAHO ANTIMONY MINING CO.

IDAHO

H. L. Williams, Seattle, Wash., managing director. Channing Prichard, supt.

Property: in Yellow Pine mining district, near Cascade, Idaho county, shows an orebody of stibnite, 18-30" wide, developed by 4 tunnels. Two carload shipments, 1915-16, are reported to have yielded 47% antimony. No later returns.

MINERAL ZONE MINING CO.

IDAHO

No recent returns secured. G. L. L. Baskett, supt., Elk City, Idaho.

Property: known as the Parr group, includes the Mineral Zone gold mine near Elk City. In April, 1916, a clean-up of a 15 days' run is said to have yielded \$2,300.

Development: is by tunnels. There is a 3-stamp mill on the property. Ten men employed.

NORTHWESTERN MINING CO.

IDAHO

Out of business.

Property: a copper mine near Lucile, Idaho Co., Ida., was acquired by the Blue Jacket Mining Co., R. H. Bayard, pres., Gailbin Bldg., Baltimore, Md.

OLIVIA GROUP

IDAHO

Owned and operated by Hazlitt & Trader, Dixie, Idaho Co., Idaho.

Property: 11 unpatented claims, 210 acres in Dixie mining district, shows gold-silver-copper ore in quartz fissure veins, 8"-40" wide, running N. W., with dip 60° N. E. The country rock is granite and gneiss.

Development: by 100' tunnel, 100' vertical shaft and drifts, totaling 1,000' of underground workings.

Equipment: includes a new 10-ton Huntington mill, which ran only a short time in 1915. Plan driving tunnel on Ironsides claim to depth of 250'.

STECKNER GOLD MINING CO.

IDAHO

Care D. B. Cornell, sec.-treas., Great Barrington, Mass. Henry Tator, pres.; F. H. Cornell, v. p.

Inc. Feb. 17, 1914, in Arizona. Cap., \$2,000,000.

Property: the Gold Dollar group, 10 lode and 5 placer claims, near Orogrande, Idaho Co., Idaho, shows fissure veins in granite. The veins are 2'-4' thick and carry gold ore, shown by systematic sampling to carry \$3 to \$13 per ton.

Development: by 3,000' of work, all tunnels, 1,000' depth.

UNA MINING CO.

IDAHO

J. M. Hinton, supt., Orogrande, Ida.

Officers: J. W. Turner, pres.; Thos. A. White, v. p.; Ralston McCraig, sec.-treas., with W. B. Phillips and W. S. Willis, directors.

Inc. 1914. Cap., \$1,250,000; shares \$1 par; 650,000 issued.

Property: the Una mine, near Orogrande, shows a vein 10' wide, carrying pay streaks of a few inches to 5' thick. In the 40' shaft the ore is said to average \$7 per ton in gold with some silver.

Development: by 900' tunnel to cut vein at 200' depth.

UNITY GOLD MINES CO.

IDAHO

Offices: care of Idaho Mines Syndicate, 120 Broadway, New York and Boise, Idaho.

Officers: Jas. H. Hawley, pres.; L. M. Hart, v. p.; George C. Luebbers, sec.; George W. Fletcher, treas.; J. A. Czizek, mgr.; above are directors. R. A. Beall, supt.

Inc. April, 1916, in Del. Cap., 500,000 shares; \$5 par; outstanding 200,000 shares. Security Transfer & Registrar Co., New York, transfer agt. and registrar. Listed on New York curb.

Property: 2 groups of claims, 120 acres, including the Little Giant and Charity mines, in the Warren mining district, Idaho Co., 40 miles from a railroad. Has been idle for several years. Claims said to cover 2 distinct veins for 4,500' along the outcrop. In addition company owns a millsite and 4½ miles of ditches and pipe lines with water rights. Parallel quartz veins carry gold ore.

Development: by tunnels and shallow shafts. Present management is driving a 6,000' tunnel to cut the veins 400' below present workings. The Charity mine has been developed by a 150' shaft and shallow tunnels. By July, 1917, the long tunnel was in 1,450', where the Banner vein was 5' wide. At 600' beyond is the Giant vein, and the Charity mine 3,000' farther, opening it at 2,000' depth.

The proven shoot in the Little Giant vein is said to be 1,200' long, worked to 200' depth; and that on the Charity vein 1,100' long worked to 150'.

The former will be cut at 700' and the latter at 1,200' depth by the tunnel. The last 5,500 tons milled from the Little Giant upper workings yielded \$85 per ton.

A 50-ton mill is being erected, driven by water power.

KOOTENAI COUNTY

COMMONWEALTH MINING CO. IDAHO

Ernest C. Wood, supt.; 401 Empire State Bldg., Spokane, Wash.

Property: Commonwealth mines at Hayden Lake, 140 acres, worked for 25 years by various companies.

Development: totals 1,100' including 400' shaft sunk on dip of vein. From 12 to 18 men are employed. Values are in lead and silver reported to average \$12.

LATAH COUNTY

GOLD CREEK MINING & MILLING CO. IDAHO

Office: A. A. Kirby, sec.-treas., Paulsen Bldg., Spokane, Wash.

Officers: E. V. Thompson, pres.; A. G. Crum, v. p.; Paul Bockmier, mgr.; preceding with J. H. Fussy, C. C. Burr, directors.

Property: in Gold Creek district, Latah Co., Ida., considered promising. Financial condition satisfactory and work proceeding.

LATAH COPPER MINING CO., LTD. IDAHO

Potlatch, Latah Co., Idaho. Idle since 1907. See Vol. XI, Copper Handbook.

MERGER MINING CO., LTD. IDAHO

Address: J. C. Northrup, mgr., Palouse, Wash.

Officers: J. C. Northrup, pres.; C. E. Frederick, v. p.; W. E. McCroskey, sec.; G. A. Weldon, treas.; above with J. A. Saylor, directors.

Inc. Oct. 15, 1913, in Wash. **Cap.,** \$3,750,000; shares \$1 par; 3,350,000 issued; assessable for annual labor only.

Property: 20 claims, 318 acres, known as the Hoodoo mine, well watered and timbered, on Copper mountain, near the Palouse river, in the Hoodoo district, Latah county, almost 40 miles from Palouse, with a 20-mile wagon-road to Harvard, and 10 miles from the Puget Sound railway. The property shows quartzite and schist, with contact fissures in quartzite and schist, having a N. E. strike, and a N. W. dip. Orebody said to be 10 to 40' wide, and to contain chalcopryite, and chalcocite ores, the latter with 22% and the chalcopryite ore, 3% copper. No production during 1916.

Development: includes 5 tunnels, with about 2,000' of workings.

Equipment: includes 60-h. p. gasoline power, with a 3-drill air compressor. There are 16 buildings. Property leased in 1917, and concentrator to be built.

MIZPAH COPPER MINING CO., LTD. IDAHO

Property sold to Merger Mng. Co., which see.

LEMHI COUNTY

ALLIE MINING CO., LTD. IDAHO

Edgar C. Ross, of the Ross Syndicate, Salt Lake City, pres.-gen. mgr. Company inc. 1905. Property, 18 claims, including the Allie mine in the Texas district, near Gilmore, Lemhi Co., Idaho. Lead-silver ores occur in fissure veins in flat Devonian limestone underlain by Cambrian quartzite.

A development tunnel 4,500' long has been driven into Gilmore mountain jointly by this, the Gilmore and the Pittsburg-Idaho companies. This crosses a dozen silver-lead and one gold vein. Development 1915 was on

the Latest Out lead vein at 800' below the outcrop. For geological features see Umpley, Bull. 528, U. S. Geol. Survey, 1913, p. 107.

The Allie vein, closely parallel to the lead veins, has a gangue of iron oxide with no lead, only a trace of silver and almost exclusively gold values, averaging 1 ounce gold with 50% iron.

In 1914 ore reserves were claimed to be 15,000 tons, with average assay of \$12 per ton gold. Extensive prospecting had not up to 1913 shown any commercial silver-lead deposits, but had opened up good gold ore.

Production: First shipment in Feb., 1914, of about 26 tons gold ore showed smelter returns of \$11,060. Total production was 50 tons, averaging better than \$300 per ton. Later returns, if any, are not available.

BLACKBIRD COPPER & GOLD MINING CO., LTD. IDAHO

General office: DuBois, Pa. **Office:** 807 Newhouse Bldg., Salt Lake City, Utah.

Officers: John E. DuBois, pres.; Chas. J. North, v. p.; F. O. Frick, sec.; W. H. Watt, treas. and gen. mgr.; with L. N. Morrison, directors.

Inc. in West Virginia. Cap., \$2,000,000; shares \$1 par; nonassessable. Bonds, \$500,000, at 6%. Annual meeting, fourth Tuesday in January. Is a close corporation.

Property: Brown Bear mine and adjoining ground, covering 29 claims, patented, 482 acres, in the central part of the Blackbird district, Lemhi Co., Idaho.

Development: 3 shafts, with drifts and numerous short tunnels. Orebodies are irregular replacements along fracture zones in schist and quartzite. Idaho property is in one of the best mineralized sections of the state and is said to show wide zones of disseminated ore carrying 2½% copper and 5 cts. gold for each per cent copper. This district is regarded as promising. Property shut down since patenting.

Company also owns 97 claims, 87 patented, adjoining the Cactus mine in the San Francisco district of Utah. This property has considerable development and was explored by diamond drilling. Development of the 300' level from an old shaft disclosed a vein of chalcopyrite ore.

CARMAN CREEK MINING CO. IDAHO

Salmon City, Lemhi Co., Idaho. J. W. F. Halcombe, pres.-mgr.-sec.; John Harlan, v. p.; Wm. Wallace, treas.

Inc. Dec., 1905, in Washington. Cap., \$1,000,000; shares \$1 par; non-assessable; 999,500 issued.

Property: 7 claims, about 140 acres, 16 miles from Salmon, said to carry an oreshoot showing gold, silver and copper ore. Assessment work only was done in 1916.

COPPER QUEEN MINE IDAHO

T. E. G. Lynch, owner, Digby, Nova Scotia, Canada. Mine near Tendoy, Lemhi Co., Idaho.

The mine is erroneously reported to be the property of the Copper Queen Gold Mining Co., in a Geological Survey report (Bull. 528, p. 120), but has belonged to T. E. G. Lynch since 1899. The Copper Queen Mining & Smelting Co. leased the Queen of the Hills mine, 40 miles away. Lessees Copper Queen mine shipped 448 tons of sorted ore to Salt Lake City, 1911, that averaged 29.4% copper, 5.2 oz. silver and 0.81 oz. gold per ton. Reported Dec. 1915, that mine has recently been leased to the Idaho-Seattle Mining Co., which see.

COPPER QUEEN MINING & SMELTING CO. IDAHO

Office: 608 Lonsdale Bldg., Duluth, Minn. **Mine office:** Salmon, Lemhi Co., Idaho.

Officers: Geo. H. Crosby, pres. and gen. mgr.; Emerson Hill, v. p.; A. J. McLennan, sec.-treas.; A. F. Bennett, supt.

Inc. June 12, 1905, in Arizona. **Cap.**, \$500,000; shares \$1 par; nonassessable; issued, \$282,000. Absorbed 1908, the Copper Queen & Crescent Mining & Smelting Co., giving 1 share for 8.

Property: the Queen of the Hills mine, 17 claims, 320 acres, in the Eureka district, 7 miles N. W. of Salmon, is said to show 3 nearly vertical fissure veins in granite and schistose quartzite, with a generally N. E. strike. The Eva, or westernmost vein, shows an 8 to 14" quartz band on the wall of a brecciated zone 5' wide. The central, or Queen, and the Nellie veins show 12 lodges of granite breccia partly cemented by quartz. The ore is coarsely crystalline quartz, carrying pyrite, chalcopyrite and some galena, with \$3 to \$5 in gold occurring in 5 known oreshoots, 2 in the Nellie, 2 in the Queen and 1 in the Eva vein.

Development: by shafts of 105' and 400' with 5 levels and by 7 tunnels, longest 450' with 4,700' of workings.

Equipment: includes 100-h. p. electric plant, a 24-h. p. hoist, good for 700' and a 5-drill air compressor. There are 10 buildings, including a 50-ton log mill, having 15 Allis-Chalmers stamps, a gyratory crusher and 2 Wilfley tables.

Property idle, in charge of a watchman.

DULUTH-LEMHI MINING CO.

IDAHO

Former secretary-treasurer writes, 1917, that company is out of business. Described in Vol. XII.

ERICKSON MINE

IDAHO

Bond and lease held by G. W. Holmberg on copper mine 8 miles west of Leadore, transferred to Salmon River Copper Co., July, 1917.

GILMORE MINING CO.

IDAHO

Offices: 222 Kearns Bldg., Salt Lake City, Utah; and Gilmore, Lemhi Co., Idaho.

Officers: Edgar C. Ross, pres. and gen. mgr.; Frank Hahne, v.-p.; Harry R. Hyde, treas.; Clarence Warnock, asst. sec., with E. B. Critchlow, directors.

Inc. Feb. 10, 1912 in Utah. **Cap.**, \$1,000,000; shares \$1 par, assessable; outstanding \$800,000. Bonds authorized, \$100,000; none issued. Company is a close corporation. Annual meeting, Jan. 2. All receipts from ore sales spent in development work.

Property: 12 patented claims, 250 acres, in the Texas mining district, at Gilmore, was purchased from the Allie Mng. Co., Ltd.

Ore: gold-silver in fissure veins in limestone, said to have an average value of \$14.50 per ton. Veins strike N. 10° E. and dip 60°.

Development: by a 60° incline shaft and tunnels, greatest depth of workings on the vein is 850'. Total underground workings, 8,800'. This company in conjunction with the Pittsburgh-Idaho and Allie Mining companies has run a 4,500' development and transportation tunnel into Gilmore Mountain, which is said to cut a number of lead-silver fissures and one important gold vein.

Production: Shipments early in 1917 totaled \$72,084, ore averaging 0.025 oz. gold, 7.75 oz. silver, and 23.16% lead. Monthly output is 15 cars of ore. See U. S. G. S. Bull., 528, p. 107.

HARMONY MINES CO.

IDAHO

Office: 602 Hearst Bldg., Chicago, Ill. **Idaho address:** Salmon, Idaho.

Officers: A. W. Nieman, pres. and mgr.; C. Nickelson, v. p.; Gladys Nieman, sec.; J. W. Reihman, treas.; E. F. Nieman, supt.; above, with C. V. Nieman, H. Cohen, A. C. Skafgard and G. Prasche, directors.

Inc. Jan. 24, 1916, in Nev. **Cap.**, \$1,000,000; shares \$1 par; 649,000 issued. Annual meeting, third Tuesday in January.

Statement for 1916 shows income from stock sales, etc., of \$46,866; operating expenses, \$42,686; gross earnings, \$1,191. 30,000 shares sold at \$2, 1917.

Property: 11 claims, unpatented, 218 acres, in Whithington Creek mining district, Lemhi Co., Idaho. Claims show 2 well defined orebodies occurring in a shear zone in schist. Vein being worked is 18' wide, but the center is low grade material and only the higher grade streaks of ore on the walls are mined.

Ore: sulphide, occurring as chalcopyrite with average assays of 6% copper.

Development: by two tunnels, 180' and 700' long, with total underground workings of 1,085'. Lower crosscut tunnel will be main working level.

Equipment: includes compressor and 2-bucket tram. Employs 20 men.

Production: 28 tons of ore in 1916; 5 carloads averaging 8% copper, to July, 1917.

Company seems to be developing its property energetically.

IDAHO-SEATTLE MINING CO.

IDAHO

Office: 1604 Hoge Bldg., Seattle, Wash. **Mine office:** Tendoy, Idaho.

Officers: F. R. Van Tuyl, pres.; L. E. Eyman, v. p.; R. V. T. Horsha, sec.-treas., with F. A. Linforth and L. R. Margetts, directors; S. A. Matthews, supt.

Inc. Oct. 13th, 1915, in Mont. **Cap.**, \$1,000,000; shares \$1 par; 100,000 issued. Annual meeting 2nd Monday in January. Gross earnings in 1916 were \$20,000 from dump and mine.

Property: 3 claims, 2 patented, 60 acres, known as the Copper Queen mine, in Agency creek 8 miles from Tendoy, Lemhi county, held under bond and lease. Claims show bornite, chalcopyrite, copper glance and quartz in fissure veins dipping at from 45-70°. Ore occurs in shoots 20"-16", reported to average 10% copper, ½ oz. gold, 1 oz. silver per ton. Developed by 1,600' of underground workings to depth of 300'. Ore is mined by overhead stopping.

Equipment: includes small concentrator. Underground workings to be unwatered during 1917. Machine-drills installed in 1916.

IDAHO TUNGSTEN CO.

IDAHO

Had a 7-year lease on the Ima Cons. M. & M. Co. (which see) property near Ima, Patterson Creek, Lemhi Co., Idaho. Said to have shipped 12 tons of 60% tungsten concentrates, 1915.

IMA CONSOLIDATED MINING & MILLING CO.

IDAHO

Warren Zeigler, supt.

Inc. 1900 in Idaho.

Property: 21 patented claims near Ima, on Patterson creek, 21 miles S. W. of Landore, Ida. Tungsten was discovered on this property in 1903, but was not mined until 1911.

Ore: mainly hubnerite with some wolframite, occurs in white quartz fissure veins, 1-10' thick in a formation of pre-Cambrian sedimentaries, closely resembling silicious schist. The quartz gangue shows lead, zinc and iron sulphides.

Development: aggregates about 2,500' of tunnels and drifts.

Equipment: includes a 50-ton concentrator with flotation unit. Property was worked under a 7 years' lease by the Idaho Tungsten Mining Company. Shipped about 12 tons of 60% tungsten concentrates in 1915. Reported under lease to L. A. Jeffs and E. W. Johnson, 1916.

LATEST OUT MINING & SMELTING CO.**IDAHO**

Ralph Nichols, mgr., Gilmore, Lemhi Co., Idaho.

Property: the Latest Out mine, at Gilmore, is a lead-silver mine, developed to depth of 800'. Shipments of 27,000 tons were made 1910-12. Worked by lessee in 1915-16. (See full description by Nichols in Trans. Am. Inst. M. E., Vol. XLVI, pp. 937-9, Lead-Silver Mines of Gilmore (Lemhi Co., Idaho).)

Ore: limonite and hematite replaced by shoots of lead minerals in fissure veins in limestone at right angles to bedding with south rake to ore-shoots. Sulphides decrease with depth. Ore on 200'-500' level assays 32% lead, 10% silica, 25% iron, 3% zinc and 12 oz. silver per ton. Oreshoots are 30'-40' wide in places.

LEMHI GOLD MINING CO.**IDAHO**

Operates the property of the Virginia Cons. Mining Co., near Baker, Lemhi Co., Idaho.

PITTSBURGH-IDAHO CO., LTD.**IDAHO**

Office: 223 Fourth Ave., Pittsburgh, Pa. **Mine office:** Gilmore, Idaho.

Officers: A. S. Ross, pres.; Irvan Neckermann, 1st v. p.; Robt. B. Little, 2nd v. p.; W. A. McCutcheon, sec.-treas.; with G. W. Provost, J. W. Brown and J. S. Alexander, directors; H. F. Ellard, supt.

Inc. in Idaho. Cap., \$1,000,000; shares \$1 par; 809,407 shares issued. Authorized bond issue, \$150,000; \$18,000 retired by sinking fund; \$5,000 outstanding. Commonwealth Trust Co., Pittsburgh, registrar; 223 Fourth Ave., Pittsburgh, transfer office. Annual meeting, 1st Monday in July. Stock listed on Salt Lake City Exchange.

Dividend: 3c per share paid Apr., 1916. Total dividends to date, \$375,000.

Statement of year ending Jan., 1917, shows: quick assets, including cash, accts. rec., supplies, etc., \$447,760; property, \$887,070; total, \$1,334,830; liabilities: cap. stock, \$1,000,000; sinking fund bonds, \$150,000; accts. payable, \$2,421; surplus, \$182,409.

Net income for 1916 was \$159,934, out of which \$44,928 was distributed in dividends. Total operating expenditures were \$165,468.

Property: 25 claims, 5 patented, about 500 acres, at Gilmore, Lemhi county, said to show fissure veins in limestone, from 3 to 26' wide and 150 to 450' long. Veins strike N.-S., with dip of about 45°. Ores are carbonate-oxides, and shipments to date average 26% lead, 12 oz. silver and 75 cts. gold per ton of crude ore.

Company is also developing the Brown group on which high-grade ore has been discovered. A recent shipment netted \$86 per ton, the ore averaging 62% lead, 30 oz. silver and .03 oz. gold per ton. Is a very promising prospect.

Development: by 600' shaft being sunk to 800'. Winze down about 150' below 600' level discloses a continuous oreshoot averaging 44% lead, 26 oz. silver and .03 oz. gold per ton; vein is 7' wide at bottom of winze.

Equipment: Diesel electric generator plant ordered, 1917.

Production: ore shipments in 1916 netted \$229,460 and leasers paid \$38,187.

PITTSBURGH-IDAHO MINING & MILLING CO.**IDAHO**

Office: Kamiah, Idaho. **Mine office:** Gilmore, Idaho. A. S. Ross, pres.-gen. mgr.

Inc. Jan., 1903, in Idaho, as successor of Pittsburgh-Idaho Mining Co. Cap., \$1,000,000; shares \$1 par.

Property: 19 claims, 880 acres, in the Lo Lo district, near the Montana line. Claims said to show 6 contact veins, between gneiss and quartz-porphry, of which two, of 50 to 100' width, carry cuprite, malachite, bornite

and chalcopryrite, giving assays up to 12% copper, 14 oz. silver and \$20 gold per ton.

Development: to 600' level by shafts and tunnels of 40', 290' and 600'. A winze sunk 50' from the 600' level on a 3' vein showed lead carbonate ore with high lead and silver values. Company employed 28 men in 1915 and granted 30 leases. Gasoline power is used.

Production: was at the rate of 2,000 tons per month in 1912; 800-900 tons in 1913; 200 tons in 1914. No recent returns.

SUNSET MINING CO.

IDAHO

Address: Thomas Walden, Leadore, Ida.

Officers: D. C. Smith, pres.; D. L. McGrath, v. p. and gen. mgr.; E. G. Ellis, treas.; G. W. Dougherty, sec.; with E. R. Day, J. R. McGrath and Matilda Ellis, directors.

Property: at Leadore, Lemhi Co., Ida., said to show lead-silver ore.

Development: by 900' crosscut tunnel. In July, 1917, about 50 tons daily was shipped. A 200-ton mill contemplated.

VIRGINIA CONSOLIDATED GOLD MINING CO.

IDAHO

Idle.

Office: 207 Atlas Blk., Salt Lake City, Utah. Mine near Baker, Lemhi Co., Idaho. L. M. Byers, pres.; W. A. Byers, sec.-treas. and gen. mgr.

Inc. 1904, in Idaho. Cap., \$500,000; shares \$1 par.

Property: 15 claims, 11 patented, 300 acres, in the Sand Creek district, 5 miles from a railroad, show slate, granite and porphyry, with 8 fissure veins, said to average 2' in width and to be traceable 6,000', carrying chalcopryrite and galena, assaying up to 7% copper, 2 oz. silver and \$25 gold per ton. Mine is reported to have 6,000' of workings, with 10,000 tons of ore in sight.

Equipment: includes a 3-stamp mill.

LEWIS COUNTY

DEER CREEK MINING & MILLING CO.

IDAHO

Forest, Lewis Co., Idaho.

Officers: W. J. Orr, pres.-gen. mgr., Bellefontaine, O.; A. M. Orr, v. p.; E. C. Orr, sec.-treas.; S. Q. Orr, asst. sec.-mgr.; with B. F. Pool, J. P. Lorang, P. Myers, W. Gesler, E. Fisher and G. Harshman, directors.

Property: 17½ claims, 17 miles S. W. of Winchester, in the Salmon River direct, shows orebodies 10 to 20' wide, carrying copper ore with gold values. One vein has 4' of chalcopryrite ore developed by a tunnel: \$150,000 reported to have been spent in development and equipment, latter including 2,000' of flume, water wheel, and compressor. Company plans 1,500' tunnel to tap vein at 1,000' and rebuilding mill, destroyed by fire in 1916.

OWYHEE COUNTY

BANNER M. & M. CO.

IDAHO

Peter Steele, pres. and gen. mgr.

Property: 20 claims, at Silver City, Owyhee Co., Idaho, an old-time producer. Authorized bond issue in 1915 provided sufficient capital for development work.

Ore: quartz, carrying gold and silver.

Development: by tunnel.

Equipment: 4 (Nissen)-stamp mill, using pan-amalgamation and concentrators, compressor and electric power. Is working small crew in development.

DEMMING MINES CO.**IDAHO**

Main office: Nampa, Idaho. **Mine address:** care M. T. Rowland, Demming, via Murphy, Ida.

Officers: W. L. Kellogg, pres.; M. T. Rowland, v. p. and gen. mgr.; E. A. Gilbert, sec.-treas.; with P. A. Alquist and George Wagner, directors. E. W. Rowland, 1st asst. gen. mgr.; Harold Rowland, 2nd asst. gen. mgr.; J. H. Winchell, assayer and engineer.

Inc. in Idaho. Cap., \$15,000,000; shares \$5 par.

Property: 88 claims, 600 acres, 38 miles S. E. of Murphy, Owyhee county, Ida. Claims show fissure veins in granite that run N. E.-S. W. and are cut by cross fissures 5 to 12' wide. Ore is sulphide carrying gold and silver values.

Development: by tunnels and shaft. Reserves in No. 1 were estimated as worth \$400,000.

Equipment: 100-ton mill using ball mill, Janney flotation machines and Oliver filter, compressor, auto-trucks, etc. Mill to be enlarged.

SILVER CITY MINING CO.**IDAHO**

Silver City, Owyhee Co., Idaho. Requests for information unanswered.

Property: near Silver City, adjoins the Trade Dollar Consolidated on the east and has a system of parallel fissures containing gold-silver ores. In 1914 the company remodeled the old Blaine mill, purchased from the Trade Dollar Consolidated, located in Long Gulch, ½ mile S. E. of Silver City. Mill has 10 stamps, classifiers, concentration tables, and a 25-ton cyanide plant. Recent production not reported.

SINKER TUNNEL MINING CO.**IDAHO**

Address: W. G. Adams, sec., Nampa, Ida.

Property: the War Eagle group of gold claims in Silver City district. Idle since 1878, but re-opened in April, 1916, since when the 6,400' tunnel has been extended 310', cutting a rich vein, said to be 9' wide, including a "granite horse."

SHOSHONE COUNTY*(See Coeur d' Alene district.)***ILLINOIS****AMERICAN ZINC CO. OF ILL.****ILLINOIS**

A subsidiary of the Amer. Z. L. & Sm. Co. and described under that title.

BURR MINING CO.**ILLINOIS**

Connersville, Ind.

Officers: F. C. Bosler, pres.; Jos. R. Mountain, v. p.; P. H. Kinsler, sec.-treas.; J. H. Billingsly, gen. mgr., Galena, Ill.; preceding officers, J. H. Banghman, directors. F. J. Dewilde, cons. engr.

Inc. in Ind. and Wis. Cap., \$30,000; shares \$100 par.

Operating the Treganza lease, 40 acres mineralized land, near Galena, Ill. A 165' shaft develops sheet-ground formation. Company put a new 200-ton mill in commission, Feb., 1916. Output is zinc concentrates. Shipping at the rate of 160 tons of 45% concentrates weekly, 1916-17.

GREAT WESTERN LEAD MANUFACTURING CO.**ILLINOIS**

Address: Galena, Ill.

Property: the Pittsburgh lead mine, the second largest producer in northern Illinois. Workings are down 140' and a 100-ton mill is operated.

MATTHIESSEN & HEGELER ZINC CO.**ILLINOIS**

Address: La Salle, Ills. Owns and operates large zinc oxide and spelter furnaces, etc., and are noted buyers of pure and high grade zinc ores from the Missouri-Oklahoma fields. Is also a manufacturer of sulphuric acid.

MINERAL POINT ZINC CO.**ILLINOIS**

Subsidiary of the New Jersey Zinc Co., 55 Wall St., New York.

Property: the Marsden-Black Jack, the largest lead and zinc producer in northern Illinois. Shafts are 200 and 250' deep. A mill is operated.

ROSICLARE LEAD & FLUORSPAR CO.**ILLINOIS**

Property: is opened to 500'. Mill has a 500-ton capacity. It is the largest lead producer in southern Illinois.

VINEGAR HILL ZINC CO.**ILLINOIS**

Address: Galena, Ill.

Property: the Unity and Graham mines in the Galena district. During 1916 there were 13 holes drilled and mining was started on one lease; on the ore blocked out by the other 36 holes, a working shaft was sunk and a 200-ton mill erected and started.

The Unity is the third largest zinc producer in the State.

WISCONSIN ZINC CO.**ILLINOIS**

Subsidiary of the American Zinc, Lead & Smelting Co., 55 Congress St., Boston, Mass.

Property: the Birbeck zinc mine in the Galena district. northern Ill.

INDIANA**INTERNATIONAL LEAD REFINING CO.****INDIANA**

East Chicago, Ind. Is a subsidiary of the International Smelting Co., and described thereunder.

KANSAS**ADMIRALTY ZINC CO.****KANSAS-OKLAHOMA**

Address: Douthat, Okla. F. M. Aiken, Tulsa, Okla., pres.; O. F. Brinton, mgr.; John Griffard, supt.

Inc. in Delaware. Cap., \$750,000.

Property: 180 acres in Oklahoma and Kansas, shows a blanket deposit between lime and flint, carrying zinc-lead sulphides, said to average 10% in metal content.

Development: by vertical shaft to depth of 220'.

Equipment: includes 8"x8" hoist, 3 compressors, 4 electric pumps, tramway and 4 mills, with a daily capacity of 1,200 tons. Ore treated during 1915-16 amounted to 51,200 tons, concentrates averaging 62.50% zinc and 81.50% lead.

Recent production has been as follows: in 1915: 936,750 lbs. zinc and 156,000 lbs. lead; in 1916: 6,085,400 lbs. zinc and 1,014,200 lbs. lead. Management plans erecting 2 new mills in 1917.

AMERICAN PIPE LINE CO.**KANSAS-OKLAHOMA**

A subsidiary of the Amer. Z. L. & Sm. Co., and described under that title.

BIG LEAD MINING CO.**KANSAS**

Address: D. G. Bailey, sec., Muskogee, Okla.

Officers: J. A. Settle, pres.; J. J. Poole, v. p.; with J. E. Horshal, M. T. Hardin, J. S. Goldsmith, E. C. Wright and F. C. Hoffman, directors.

Has a lease on the Chubb land on the Kansas side of the new district, N. W. of Picher, Okla.

CHANUTE SPELTER CO.**KANSAS**

Office: St. Louis, Mo. Works office: Chanute, Kansas.

COLUMBUS M. & D. CO.**KANSAS**

Property sold 1917 to American Metal Co. for \$3,000, and a royalty of 2½% on future output.

COMMERCE MINING & ROYALTY CO.**KANSAS**

One of the largest operators in the Kansas-Oklahoma field.

Address: Picher, Okla. Has a lease on the Weber land, N. of Picher. Drilling showed ore at 270' depth to which one shaft has been sunk.

INSPIRATION MINING CO.**KANSAS**

Address: Amos Gipson, 1st Natl. Bank, Joplin, Mo.

Property: zinc claims N. of Picher, Okla., on the Kansas side. Drilling showed a deposit 108' long, from a depth of 225' to 275'. Two shafts are down and drifting started. The A. R. G. 400-ton mill, formerly at Duenweg, Mo., has been rebuilt here.

JOPLIN ORE AND SPELTER CORPORATION**KANSAS**

Offices: 40 Exchange Place, New York, and Joplin, Mo. Works at Pittsburg, Kan.

Officers: Wm. Barret Ridgely, New York, pres.; E. Allendorf, Joplin, Mo., treas.

Inc. April, 1916, in West Virginia, to take over the property of the Joplin Ore & Spelter Co., of Missouri. Cap., \$2,000,000; shares \$1 par, changed from \$5 July, 1916; all issued and fully paid. Empire Trust Co., New York, registrar. Stock transferred at company's office.

Dividends: initial one of 5.5% paid May 25, 1916.

Property: a zinc smelter at Pittsburg, Kan., about 37 miles from Joplin, Mo. Plant consists of 6 blocks of furnaces, each having 224 retorts, a total of 1,344 retorts. Two additional blocks of 224 retorts, built in 1916, give the company a total of 1,792 retorts and an estimated capacity of 14,330,000 lbs. of spelter annually. Property reported on by Arthur E. Feust, E. M., in 1916.

In the 9 months ended Dec. 31, 1916, gross income was \$813,006, less \$546,739 for ore purchased, leaving a gross profit of \$266,267. Operations cost \$209,761, leaving \$56,506 net profit. Full capacity was not attained owing to the low price of spelter in 1916.

MAINE**DOUGLAS COPPER MINE****MAINE**

Blue Hill, Maine. Operated by American Smelting & Refining Co. for the 60,000 tons of fluxing ore developed on property.

MARYLAND**BALTIMORE COPPER SM. & ROLLING CO.****MARYLAND**

(Baltimore Copper Works), Fourth Ave. and Fifth St., Canton, Baltimore; Md. Jos. Clendenin, pres.; Wm. H. Peirce, v. p.; Edw. Brush, v. p.; H. A. Thoman, sec.; Chas. N. Sappington, treas. Company succeeded the Baltimore & Cuba Smelting & Refining Co., which built the first American copper smelter, 1845, and is controlled, through stock ownership, by American Smelting & Refining Co. (American Smelters Securities Co.)

Lands: 45 acres, located on one of the best harbors of the Atlantic seaboard, with direct rail connections, being very advantageously located for both domestic and foreign business. The plant is large and modern, including a smelter, nickel refinery, electrolytic plant, and sheet copper rolling mill. The electrolytic refinery, of 1,000 tons daily capacity, has

anodes arranged on both series and multiple plan. Material treated is entirely auriferous and argentiferous, being received in the form of blister copper from various western states, and from several foreign countries. Works employ about 3,500 men.

GREAT FALLS MINE.

MARYLAND

Formerly called the Hill-Townsend Gold Mine, in Montgomery Co., Md. In 1914 the old workings were cleaned out, the shaft retimbered, and new drifts run. The 25-ton tube mill was only used to make tests of ore mined. Small shipments were made to the smelter and results said to have been satisfactory.

UNITED M., M. & COPPER SM. CO.

MARYLAND AND PENNSYLVANIA

Idle. **Office:** Frederick, Md. Mines at New London, Md., and Charmian, Pa. A. L. Wickart, sec., Allentown, Pa.

Inc. 1913, in New Jersey, as a merger of the Eagle Metallic Copper Co. and the Linganore Copper Co., now dead. Owns all the property of Linganore C. Co.

Cap., \$2,000,000.

Property: 806 acres, in 2 groups, include the Dolly Hyde, New London and Eagle mines, on the Western Maryland and Baltimore & Ohio railroads.

The Dolly Hyde mine, 220 acres, was for many years the principal copper property of Maryland, though never a large producer. The mine has contact deposits in dolomite and phyllite, carrying a little malachite in the upper workings, succeeded at shallow depth by bornite and chalcocopyrite in white marble. This mine is idle, but was being prepared for production, late 1913.

The New London or Linganore mine, 86 acres, with 14 acres of timber land, was opened and worked 1835-55, apparently at a profit, and was idle after 1881, until reopened, May, 1907, but is again idle. The property has two 4 to 5' fissure veins in slate, with N.-E. strike, carrying bornite and gray copper, estimated to average 3% copper and 16 oz. silver per ton, with a trace of gold. Development is by a 250' shaft and 4 tunnels, longest 340', with a total of 1,095' of workings, estimated to block out 17,307 tons of ore for stoping.

The New London mine has a 65-h. p. steam plant, with a 35-h. p. hoist, good for 500' depth, and an 8-drill Sullivan air compressor. There are 12 buildings.

The mill, 40x25' in size, consisting of a ball mill and slime tables, was built in 1911.

The Eagle mine comprises 500 acres near Charmian, including an old copper mine, never successfully worked. Property shows a mineralized zone of 400' average width, carrying native copper, chalcocite, bornite, chalcocopyrite and tetrahedrite, averaging about 2 oz. silver per ton, with traces of gold. Mine has a 480' shaft at 40° incline, in ore from surface, giving assay up to 6% copper, but is worked opencast.

Equipment includes a 175-ton smelter and 150-h. p. steam plant.

MASSACHUSETTS

NEW ENGLAND MINING CO.

MASSACHUSETTS

Idle. **Office:** 35 School St., Greenfield, Mass. **Mine office:** Chalemont, Franklin Co., Mass. Othello A. Fay, pres.; E. Forrest Sweet, sec.; Capt. Geo. H. Davenport, treas. and gen. mgr., at last accounts.

Inc. 1902. **Cap.,** \$500,000; shares \$5 par.

Owns about 1,000 acres 2 miles west of the Davis pyrite mine. **Vein**

traceable 700', is approximately vertical, conforming closely in dip and strike with the Savoy schist in which it occurs. Deposit apparently is a fahlband, lacking well-defined walls, ore occurring scattered through 15 to 20' of the schist, with 6 to 12" of quartz, well mineralized, on the south wall, and a heavy impregnation of chalcopyrite, 1 to 2' wide, on the north wall. Property has been partly stripped, and vein trenched across.

REVERE COPPER CO.

MASSACHUSETTS

See Taunton-New Bedford Copper Co.

TAUNTON-NEW BEDFORD COPPER CO.

MASSACHUSETTS

Taunton, Mass. Henry F. Bassett, sec.-treas. Absorbed Revere Copper Co.

Inc. Jan. 15, 1831. Cap., \$1,200,000; shares \$100. Corporation does a copper manufacturing business, making sheet brass, copper print rollers, etc.

MICHIGAN

The Copper companies are grouped together in one section and the Iron mining companies in another list, arranged alphabetically, irrespective of counties or ranges.

COPPER MINES

ADVENTURE CONSOLIDATED COPPER CO.

MICHIGAN

Office: 32 Broadway, New York. Mine office: Greenland, Ontonagon Co., Mich.

Officers: W. Parsons Todd, pres.; Charles G. Lund, v. p.; preceding officers, Chas. J. Devereaux, W. R. Todd, Jas. L. Bishop and Chas. D. Hanchette, directors: W. A. O. Paul, sec.-treas.; E. W. Walker, supt.

Inc. Oct. 17, 1898, in Michigan. Cap., \$2,500,000; shares \$25 par; paid in, \$23. American Loan & Trust Co., Boston, registrar; Old Colony Trust Co., Boston, transfer agt. Annual meeting, first Thursday after first Wednesday in June. Stock listed in Boston.

Operations, 1912, were conducted at a loss of \$38,741, and company ended year with cash assets, \$42,307, and liabilities, \$33,634. An assessment of \$1 per share was levied July 20, 1911, and again in March, 1916. On Jan. 1, 1917, balance on hand was \$38,412 as compared with \$2,245 on Jan. 1, 1916, and \$2,054 on Jan. 1, 1915. Receipts for 1916 totaled \$100,037 and expenditures \$61,625. Receipts were derived from rents, sale of previously stored mass copper and assessments paid.

Property: Consists of 3 old mines, the Adventure, Knowlton and Hilton, opened in 1850, 1853 and 1863 respectively, 1,696 acres on the mineral belt, also a mill site on Lake Superior. The mineral lands are located in Secs. 35 and 36, T. 51 N., R. 38 W., and in Secs. 1 and 2, T. 50 N., R. 39 W. The Toltec and part of the Belt lie on the north, South Lake east, Toltec and Mass on the South, and the Mass on the west of the main tract. The Knowlton tract has the Mass to the north and east, Flint Steel to the south and Michigan to the west, the Ridge mine of the Mass lying between the two Adventure tracts. The village of Greenland lies on the northwestern corner of the Adventure's principal tract, and the village of Maple Grove, controlled by the company, is near the mine.

The old Adventure mine was opened 1850, along a line of ancient pits showing prehistoric mining. The largest annual production was 233,941 lbs. fine copper, 1857. After being closed by owners, the old openings were worked for years by tributors, proving notably rich in silver.

The Hilton, or Ohio mine, opened 1863, on the Mass lode, never was worked vigorously. The Knowlton was opened in 1853. These three old

mines made 1,949,173 lbs. fine copper, previous to their merging as the Adventure Consolidated which started work Nov. 1, 1898.

Diamond drill work and crosscutting has disclosed four copper-bearing lodes.

The Adventure property has a series of 7 parallel copper-bearing beds in a cross-section of about 1,200' and these coupled with the existence of Adventure bluff, a 300' hill, caused the opening of the mine by adits, as well as by shafts. The Evergreen belt, of Ontonagon county, comprises a belt of bedded traps, amygdaloids and conglomerates, 7 of these amygdaloidal beds carrying copper on the Adventure tract. These beds were fully described, Vols. I to VII, inclusive.

The cupriferous beds of the Evergreen belt are notoriously bunched, being rich in spots and worthless at other points. The strike of the parallel lodes of the Adventure is N. 73° E. on the main tract, where operations were conducted, shafts being sunk at an angle of 45°. The old mine has 4 tunnels and 4 shafts, latter, except No. 1, which is in the Merchant lode, being sunk on the Knowlton bed, at 45°, and numbered from west to east.

Production from the old mines ceased, Jan., 1908, since which time only exploratory and development work was done. Shipments were resumed in November, 1916.

There are 5 shafts, of which No. 5 is the deepest.

No. 5 shaft, started May 6, 1909, is 6x16' inside measurement, with two 6x6' hoisting compartments and a 4x6' compartment for ladders and pipes. Shaft is vertical and was 1,520' deep, June, 1913. It is located about 1,500' south of No. 3 shaft, is lined with concrete for a depth of 50' from the collar, and is solidly timbered from surface. The shaft cuts No. 1 Adventure lode at depth of 894', and is expected to cut No. 2 lode at about 2,200' depth, and No. 3 at about 2,600' depth. The No. 1 lode, opened by an 80' crosscut on the 1,021' level has been drifted upon for a distance of about 200' and discloses very little copper. A 1,150' exploratory crosscut south and west on the 1,500' level intercepts 3 beds, designated as Nos. 2, 3 and 4, cutting the first at a distance of 684', the second at 880' and the third at 1,015' from the shaft. These lodes, opened by drifts out from the crosscut, are altogether without promise so far as opened, the No. 2 lode, 29' wide, and opened for a distance of 145', carrying much copper in the first 7' with the remainder practically barren; No. three, 32' wide, and opened 547', showing varying amounts and generally poor, and No. four, 65' wide, carrying practically no copper in the 34' drift run along the footwall of the lode. A fifth lode, No. 1½, first encountered in shaft sinking, is opened for a distance of about 130' at a depth of 1,190' in the shaft, and makes a fair showing. All work was suspended June, 1913, and only resumed in May, 1916. No. 3 shaft has been unwatered to the 8th level and ore is being mined from 3rd-8th levels.

The new Mass lode, so-called, lying about 120' S. E. of the Evergreen bed, was opened by test pitting, May, 1909, and some crosscutting was done from the Evergreen bed, down to the 6th level of No. 2 shaft, but only a few feet of drifting was done. This bed shows a width of 8 to 12', but carries flaky copper, with considerable epidote. No work is in progress on this bed.

The mine equipment includes a 38x59' steel boiler house with three 500 h. p. Burt boilers; a 59x59' steel engine house having an Allis-Chalmers duplex double-cone drum direct-acting hoist with 42x60" cylinders, capable of raising a 12-ton load from a depth of 5,000' on an incline of 45° at a speed of 2,000' per minute, and a 38x65' steel compressor house having a 60-drill Rand-Corliss air compressor. There is a complete electric light

and power plant and protection from fire is furnished by water mains. The principal mine buildings are sheathed with steel and painted, and the property is served by a spur of the Copper Range railroad.

Production has been as follows: 23,572 lbs. in 1900; 29,361 lbs. in 1901; 606,211 lbs. in 1902; 2,182,608 lbs. in 1903; 1,380,480 lbs. in 1904; 1,606,208 lbs. in 1905; 1,552,628 lbs. in 1906; 1,244,874 lbs. in 1907. Shipments to the Winona mill begun in November 1916, have been gradually increased to about 300 tons per day.

AHMEEK MINING CO.

MICHIGAN

Office: 12 Ashburton Place, Boston, Mass. Mine office: Kearsarge, Keweenaw Co., Mich.

Officers: Rodolphe L. Agassiz, pres.; Jas. MacNaughton, v. p. and gen. mgr.; Clarence H. Bissell, sec.-treas.; G. L. Osgood, asst. sec.-treas.; Rodolphe L. Agassiz, Wm. A. Hodgson, Thomas L. Chadbourne, Jr., E. V. R. Thayer, Thomas N. Perkins and Francis L. Higginson, directors; S. Russell Smith, supt.; Thos. Rapson, mg. cap.; J. T. Reeder, purch. agt.; John G. Bennetts, clerk; A. L. Burgan, mill supt.

Inc. March 22, 1880, in Michigan and charter extended, 1910, for 30 years. Cap., \$1,250,000; shares \$25 par, fully issued; \$17 paid in; increased, June 8, 1915, to 200,000 shares; par \$25, 4 new shares being given for each one of the original shares. Last assessment was \$5, Feb. 5, 1904. Paid dividends of \$5 in 1911, \$22 in 1912, \$17 in 1913, \$4 in 1914, \$13 on old capitalization and \$2.50 on new in 1915; \$14 per share in 1916; \$12 for 9 months of 1917.

Annual meeting, second Tuesday in April. American Trust Co., Boston, registrar; State Street Trust Co., Boston, transfer agent.

Balance of assets was \$968,772 at end of 1914; \$1,583,654 at end of 1915; \$2,233,364 on Dec. 31, 1916. Is controlled by the Calumet & Hecla Mining Co., through ownership of 98,048 shares, of a total issue of 200,000 shares.

Net income for 1916 was \$3,449,710 compared with \$2,180,000 in 1915; \$463,000 in 1914; \$207,420 in 1913, and \$1,465,397 in 1912.

Property: 931 acres, lying between the Mohawk and Allouez mines, set off, 1880, by the Seneca Mining Co., to work the Kearsarge or Houghton conglomerate. Under the management of Capt. John Daniell, 2 shafts were sunk on this bed, which averages about 70' width, with 3 paystreaks of 2 to 3', aggregating 7' width, each carrying copper in good quantities, but bed not payable as a whole, owing to great width of partly or wholly barren rock. Boundary lines were rectified, by exchange of 11.18 acres with Allouez, July, 1903, and by a similar exchange of 20 acres, with Mohawk, 1909, giving straight boundary lines on the dip of the bed, permitting easier development by all mines concerned. Work on the present mine was started Dec. 2, 1902, as work at the Mohawk mine had disclosed the position and trend of the Kearsarge lode.

The Kearsarge bed, on which the present mine is opened, ranged 14 to 18' in width, with but little poor ground encountered in the entire mine. Openings are considerably ahead of stoping requirements, and blocking out is almost entirely by drift stopes, which are carried about 9' wide and 14' high, to the boundary limits, where extraction is begun and brought backward to the shafts, thus reducing timber requirements to a minimum. The mine keeps 3,000,000 to 3,500,000 tons of stamp rock blocked out for stoping. All levels below the first are 125' apart. A Richmond electric bell signal system connects all underground workings with the engine rooms, and underground stations are connected with surface by telephone. Concrete is substituted for timber in the construction of the shafts, and in other places where practicable, rendering the shafts as nearly fireproof as possible. Mules are used in tramming rock underground.

During 1916, exploration was continued in the Kearsarge conglomerate. On No. 10 level of No. 2 shaft, the drift was swung at right angles to the general strike of the lode and continued as a crosscut to a point 1,352' W. of the Kearsarge lode, where the Kearsarge conglomerate lode was cut. This body is 36' wide, and carries a little copper in streaks. Other work did not find commercial ore, but a S. drift opened a fissure giving 12 tons of mass copper.

A cross fissure vein of domeykite, copper arsenide, 71.7% copper, and mohawite, a copper-nickel-cobalt arsenide, mainly the former, that is 4 to 12" wide, was opened 300' south of No. 1 shaft, on the 5th level, and a second vein of 2 to 12" width is found about a quarter-mile south, both crossing the bedded formation at practically right angles.

The mine has 4 shafts, numbered from south to north, planned to develop the entire tract. Nos. 1 and 2 shafts, 1,445' apart, sunk at 42°, are each 8x17' 4" in size, with 2 hoisting compartments and a ladderway. These shafts were 2,720' and 2,971' deep respectively at end of 1916. Each shaft has, between the 9th and 10th levels, a 400-ton rock bin, equipped with a measuring hopper holding exactly one 7-ton skip load, loaded in 20 seconds by one man, this system saving much time, and confining hoisting of all rock mined down to the 10th level to 1 point in the shaft. No. 1 shaft can be sunk to about 3,000' depth before cut off by the Allouez line, and No. 2 can be sunk much deeper.

All openings from No. 1 shaft show ore of average quality, save those on No. 8, 10, 14 and 16 levels south, beyond the disturbed area.

Extensions on No. 3, 14, 16 and 17 levels north, on No. 18 south, and on No. 19, 20, 21 and 22 both ways from No. 2 shaft, have been in average ore but from No. 16 down the copper is not so uniformly distributed.

The northern end of the mine is developed by shafts 3 and 4, begun August, 1908. These will command the 12 forties lying in the western half of Sec. 28 and eastern half of Sec. 29. Shafts 3 and 4, three-fourths mile N. E. of No. 2, have a common collar, being only 6' apart at surface, but diverging north and south, from the surface, at an angle of 42°. These shafts are sunk through 70' of overburden, and are concreted into the solid rock ledge for depth of 95' from surface. Owing to the outcrop of the Kearsarge lode being owned by the Mohawk, Ahmeek having only the underlay at its northern end, shafts 3 and 4 are sunk in the hanging, at an angle of 80° on a plane corresponding longitudinally to the strike of the bedded formation, and bend at depth of 980', in a curve with a radius of about 400', bringing the shafts to 34°, to correspond with the rather flat dip at the Kearsarge bed, both shafts entering the bed, early 1911, at depth of about 1,275'. Concrete sets and stringers have been used in these shafts wherever ground would permit. Each shaft has 3 compartments, with two 8x8' skipways and a 4x8' ladderway. It is proposed to work out the upper portion of the bed by crosscuts, beginning at depth of 1,020' in No. 4 shaft, which will be the 1st level in these shafts, which have 3 stations above the point where the bed intersects, from which crosscuts will be run to the Kearsarge bed, to the Mohawk line. No. 3 shaft was 2,473' and No. 4 was 2,319' deep at end of 1916. In 1915 new workings totaled 8,769' compared with 13,654' in 1916.

During 1916, openings north of No. 3 were of average grade, but stoping showed the vein to carry copper in bunches. Development at No. 4 shaft was generally satisfactory.

The main power house, between shafts 1 and 2, is in 2 parts, of brick and steel, with composition roof. Equipment of No. 1 power house includes 60-drill and 50-drill Nordberg cross-compound 2-stage air compress-

ors, and a 32x72" cylinder Nordberg hoist. The electrical plant consists of a 13x26" Nordberg tandem-compound engine, direct-connected to a 200 k. w. 250-volt Northern Electric generator. Condenser pumps and reheaters are located in the basement. No. 2 engine house is a duplicate of No. 1, containing a similar hoist with double conical drums with maximum diameter of 18'-6", capable of hoisting 10-ton skips in counterbalance from 1 mile depth. Nos. 1 and 2 engine houses are connected by a steel-frame boiler house, having six 200 h. p. boilers, with room for 8 equipped with feed pumps, ash sluices, coal trestles, etc. The boiler house has a self-supporting steel smokestack, 150' high and 7'6" in diameter, on a sandstone-faced concrete base. A 1,360 cu. ft. Sullivan compressor was installed early in 1917.

Shafts 3 and 4 are equipped with two 32x72" cylinder Nordberg hoists, a triple-expansion Nordberg compressor, and turbo-generator, housed in a brick structure 65' wide by 146' long, with corrugated-iron roof; a steel boiler house 57' wide and 84' long with corrugated-iron roof, housing eight 200 h. p. boilers, and a steel self-supporting brick-lined smokestack, 7' diameter and 140' high. There is also a change house of brick construction, 39x139'. One shaft rock house serves both shafts.

The central crushing plant, of brick, is 800' north of No. 1 shaft, and 624' south of No. 2 with which the plant is connected by a temporary frame trestle 37' high and 14' wide, carrying a double track for 7-ton tram cars, which are dumped by means of cradles, and rock directed by grizzlies and chutes to the crusher, below which is a hopper, feeding directly into a shaker driven by a 7½ h. p. electric motor, crushed rock, thence being fed automatically into a link-belt conveyor driven by a 35 h. p. motor, going to the rock bin. The crusher building, of steel, contains 3 Farrell crushers, driven by a 12x24" Nordberg engine, and tram cars are actuated by two 35 h. p. motors, located in the 2nd story of the building. Crushed rock goes to a 1,600-ton cylindrical steel rock bin, 32' in diameter and 48' high, set on concrete piers, with tunnel and railway track beneath, permitting the filling of cars by gravity, 1 man loading a 40-ton car in 10 seconds.

Mine buildings include office building, machine shop, warehouse, connecting with railway tracks; an office for mining captains and timekeepers, smithy, cold-storage shed, and about 100 dwellings. The locality is protected by a water system having 6,000' of 6" mains with 16 Ludlow hydrants. Water is taken from an 8' dam across the outlet of Seneca lake. This water supply probably will be adequate for several years, but is located on another company's land. A large water supply could be developed from Ahmeek lands near the Allouez boundary, and an inexhaustible supply is available from Lake Superior, 4 miles distant, but about 600' lower. The fire-protection system was connected with that of the Calumet & Hecla during 1916.

The mine has rail connections with both the Mineral Range and Keeweenaw Central lines, and is connected with the mill by the Mineral Range, which enters the structure over a steel trestle 100' high.

The stamp mill, at Hubbell, on Torch lake, went into commission June, 1910. There were 4 heads, each stamp breaking about 560 tons of rock daily. The mill site has a frontage, on Torch lake, of about 2,000' with a maximum water depth of 90', providing for wasting sands for many years. Ground was broken May, 1913, for an addition to the mill, with room for 4 heads, all of which have been installed, together with extensive regrinding machinery. No. 7 stamp started in July, 1916, and No. 8 in Feb., 1917. The output in April, 1917, was 4,200 tons daily.

Several new ideas are embodied in the erection and equipment of this

mill. The material of construction is steel and concrete throughout. Stamps rest on concrete piers, each standing on a concrete slab 4'6" thick that rests directly upon a hard pan of closely-cemented gravel. Each slab holds about a mile of wire cable, interlaced upward on its surface and reaching into the pier above, which is 40x40' at the base, pyramidal in form and 38' high, giving the stamps an elevation of about 50' above lake level. There are four 1,000-ton rock bins. A new feature in local mill construction is double-deck floors, the jigs being located on the upper or roughing floor, and sands overflowing to Evans round tables and Wilfley concentrators on the ground floor. Wash equipment includes 88 jigs, 12 Evans round tables, 45 Wilfley tables and 4 sets of Woodbury jigs. Tests made to end of 1910, indicate a saving of about one-half pound fine copper per ton from the Woodbury system of milling, over the old system. The jigs and tables are actuated exclusively by electricity.

The mill power house has six 200 h. p. boilers, and a low pressure steam turbine. The plant has a 300 k. w. generator, and a pump of 40,000,000-gal. daily capacity, capable of supplying water for 8 heads, connected with Torch lake by a 600' pipe intake.

Production:

Year	Tons R'k Treated	Lbs. Mineral Produced	Lbs. Cu. per Ton R'k Stpd.	Cost(a) per Ton	Lbs. Copper Produced	Tot. Cost per Lb.	Rec'd per Lb.
1916....	1,164,010	.....	20.7	\$1.46	24,142,158	11.47c	25.72c
1915....	948,874	32,292,325	23.0	1.26	21,800,492	7.96	18.28
1914....	590,519	20,333,000	23.1	1.55	13,634,605	9.71	13.08
1913....	383,749	13,742,140	24.0	1.77	9,220,874	13.30	15.42
1912....	652,280	23,945,315	25.2	1.39	16,455,769	7.85	16.61
1911....	598,549	21,917,925	25.4	1.42	15,196,127	7.17	12.85
1910....	530,365	16,758,521	22.3	1.42	11,844,954	11.05	12.94
1909....	406,045	.....	22.7	....	9,198,110	15.48(b)	13.39
1908....	298,178	.....	21.1	....	6,280,241	12.66	13.36

(a) Includes mining, transportation, stamping and taxes. (b) Due to unusually heavy construction costs.

Copper production is marketed through the United Metals Selling Co. Reserves not officially given are maintained at about 5,000,000 tons, and the life of the mine is estimated at 18 years, with present output.

The strike called by the Western Federation of Miners on July 23, 1913, and declared off on April 12, 1914, curtailed production during that time. Later in 1914 when the European war broke out, the copper market was demoralized and the mines were operated on a three-quarter time basis from Sept. 1, 1911, to Feb. 1, 1915.

With 8 stamps operating, Ahmeek is now producing at the rate of over 30,000,000 lbs. copper per year, figured on the basis of 21 lbs. ore, with a cost per lb. copper of about 11c.

ALGOMAH MINING CO.

Office: 60 Congress St., Boston, Mass. **Mine office:** Lake Mine, Ontonagon Co., Mich.

Officers: R. M. Edwards, pres. and gen. mgr.; S. L. Powers, v. p.; Albert L. Wyman, sec.; Henry Tolman, treas.; R. M. Edwards, J. H. Rice, Henry Tolman, S. L. Powers and Arthur C. Paine, directors; Thos. Bennetts, supt.; Wm. Wearne, mg. capt.

Inc. June, 1910, in Michigan. Cap., \$2,500,000; shares \$25 par; issued 70,000 shares; paid in \$13. Last assessment, May 18, 1916, \$1. Of the capitalization, 60,000 shares were given land owners in full payment for

property and 10,000 shares were sold to public at \$10 per share. Annual meeting, third Tuesday in April. American Trust Co., Boston, transfer agent; Federal Trust Co., Boston, registrar. Stock is listed on the Boston Stock Exchange.

The treasurer's statement, Dec. 31, 1916, showed excess of assets, \$26,470, as compared with excess of liabilities, \$18,133, Dec. 31, 1915; \$14,597 surplus assets at close of 1914 and \$27,707 in 1913.

Property: 480 acres, adjoining the Lake mine in Ontonagon Co., Michigan, being the N. $\frac{1}{2}$ and S. W. $\frac{1}{4}$ of Sec. 3, T. 50 N., R. 30 W. Property was owned formerly by a company of the same name, which began work 1852, and did a little prospecting, with negative results, expending about \$65,000.

An 8x12' exploratory shaft, started in an amygdaloidal bed, without definite data as to pitch, was over 560' deep, May, 1917. For the first 95' the shaft continued in vein material, passing into the hanging wall at about 95' from surface. The first level, opened at 104', has about 2,350' of drifts, and a 90' crosscut to the eastern sandstone. The second level, 212' from surface, has a crosscut northwest across the formation which, for more than 1,000', exposes almost solid trap, a small amygdaloid, 560' from the shaft, showing some native copper in about 680' of drifts. The Algomah bed, in which the shaft is sunk, apparently has a dip of about 80° and a width ranging from about 40' at the first level to about 60' at a depth of 470', indicated by diamond-drill borings.

The Algomah bed is peculiar in both strike and contents, strike apparently being nearly north and south, in line with the strike at the Lake mine, next north, and the bed carrying copper oxide instead of native copper, as is the case with all of the other copper mines of the Lake Superior district opened on the bedded formation of the Keweenaw series. Ore is mainly black oxide, or melaconite, carrying traces of native copper, and chrysocollo of 16 to 19% assay tenor was found in a test pit near the shaft. Assays made of a small quantity of selected ore, removed in the course of shaft sinking, gave a copper value of 24.1%, this selected ore representing one-eighth of the entire body of material taken from the shaft.

Considerable diamond drilling has been done in the area west of the orebody, and to great depth, but results are conflicting and nothing definite is known concerning either the dip, strike or value of the several copper-bearing formations there encountered. No mining work was done on the property during 1914, but one shipment of selected ore was made, which yielded 5,005 lbs. copper and sold for \$1,695. A few shipments of ore, taken from above the 40' level, were made in 1915, the first assaying 14% copper. Shaft sinking, resumed in the summer of 1915, to be continued to 500' depth, and development work will be done on this level. It is expected that in depth the shaft will encounter some of the lodes worked in the Lake and South Lake mines, as they flatten downward and dip toward the Algomah ground. Property is a likely prospect only.

Equipment: includes a steam hoist, with capacity to lift a 3-ton load from a depth of about 500', and an air compressor. Buildings include a power plant, office and boarding houses. Property considered promising and management good.

ALLOUEZ MINING CO.

MICHIGAN

Office: 12 Ashburton Place, Boston, Mass. **Mine office:** Allouez, Keweenaw Co., Mich.

Officers: Rodolphe L. Agassiz, pres.; Jas. MacNaughton, v. p. and gen. mgr.; preceding officers, Harry F. Fay, D. S. Dean, F. L. Higginson, Geo. S. Mumforn, D. L. Pickmaside and Alex. White, directors; Geo. G. Endicott, sec.-treas.; F. W. Ridley, supt.; J. J. Gibbens, mg. capt.

Inc. Sept., 1859, in Michigan. Cap., \$500,000; shares \$25 par; reorganized and reincorporated, 1889, with capitalization \$2,500,000; shares \$25 par; paid in, \$22.25. Last assessment, \$3 per share, was levied 1904. Annual meeting, second Wednesday in April. Old Colony Trust Co., Boston, registrar; American Trust Co., Boston, transfer agent. Owns a half interest in the Lake Milling, Smelting & Refining Co. Is controlled through ownership of 41,000 shares, by Calumet & Hecla Mining Co.

Initial dividend, \$1 per share, was paid July 31, 1915; \$9 in 1916, and \$3 for first quarter, 1917.

Balance sheet of Dec. 31, 1916, shows quick assets and cash of \$1,545,814, and accounts payable of but \$154,602. Construction expenses for 1916 were \$22,321; mine expenses, \$901,042; smelting, etc., \$185,805, with a gain from mining operations of \$1,524,511.

Lands: 3,400 acres, including mineral ground 640 acres, adjoining the Ahmeek Mining Co., which contains the Kearsarge amygdaloid at great depth.

The old mine, opened 1859, is on the Allouez conglomerate, a bed underlying the greenstone. The conglomerate, 30' wide in many places, with strike of N. 39° E., and dip of 39°, average 0.7 to 1% copper, and is very refractory under the stamps. There are 3 shafts, deepest about 3,700'. Mining was begun actively in 1869, and stopped in 1877, with an exhausted treasury. The mine was then leased to Watson & Walls, who made money from it, after paying a royalty of one-eighth on gross production. In 1880 the company resumed control, to quit once more, financially exhausted, in 1885. Watson & Walls took the mine again, and once more did well; the company resumed work on its own account for the third time, and again lost money, stopping all work in 1892. The old mine had been idle for some years, except for exploratory and development work in 1898 to 1900, when a shaft was sunk 1,200' on the Osceola lode, and nearly 4,000' of openings secured thereon, with indifferent results. The shafthouse at the Osceola shaft has been demolished. The old stamp mill, on Hills creek, has 3 old-fashioned heads, and is too antiquated for use. The old Allouez made 26,051,528 lbs. fine copper, 1869 to 1892.

At No. 1 mill, Point mills, the water system was improved in 1916. At No. 2 mill, Hubbell, work progressed slowly on the two new stamps. The fire system was connected with the Calumet & Hecla.

Development: at the Allouez mine is on the Kearsarge amygdaloidal bed, which does not outcrop on Allouez lands, though underlying the entire 640-acre tract, hence was opened on the underlay. The mine had but one producing shaft, until late 1909. Shafts Nos. 1 and 2 are connected by crosscuts and drifts, on several levels. The Kearsarge bed, above the 14th level, is opened by crosscuts, uppermost being at the 6th level, below which plats have been cut in the shafts at the 8th, 10th and 12th levels, for crosscuts to be run to the bed. The Kearsarge bed averages about 16' width in the Allouez mine.

New underground openings totaled 8,517' in 1912; 4,400' in 1913; 3,526' in 1914; 4,858' in 1915; 3,503' in 1916.

No. 1 shaft, at the extreme southeastern corner of the tract, with 3 compartments, started May, 1903, and 3,688' deep, leaves surface at an angle of 75°, but at slight depth takes an angle of 80°, continuing thereon to about 1,435' depth, when a curve of 60' brings the shaft to an angle of 38° 30', which is the dip of the bed. At the change of angle, on reaching the bed, a single idler with a very wide flange cares for the cables passing at either end. Owing to the steep pitch of the shaft, back rails of 6x10" timber are set so close to the wheels of the skips that their flanges cannot leave the

steel rails, the wooden timbers serving as guides. The first level is opened at depth of 1,264'. In order to save pumping charges on surface water, a gutter, cut entirely around the shaft, leads to an incline 36' long, used as a sump. This shaft showed very fine ground in its upper levels, but deeper openings are not so good. Equipment at No. 1 shaft includes a 42x62" steel shaft rock house having two 18x34" crushers. The floor was re-modeled during 1916.

Development on Nos. 18 and 19 levels of No. 1 shaft have been of average quality, though on No. 19 north, the ground was somewhat erratic.

No. 2 shaft, 1,500' northeast of No. 1, is similar to No. 1 in general design, but changes pitch when entering the bed at 2,307' from surface, from 80 to 42°. The bed above the point of intersection will be reached, to the boundary, by crosscuts. This shaft is sunk further in the hanging than No. 1, owing to the proximity of a lake. A new record in shaft sinking was established, 1908, at No. 2, when, with 2 drills, the shaft was sunk a total of 1,275', in addition to which 4 plats were cut, and 105' of crosscutting was done. The collar of No. 2 shaft is of concrete. Washington fir and 16x24" steel I beams, with 14x14" square timber wall plats and 4" plank sheathing. The interior, from collar to solid rock ledge, is lined with 22" of concrete, dividers having their ends bedded in concrete, this giving an impregnable shaft, sunk through 52' of treacherous quicksand overburden. Both shafts can be sunk to about 9,400' before reaching the western boundary line. No. 2 shaft is 3,408' deep.

At No. 2 shaft during 1916, No. 17 level reached the Ahmeek boundary. On No. 18, 19, 20 and 21 good ground was opened, especially on No. 18. Electric locomotives have been installed.

Machinery equipment includes a Nordberg hoist with 32x72" duplex cylinders and 18' double-conical drum for No. 1 shaft, and No. 2 has a 20x30" engine good for depth of 5,000'. No. 1 engine house, of mine rock, with redstone trimmings, has 12-drill and 18-drill air compressors, and No. 2 engine house has a 60-drill Laidlaw-Dunn-Gordon air compressor. The stone boiler house has five 125 h. p. boilers and a 120' self-supporting steel smokestack. Buildings include a redstone machine shop and smithy, and a large warehouse. There is a very considerable mine location, with numerous dwellings, some remaining from 40 years ago, and some new. The mine is reached by a spur of the Mineral Range railroad.

Recent production has been as follows:

	Tons R ^k Treated	Lbs. Min. Produced	Lbs. Cu. Mine Cost		Lbs. Cu. Produced	Total Cost	
			R ^k Stpd.	per Ton (a)		per Lb. Cts.	per Lb. Cts.
1916....	566,960	.....	18.02	\$1.589	10,219,290	10.47	25.305
1915....	534,705	10,043,459	18.78	1.365	10,043,459	9.31	18.166
1914....	354,457	9,408,470	17.09	1.583	6,056,548	11.18	12.853
1913....	236,663	6,640,000	17.29	1.687	4,091,129	12.09	15.672
1912....	333,618	8,787,120	16.56	1.613	5,525,455	13.52	16.668
1911....	288,610	7,532,490	16.56	1.668	4,780,494	13.30	.....
1910....	247,119	7,406,970	18.84	1.769	4,655,702	11.57	.....

(a) Includes mining, transportation, stamping and taxes.

The strike, called July 23, 1913, by the Western Federation of Miners and declared off April 12, 1914, interfered with production during that time. After the European war broke out in 1914 the property was operated on a three-quarter time basis from Sept. 1, 1914, to Feb. 1, 1915.

The Allouez, a considerable disappointment in earlier years, earned a net profit of \$171,264 in 1912, turning a deficit of \$77,700 of former years

into balance of assets of \$93,564 over all liabilities, and in 1914 net profits were \$114,530. Earnings in 1916 were \$1,524,511, so that with a working capital of \$963,810, the company is now on a sure dividend paying basis. Is regarded as a good investment.

ARNOLD MINING CO.**MICHIGAN**

Idle. Office: 78 Devonshire St., Boston, Mass. Mine office: Copper Falls, Keweenaw Co., Mich.

Officers: Francis L. Maguire, pres.; John Brooks, sec.-treas.; Capt. Wesley Clark, supt.; preceding officers, Edw. F. Newton and John E. Fitzgerald, directors. Annual meeting, second Tuesday in May.

Inc. 1864, in Michigan. Cap., \$2,500,000; shares \$25 par; issued, \$1,550,000.

Property: 3,323 acres, in T. 58 N., R. 31 W., in 2 tracts, including the Old Copper Falls mine and the Arnold mine proper, with frontage of about 3 miles on Lake Superior. The Copper Falls mine, worked 1850, until Aug., 1893, made 25,686,429 lbs. fine copper, mainly from the Owl Creek fissure, and paid dividends of \$100,000. The Arnold mine proper, developed on the Arnold ashbed, was opened 1863, reopened 1897, closed 1901, rock stamped averaging under 0.8% copper. Has a stamp mill and 2½-mile narrow-gauge railroad, known as Arnold & Eagle Harbor, rolling stock of which has been sold. No. 1 shaft of the Arnold is about 1,000' deep, sunk at an angle of 26° with the horizon. Total production, 1899 to 1911, inclusive, was 2,065,817 lbs. fine copper.

ASHBED MINING CO.**MICHIGAN**

Office: 78 Devonshire St., Boston, Mass. Mine office: Copper Falls, Keweenaw Co., Mich.

Officers: Francis L. Maguire, pres.; John Brooks, sec.-treas.; Cap. Wesley Clark, supt.; preceding officers, Edward F. Newton and Charles G. Lund, directors.

Inc. 1880, in Michigan. Cap., \$1,000,000; shares \$25 par. Annual meeting, second Tuesday in March.

Property: 1,143 acres, Petherick mine, in vicinity of Copper Falls, adjoining the Arnold mine. The last mining work was done 1905-1906. Described Vol. II of the Copper Handbook.

BALTIC MINING CO.**MICHIGAN**

Dissolved. Property now owned by Copper Range Co., which see.

BOHEMIA MINING CO.**MICHIGAN**

Office: 85 Devonshire St., Boston, Mass. Mine office: Lake Mine, Ontonagon Co., Mich. Operating office: Dee Bldg., Houghton, Mich.

Officers: Wm. A. Paine, pres.; Chas. A. Snow, v. p.; Robt. H. Gross, sec.-treas.; preceding officers, John H. Rice, Thos. S. Dee, Richard M. Edwards and F. Ward Paine, directors.

Inc. Jan. 29, 1910. Cap., \$2,500,000; shares \$25 par; assessable; paid in, \$8; issued, \$1,875,000. Of the 75,000 shares issued, 30,000 were given for lands, and 45,000 were sold to the public, at \$8. Boston Safe Deposit & Trust Co., transfer agent. Stock is listed on the Boston curb, 1916 quotations around \$2. Annual meeting, third Wednesday in April.

Property: 960 acres, originally known as the Piscataqua, in very early days, and later as the Henwood. It is hoped that the property is traversed by the cupriferous amygdaloidal bed of the Lake Copper Co. Diamond drilling was done 1910. Drill holes have yielded a number of cores, from various amygdaloidal beds, with copper in fair quantities, but with nothing remarkably promising or that would justify sinking a shaft. Suspended operations March, 1911.

Annual report, Feb., 1917, shows cash in bank, \$131,088 and states that as soon as sufficiently important developments are made on adjoining properties, development work will be resumed.

BOSTON & LAKE SUPERIOR MINERAL LAND CO. MICHIGAN

Office: Leopold Bldg., Houghton, Mich. Fred W. Nichols, resident agt. Property is mineral land in the Lake Superior copper district. No mining work ever done.

CALUMET AND HECLA MINING CO. MICHIGAN

Subsidiaries of the Calumet & Hecla Mining Co. are listed under their respective titles: Ahmeek, Allouez, Centennial, Cliff, Gratiot, Isle Royale, La Salle, Lake Superior Sm., Laurium, Osceola, Superior, Tamarack and White Pine C. Co.

Address: 12 Ashburton Place, Boston, Mass. **Mine office:** Calumet, Mich.

Officers: Rodolphe L. Agassiz, pres.; Jas. MacNaughton, v. p. and gen. mgr.; Francis L. Higginson, Robt. F. Herrick and W. Hunnewell, directors; John F. Perkins, sec.-treas.; Chas. A. Hall, asst. treas.; A. J. Garceau, asst. sec.; W. M. Gibson, asst. supt.; E. S. Grierson, chief engr.; John Knox, chief mg. capt.; Ocha Potter, chief efficiency engr.; Fred S. Eaton, chief clerk; E. D. Johnson, purch. agt. **Mill office:** Lake Linden, Mich. Henry Fisher, supt.; C. H. Benedict, mill metallurgist. **Smelter offices:** Hubbell, Mich. H. D. Conant, supt.

Inc. 1871, in Michigan. **Cap.**, \$2,500,000; shares \$25 par; paid in, \$12. Charter renewed, 1900, for 30 years, and amended, 1905, under the new laws of Michigan, making the corporation a securities-holding company, as well as a mining and smelting company. Was organized as a consolidation of the Hecla, Calumet, Portland and Scott mining companies. Stock is listed on the Boston Stock Exchange, and traded in on the unlisted department of the New York Stock Exchange. Annual meeting, second Thursday in April. Old Colony Trust Co., Boston, transfer office; American Trust Co., Boston, registrar of stock.

Balance sheet, of Dec. 31, 1916, gave cash and quick assets of \$17,497,865, with liabilities of \$6,739,263, leaving a balance of quick assets of \$10,758,602, including notes outstanding at this date, which were \$4,134,000 at 4%, called and payable Feb. 18, 1917. Surplus, \$45,284,378.

Dividends: \$5,000,000 in 1905; \$7,000,000 in 1906; \$6,500,000 in 1907; \$2,000,000 in 1908; \$2,700,000 in 1909; \$2,900,000 in 1910; \$2,400,000 in 1911; \$4,200,000 in 1912; \$3,200,000 in 1913; \$1,000,000 in 1914; \$5,000,000 in 1915; \$7,500,000 in 1916, and \$8,500,000 in 1917. Total to Dec. 20, 1917, \$145,250,000, or \$1,450.25 per share, being the largest dividends ever paid by any incorporated mining company, and, in addition, the Hecla Mining Co. and Calumet Mining Co., before their amalgamation under the present title paid dividends aggregating \$950,000. Dividends received from other mining companies amounted to \$2,226,930 in 1916.

During 1917, C. & H. paid three dividends of \$25 per share and one of \$10, the last being reduced to conserve cash resources for heavy Federal taxes, estimated at between \$2,000,000 and \$3,000,000 for 1917.

Since the change in charter, 1905, permitting the acquisition of stock in other corporations, the Calumet & Hecla has secured control of various other mines and mineral tracts, by organizing subsidiary corporations, and also by acquiring stock in companies previously organized. In 1905 the company bought the following stocks, at a cost of \$8,592,129.99 in cash and notes; 9,600 shares of Osceola; 19,400 shares of Tamarack; 24,796 shares of Ahmeek; 27,507 shares of Isle Royale; 10,316 shares of Seneca; 25,000 shares of Laurium. The attempt to secure physical control of the Osceola Consolidated Mining Co., at the annual meeting, March, 1917, was met by determined opposition, which took the fight into the Michigan legislature and the Federal courts. After nearly 2 years of strenuous litigation, the Calu-

met & Hecla assured control of the Osceola and other Lake Superior mining companies formerly under the management of A. S. Bigelow, through a bargain with Mr. Bigelow, by which his entire stock interests were sold to the Calumet & Hecla.

In 1916 Calumet & Hecla offered to purchase the remaining shares of Tamarack Mining Co.; but owing to a dispute as to a fair price the matter was not consummated until June 25, 1917, when the C. & H. Co. agreed with Tamarack shareholders and the former acquired the assets of the latter. The Tamarack mine now belongs to the C. & H. Co.

The share holdings of the Calumet & Hecla in subsidiary companies were as follows on Dec. 31, 1916: 41,000 shares of Allouez Mining Co.; 41,500 shares of Centennial Copper Mining Co.; 19,400 shares of Cliff Mining Co.; 50,100 shares of Gratiot Mining Co.; 152,977 shares of La Salle Copper Co.; 32,750 shares of Osceola Consolidated Mining Co.; 50,100 shares of Superior Copper Co.; 39,288 shares of Laurium Mining Co.; 32,910 shares of Isle Royale Copper Co.; 98,048 shares of Ahmeek Mining Co.; 19,400 shares of Tamarack Mining Co.; 34,259 preferred shares and 42,602 common shares of White Pine Copper Co.; 3,482 shares Calumet Transportation Co., and 2,000 shares in Great Lakes Transportation Corp. The Frontenac, Manitou, Dana and St. Louis companies have been completely absorbed.

On Dec. 23, 1916, the company sold its 11,207 shares of Seneca Mining Co. for \$60 per share, a total of \$672,420. The C. & H. has no further interest in the Seneca.

Property: the landed holdings of the Calumet & Hecla, including property owned outright, property controlled through subsidiary corporations, mining lands under options, and timber and miscellaneous lands, in Houghton, Keweenaw and Ontonagon counties, Michigan, amounts to approximately 209,051 acres, of which 102,804 acres are in Keweenaw county. The company, with its subsidiaries, has a water front of more than 34 miles, on the shores of Lake Superior, Lac La Belle and Torch Lake, and approximately 60,000 people are supported by the operations of the company and its allied interests.

The Calumet & Hecla mine proper, about 2,750 acres, lies in a compact tract in Secs. 11, 13, 14, 15, 22, 23 and 24, T. 56 N., R. 33 W., in addition to which the company owns considerable tracts, west of the Tamarack mine, carrying the underlay of the Calumet conglomerate at such stupendous depth that opening would require a 2-mile vertical shaft, and it is very doubtful whether these lands ever will become available for mining on the Calumet conglomerate. The lands west of the Tamarack were explored, 1904, by diamond drill, in search of a supposed cupriferous conglomerate, but nothing of promise was found.

The original Calumet & Hecla mine is opened on the Calumet conglomerate bed, and a parallel mine has been developed on the Osceola amygdaloid, while a third parallel mine has been partly developed on the Kearsarge amygdaloidal bed.

The Calumet conglomerate has proven unprofitable both to the north and south of the Calumet & Hecla, though workable at the Tamarack mine, which has developed the underlay by vertical shafts. The conglomerate has an average strike of N. 33° 30' E., with average dip of 37° 30' with the horizon. The bed is of 5' to 26' maximum width, with an average of 13', giving about 2,400 fathoms of stoping ground, or about 43,200 tons of stamp rock, per acre. As a rule, the richer portions of the conglomerate are in the central part of the Calumet & Hecla tract. The walls of the conglomerate carry considerable copper, especially the amygdaloidal footwall, and much of the adhering trap rock formerly rejected is now milled. Pillars

of 75' and even up to 150' width, left on either side of every conglomerate shaft, contain stamp rock equivalent to about 18% of the stoping ground available before the robbing of the pillars. The conglomerate mine is opened 6 to 8 years in advance of immediate requirements, and has upwards of 200 miles of shafts, drifts, crosscuts and winzes.

About 18,000,000' of timber, board measure, is used in the mine annually, and to the end of 1916, over 900,000,000' of timber had gone underground. Iron pillars are used as supports, in crosscuts connecting the Red Jacket shaft with drifts on the bed, and in various incline shafts to support the hanging wall. Iron, mainly scrap material, such as worn out skip rails, cut to 10' lengths and placed above I-beams, is used for lagging, to some extent. The conglomerate bed in the lower workings is not up to its average value above, being wide, but low in copper contents, and it is evident, from the results secured by the deep shafts in the district, that while the cupriferous stratified beds of Lake Superior may descend to tremendous depth, copper values decrease below 4,000'.

The conglomerate mine, which, until a few years ago, was the entire Calumet & Hecla, has a life, at the present rate of production, of between 8 and 12 years, followed by 5 to 10 years of scrambling, with greatly decreased output. The conglomerate has decreased in average copper contents with depth, but output averaged in 1915, 3.36 lb., and in 1916, 3.59 lb. more than in 1914, partly because old pillars, etc., were robbed. The mine works normally 175 power drills on the conglomerate, and 125 drills on the amygdaloid.

During 1916, there were 78 drills at work removing shaft-pillars, cleaning up arches and backs of stopes. This yielded 476,310 tons of ore.

The Calumet & Hecla has suffered severely from underground fires. The rock carrying native metal cannot burn, like sulphide ore, but the old timbering eventually becomes nearly as inflammable as tinder. The really serious mine fires, 5 in number, occurred in 1884, July and Nov., 1887, Nov. 30, 1888, and May 27, 1900. All possible precautions are taken against mine fires, these including the partial fire-proofing of all mine timber with zinc chloride solution, regular sprinkling of all shafts, the maintenance of water pipes and hydrants, fire hose, chemical engines, an electric alarm system and 18 telephones at various pump stations, from the 8th to the 51st levels, inclusive, in 5 different shafts, so distributed, as to be most readily accessible from all part of the mines. From the first 4 fires the Calumet & Hecla suffered aggregate losses of several millions of dollars, while a number of lives were lost, and 3 valuable shafts were drawn so badly that they were abandoned. The fifth and last fire, in May, 1900, severely tested the mine's fire system, the fire breaking out on Sunday evening, when the mine was deserted by all but a few employees, and gaining great headway before it was discovered. The burning portion of the mine was shut off by closing the fire doors, and the mine was sealed at surface, by covering the mouths of the shafts with heavy timbers, with dirt tamped tightly into the crevices between. Wherever gas escaped through holes in the earth, dirt was tamped in and luted with water. The fire was extinguished in 3 weeks, and the South Hecla portion of the mine continued working without interruption. All fires have been of mysterious origin, and there seem reasons for suspecting incendiarism. Great precautions are taken to prevent unauthorized persons entering the mine, and permission to go underground is given only by the president, in writing, each pass being for a single trip.

Equipment: the conglomerate property of the Calumet & Hecla is worked as 2 separate mines, known as the Hecla and Calumet branches, the South Hecla being a southerly continuation of the Hecla branch, and

the Red Jacket vertical shaft a part of the Calumet mine. The Calumet to the north, the Hecla in the center, and the South Hecla at the south, form one continuous mine, developing the Calumet conglomerate by incline shafts, the Red Jacket shaft opening the same bed vertically. The conglomerate, opened for 2 miles along the outcrop, has 11 shafts, 8 being known as single compartments, which means a single hoisting compartment, with 2 shafts having 2 hoisting compartments and 1 vertical shaft having 6 compartments. The blind shaft has an electric hoist and the mine has electric station pumps for forcing water to surface with steam pumps actuated by compressed air for short lifts, but it is planned replacing these latter by electric pumps also.

The conglomerate shafts on the outcrop are as follows, from north to south: Nos. 6 and 5, Calumet, latter a 2-compartment shaft, bottomed at the 57th level, 6,155' from surface. There is a considerable stretch of lean ground from No. 6 shaft to the Centennial boundary.

No. 4 Calumet, with 1 hoisting compartment, has a vertical depth of 4,748' and an actual depth of 7,995' on the incline of 37° 30', with a 200' winze from the bottom, giving a total depth of 8,290' from the collar of the shaft to the bottom of the winze. No. 3 Calumet shaft has been abandoned.

No. 2 Calumet shaft with 1 compartment, is 6,186' deep, practically at the boundary, and the shaft pillars and arches are being removed above the 55th level.

No. 2 Hecla shaft, 4,400' deep, and No. 3 Hecla shaft, 4,000' deep, are bottomed at the Tamarack boundary. Stopes are exhausted and the shaft-pillars are being taken out.

No. 4 Hecla shaft has been abandoned for some years. No. 6 Hecla shaft, with 1 compartment, is 7,875' deep, in good ground, and can be sunk to 8,500' depth. Nos. 7 Hecla and 8 South Hecla shafts of 1 compartment each, are 7,978' and 6,102' deep, respectively. Sinking was permanently discontinued at the 63rd level in South Hecla No. 8, and shaft pillars and arches are being removed.

Nos. 9 and 10 South Hecla, a double shaft with 2 compartments, is 8,132' deep and can be sunk to 8,500' depth. Openings south below the 72nd level have shown a marked improvement.

No. 11 Hecla, 2,400' deep, showed very poor ground at the bottom, and has been robbed by the removal of all pillars from the bottom up.

No. 12 Hecla shaft, at the company's southern line, is 5,643' deep, bottomed in poor ground, disclosing a formation nearly barren of copper at depth. This shaft is practically abandoned.

The Red Jacket vertical shaft, of 1,800 tons daily capacity, permanently bottomed at 4,900' depth, cuts the bed at 3,287'. Rock temperature was 87° F., reduced to about 70° by connection with No. 4 Calumet shaft, exhaust air from the power drills aiding in cooling the mine. The Red Jacket shaft is 14' 6" x 24' 6" within timbers, and is built of brick and cement from collar to the solid rock, and timbered below with Georgia pine. There are 6 compartments, 2 used for hoisting, 2 for water, and 2 for men and supplies. The 2 hoisting compartments, at the eastern end, have cages with 9-ton Kimberly self-dumping skips swung under. The 2 western compartments have double-deck cages for men and material, and the 2 middle compartments have large cylindrical steel bailers, for raising water. Timber for the Red Jacket shaft is lowered through No. 4 Calumet, with which the Red Jacket is connected by a crosscut. The Red Jacket shaft hoists rock from all of the northern shafts below the 56th level, at which point the conglomerate is intersected. There are 9-ton steel storage bins at the various productive levels, which aid in maintaining the uninterrupted hoisting service

that is absolutely essential in a shaft of a mile depth. The shaft rock house of the Red Jacket is 100x100' on the ground, and 110' high with 4 crushers, 1 for poor rock.

During 1916 shaft-pillars and arches were being removed from No. 58 to 62 level in this shaft.

The "Five Forties" is a tract of 200 acres, a quarter-mile wide and 1¼ miles long, lying between the Tamarack and Tamarack Junior mines, carrying the underlay of the conglomerate at great depth and, to obviate sinking a deep and costly vertical shaft, this tract is opened by a blind shaft 1,588' deep, starting from the 57th level, 2,750' N. E. of the Red Jacket vertical shaft. The blind shaft is sunk 40' under the footwall, at the same angle as the dip of the conglomerate, thus assuring solidity of walls while saving long and expensive crosscuts to the bed on each level. A foot-wall lateral on the 57th level parallels the regular drift, at a distance of 40' in the footwall, between the Red Jacket vertical shaft and the blind shaft, offering an avenue for operation that obviates the confusion certain to result were the regular mine drifts given double duty. The blind shaft starts in the footwall drift, under and parallel with the 57th level, and eventually will be about 1 mile in depth, opening four of the five 40-acre tracts, leaving the 5th and last to be opened by a sub-shaft from the blind shaft, which doubtless will be sunk on the same system. The necessity for this peculiar method of development arose from the fact that the boundary lines of the property run north and south, while the strike of the bed is N. 33°-30' E., giving a plane of dip of N. 56°-30' W. Owing to the incline shafts being sunk on the dip of the bed, while the blind shaft must follow the section lines, the latter descends diagonally on the dip of the bed, giving the blind shaft an average dip of about 22° only, although the bed dips at 37°-30'. This unusually flat incline permits the hoisting of rock in tram cars, by an electric hoist on the 57th level, cars being hauled through the blind drift and dumped into the steel bins of the Red Jacket shaft for hoisting, thus saving a transfer at the mouth of the blind shaft. The workings of the "Five Forties" show the conglomerate bed to average about 14', with about 10' carrying stamp rock, the bed as a whole being very lean at this great depth. The abandoned workings of the Tamarack Junior mine of the Osceola Consolidated, which adjoins the "Five Forties" are drained by holes bored by diamond drill from the boundary stones.

A drainage drift is driven, at depth of about 5,000', measured on the incline, 250' from the conglomerate, with a length of 5,100', extending from No. 10 South Hecla shaft to No. 7 Hecla and from the Tamarack boundary to Nos. 5 and 6 Calumet. This drift drains water to shafts Nos. 7, 5 and 6, from which it is lifted to surface by centrifugal electric pumps.

The Amygdaloid mine of the Calumet & Hecla is opened on the Osceola amygdaloidal bed, which outcrops 730' east of the Calumet conglomerate, with parallel strike and average dip of about 38°, underlying the entire main tract of the Calumet & Hecla mine. There are 6 shafts in the Amygdaloid mine, Nos. 13 to 18 inclusive, numbered from south to north. Shafts are duplicate in size, each having 3 compartments, of which 2 are used for hoisting and 1 for pipes and ladder-ways. The Amygdaloid mine has over 35 miles of workings and has frequent connections with the conglomerate by crosscuts. The Amygdaloid mine was closed 1901, and reopened 1904. In this mine the Osceola bed runs about 35' in width, with principal values along the foot and hanging, the middle third being lean, as a rule. Laterals in the Osceola workings are carried as drift stones of 12' height along the hanging wall. The Calumet & Hecla owns, on its main tract, about 11,000' of the strike of the Osceola bed. Developed ore reserves of the Amygdaloid

mine were estimated Jan., 1916, at 6,000,000 tons, and the Osceola bed has been found to carry fair copper values, at a vertical depth of nearly 1 mile, in the Tamarack property.

Depths of Shafts Jan. 1, 1916		Distance between Shafts	
No. 13.....	3,232'	13 to 14.....	2,780'
No. 14.....	2,958'	14 to 15.....	2,400'
No. 15.....	3,002'	15 to 16.....	2,100'
No. 16.....	3,274'	16 to 17.....	1,800'
No. 17.....	2,111'	17 to 18.....	1,600'
No. 18.....	1,460'		

The Kearsarge amygdaloid bed outcrops about 2,200' east of the Osceola amygdaloid and 2,900' east of the Calumet conglomerate, with parallel strike and dip of about 38°, underlying the entire main tract. Work of development was begun Aug., 1903, and there are 3 shafts, numbered from north to south, each having 3 compartments and being practically duplicates of those on the Osceola amygdaloid. The shafts above the ledge are "timbered" with steel, brick and concrete, the hanging wall being lined with 3 arches of brick, laid in 3 to 5 courses, thickness being increased with depth, supported by 2 rows of I-beams, which serve also as dividers for the shaft. The Kearsarge bed, as opened by these shafts, is erratic, though showing stretches of ground that probably will yield 18 to 22 lbs. fine copper per ton, with reasonable selection. No work has been done on this lode since the beginning of the strike, July 23, 1913.

No. 19 shaft, about 1,000' south of the Centennial boundary line, is 1,350' deep, and was closed down Dec., 1907. No. 20 shaft, next south of No. 19, is about 1,350' in depth, and idle also.

No. 21, the southernmost shaft on the Kearsarge bed, is 8,000' south of No. 20, and, at shallow depth, showed well in copper, but deeper workings were not so promising, the rock yielding only about 12 lbs. of copper per ton of rock mined. The shaft is 2,291' deep; not working since July, 1913.

The Calumet amygdaloid, lying between the conglomerate and the Osceola amygdaloid, has been little opened, but might prove payable, as it shows some good ground in a crosscut on the 900' level.

The shaft rock houses at the conglomerate incline shafts, of uniform pattern accommodate 40-ton railroad cars. Rock is hoisted to the top of each shaft rock house, passing thence over grizzlies that allow the finer rock to fall through, the larger masses being reduced in 24x36" crushers. Crushed rock falls by gravity into storage bins, whence it is dumped into cars that take it to the mills, railroad tracks running underneath each rock house. The standard equipment includes a 50-h. p. induction motor at each shaft, for driving crushers.

Owing to labor scarcity in 1917, underground haulage is done as far as possible by storage-battery and trolley-type locomotives.

Equipment: on surface at the Calumet & Hecla is probably the most complete installation to be found in the world. With few exceptions everything is duplicated, to prevent possible delay or suspension, by reason of fire or accident.

The power plants at the main mine, on the Calumet conglomerate, include 4 large boiler plants and 6 hoisting plants. The hoists of the conglomerate mine are very powerful, ranging in capacity from 1,000 to 5,600 h. p. each. Miners are carried to and from work, in the incline shafts, by man cars, these being long trucks having tiers of circus seats, replacing skips when needed, being shifted quickly on or off the skip tracks by large

cranes. This method has proven the safest, quickest and cheapest for moving men in and out of deep incline shafts.

At No. 4 Calumet shaft there is a group of the most powerful mining machinery in existence. Engine house contains the 2,500-h. p. Corliss engine "Superior," with 40" cylinders and 72" stroke; the auxiliary engines "Baraga" and "Rockland," of 1,000 h. p and 600 h. p. respectively; 2 Rand air compressors, of 25 and 40-drill capacity, and the engine "Mackinac," a 4,000-h. p. quadruple-cylinder triple-expansion steel giant, operating 4 Nordberg air compressors with a combined capacity of 500 drills. There also are four 35-drill auxiliary compressors. In the old Riedler compressor, water was injected into the compression cylinders, while the Nordberg machines deliver the compressed and greatly heated air to a cylindrical steel cooler, 12' in diameter and 30' high, into which water is sprayed from above and drawn off at the bottom, this cooling the air to 80° F. Power is supplied by batteries of boilers in 2 boiler houses adjoining. Locomotives haul the coal into the boiler houses, where it is fed to the grates by stokers.

The Hecla engine house, flanked by a large boiler house, contains the 1,200-h. p. compound hoisting engine "Frontenac" and 2 auxiliary engines, of 600 h. p. each, also a 30-drill Rand air compressor and a pair of water-plunger air compressors, with combined capacity of 144 drills, being the largest machines of this type ever constructed.

South of the Hecla plant is the "G. H. & S." engine house, having the "Houghton" and "Seneca" engines, of 1,300 h. p. each. The Hecla boiler house has 5 large boilers and a 200' smokestack, of 9' 6" internal diameter.

The engine house operating Hecla shafts Nos. 7 and 9 contains the engines "Hancock" and "Pewabic," each of 1,400 h. p., which operate 25' drums by spur gearing, and two 600 h. p. vertical compound engines for man cars. Boiler house has 5 boilers and a 250' smokestack of 12' 6" internal diameter.

The South Hecla engine house at shaft No. 11 has a 1,000-h. p. Lidgerwood hoist.

The Red Jacket shaft has two 2,850-h. p. triple expansion hoists, and in an adjoining building are five 800-h. p. boilers. In raising 10-ton loads perpendicularly from a depth of 1 mile, the weight of the cage and steel cable nearly equals that of the cargo of rock, but, with the aid of counter-balance the engines can hoist 10-ton loads at a speed of 40 miles per hour, the regular hoisting time being about 90 seconds for the vertical distance of nearly a mile, including time taken for starting and stopping, an achievement no locomotive could duplicate on a horizontal plane. The engine operates on a system devised by S. B. Whiting, formerly manager of the company. To overcome the dangerous strain caused by unequal wearing, Walker differential rings are placed on the sheaves, the cables taking 4 complete turns around the driving sheaves.

Equipment at the Amygdaloid shafts on the Osceola bed is practically the same at shafts 13, 14, 15 and 16, the new shaft No. 18, having a combined engine and boiler house, with a small Lidgerwood hoist. Shafts 13 and 16 have Nordberg first-motion double conical-drum hoists, operating 7½-ton skips in balance, good for 5,000' depth each. No. 14 and 15 have Corliss hoists with 25' cylindrical drums, good for 5,000' depth. Shafts 17 and 18 are equipped with small Lake Shore and Lidgerwood hoists and single 5 and 2½-ton skips. All the shafts have permanent shaft rock-houses, similar to those of the conglomerate workings. All engine-houses have air connections with the main compressor-plants at the old mine.

The machine shop has an equipment excelled by only a few of the largest shops in the country, including a 25-ton electric traveling crane and

mammoth planers, with electric power throughout. These shops are capable of handling anything and everything in the line of repair work, and also have complete manufacturing facilities for the making of mining, milling and smelting machinery, and have turned out hundreds of Wilfley tables, and other special machinery, under agreement with the owners of the patents.

The foundry has 2 iron cupolas, and a brass foundry, with a 20-ton electric traveling crane. The pattern shop has 2 departments, one for the shop proper and one for storing patterns.

The carpenter shop is equipped with as complete a line of labor-saving machinery as can be found in any general woodworking establishment.

The blacksmith shops are as large as those of the largest manufacturers of machinery, and are fully equipped. The Calumet shop alone sharpens upwards of 50 tons of steel drills daily. The Hecla shop does blacksmithing and forging for the entire mine. The various shops employ upwards of 150 blacksmiths.

The main electric plant of 12,000 h. p. capacity is at the mills, in Lake Linden, with a substation at the mine.

The office building is a large and handsome stone structure, housing the various executive departments and the engineering force of the mine. The company's private telephone system has an exchange with about 220 instruments, including a number of deep underground stations, with local and long-distance connections.

The Calumet & Hecla public library had 45,000 volumes in 1917; ranks third in point of circulation in the state of Michigan, with an attendance in reading rooms of 88,040 in 1917. In addition to books in English, there are works in German, French, Italian, Swedish, Norwegian, Slavonian, Polish, Hungarian, Finnish and Croatian, with periodicals and newspapers in a score of languages, about 30 different nationalities being represented on the company's payroll. There also is a branch library and reading room at Lake Linden, for employees of the stamp-mill and smelters.

The company maintains a hospital, for employees solely, with complete surgical and laboratory apparatus and a dozen physicians.

The company owns about 1,200 dwellings, furnished to employees at an average rental of 6% on actual cost, plus cost of maintenance, and upwards of 1,200 dwellings are owned by employees on lands leased from the company at low yearly rentals. This low rent is equivalent to an increased wage, compared with Western mines.

There are 15 school houses on the lands of the Calumet & Hecla, most of which were built by the company, including a fine manual training school, and a truly magnificent high school building at Calumet.

On Calumet & Hecla lands there are upwards of 30 churches, of a dozen different denominations. All of these sites were donated by the company, and in most cases substantial aid has been given in their erection and maintenance, entirely regardless of creed.

The company built a \$50,000 bath house containing tubs, showers and a 26'-40' swimming pool. A charge of 2½ cts. per bath is made, except in the women's department, which is free to women and children. The charge covers merely the cost of washing the towels and in no way compensates for the operation of the bath house proper.

In 1904 the Calumet & Hecla Mining Co. started a pension fund. Certain employees who had attained the age of sixty years or more and who had been in the company's employ twenty years or more, were retired on a pension proportionate to their length of service and their wages. These pensions have run from \$9 per month to \$38 per month.

On July 15, 1916, the C. & H. celebrated its 50th anniversary. Long-service medals were given to 1,371 employees; of these, 169 were for men who had worked over 40 years, 380 for between 30 and 40 years, the remainder for between 20 and 30 years. During 1916 the men received a 10% premium, plus 25c for each day worked from July 1 to Dec. 31. At present the bonus is 10% plus 50c daily.

The company maintains 3 distinct systems of waterworks, one at the mines in Calumet, one at the mills in Lake Linden, and one on the shore of Lake Superior, 4 miles N. W. of Calumet. The Lake Superior plant pumps water for domestic uses at Calumet against a head of 733', with an electric centrifugal pump of 3,000,000 gals. daily capacity. This plant also furnishes water to the mill and smelter boilers, on Torch lake. At the Calumet dam and mine there are 7 pumps, having a combined daily capacity of upwards of 45,000,000 gals.

The company maintains a fire department, affording protection to the mine buildings and location, and responding to calls from Red Jacket, Laurium and the other towns that go to make up the mining camp of Calumet, with 40,000 population.

The Hecla & Torch Lake standard gauge railroad, owned by the company, connects the mines, mills, smelter and shops by upwards of 20 miles of main tracks, spurs and sidings. Equipped with 150 forty-ton steel rock cars and several locomotives.

The 2 stamp mills, known as Hecla and Calumet, are at Lake Linden, 4 miles from the mine, on a tract of 998 acres, having several miles of frontage on Torch Lake.

The mills have steel frames, with concrete foundations, spaced 20' apart, with 2 and 3 tiers driven to bed-rock, and topped with 6x12" square timber, capped by a 4"x6" bed of concrete. The mills have 27 Leavitt heads and 1 Nordberg steep-le-compound head; 17 heads treating conglomerate ore and 11 crushing amygdaloid rock. Stamps are actuated by steam power, but the other milling machinery is operated electrically. The Leavitt heads have a daily capacity of about 350 tons of conglomerate, and 500 tons of Osceola amygdaloid.

The mill equipment below the stamps, includes Woodbury-Benedict jigs; 4-deck Evans-Rawlings round-tables, from which slimes are treated by Wilfley tables; Chilean regrinding mills. The 220 Wilfleys effect a considerable saving of the very fine copper formerly lost, and greatly reduce the water consumption.

As the mills stand on the flat western shore of Torch lake, but little above water level, tailings speedily filled the shallow lake for some distance off shore, and to deposit the sand it became necessary to secure a considerable initial elevation, which is gained by sand wheels. The material entering the mills as conglomerate rock leaves as coarse sand to the extent of fully 6,000 tons daily. The sludge is washed through launders to the sand-houses, where it is scooped up by the buckets of the wheels and dumped, high above, into launders running on trestles far out into the lake, these spouting forth miniature brick-red Niagaras. There are two wheel houses, one for each mill. The Calumet wheel house has sand wheels of 50' diameter, and the Hecla 50' and 64' diameter. The sand wheel is to all appearances a gigantic bicycle wheel, fitted with spur gearing where the rubber tire should be. The complete wheel weighs 500 tons, and is mounted upon massive concrete masonry. Four 25-ton iron bed plates support the pillars carrying the 21-ton Krupp forged steel axle, which is 27' long and 32" in diameter with a hollow core of 26" diameter. Radiating from axle to rim are 2" steel spokes 32' long. The completed wheel is 10' wide and 64' in

diameter, driven by gear and pinion, power being furnished by a 700-h. p. dynamo, and has a capacity of 55,000 gals. per revolutions. Nearly 2 years were required to build and adjust this monstrous wheel.

During 1916 there were no important changes at the stamp-mills. A year's tests on flotation in the laboratory were encouraging and two 50-ton Mineral Separation machines have been installed. Company will pay 1c royalty per lb. of copper recovered.

The No. 1 regrinding plant, built 1908-09, and in full commission Jan., 1910, occupies a 195x340' building. The frame is of structural steel, resting on concrete foundations, the floor being of stamp sand, with a concrete capping, no particle of wood entering into the construction of the building. Power is furnished by eight 250-h. p. induction motors, giving about 100% excess capacity, to provide against delays through overhauling and repairing. The plant has cost about \$400,000. Equipment, built almost exclusively in the shops and foundries of the company, consists of 48 Chilean mills, resting on concrete piers, in 2 parallel rows, each pier being a hollow octagon 6' high and 7' in diameter, with a 10" wall, the hollow being filled to a height of 10' with stamp sand, capped by 4' of concrete. All piers are joined by concrete ribs, in which a heavy steel cable is embedded, passing through each pier connection. The Chilean mills are being replaced by Hardinge mills. There are 200 Wilfley tables, each section of the plant having 6 grinders, 18 tables for roughings, 4 tables for middlings, and 12 tables for slimes. Product from each set of 2 grinders goes to a settling tank, from whence the roughings go to the first 3 tables, and the slimes to 2 other tables, the middlings from each 15 tables going to 2 additional tables. The coarse sands from the Calumet mill go to sand wheel No. 2, and waste sands to wheel No. 1, the coarse sand elevated by wheel No. 2 running to the regrinding plant, where the amount going to each mill is regulated by feed gates, an overflow tank at the end of the launder carrying for the surplus, in case of stoppage of the mill. A Hardinge conical tube mill, crushing coarse tailings, is 8' in diameter at the larger end, the pulverizing of sands being accomplished by the use of Danish pebbles on a lining of hard brick. Re-modeling of No. 1 plant is expected to be completed in 1917.

The regrinding mill has traveling cranes, and every piece of machinery is duplicated, so that breakages can be repaired quickly. The mill is fed with tailings from the stamps, sands carrying up to 12 lbs. copper per ton. No slime goes to the regrinding plant, which treats exclusively coarse gravel and sand from the jigs and tables. The product is clean mineral, of good average tenor, which is pumped into bins, and thence loaded into cars for shipment to the smelter. Labor costs are very low, the plant being automatic throughout, and the force is only 12 men and boys per shift.

The management figured on an extraction of about 5 pounds copper per ton from the tailings reground, at a cost of about 6 cts. per lb., on a basis of about 2,000,000 lbs. yearly production. Production, to end of 1916, from the tailings plant was 13,751,310 lbs. fine copper. Comparative results in No. 1 regrinding plant for several years are as follows:

Year	Tons Coarse Tailing	Lbs. Cu. Crushed per Ton	Lbs. Cu. Rec.	Lbs. Copper Produced	Cost (a) per Lb
1911.....	477,794	12.66	4.50	2,152,110	5.01c
1912.....	481,320	12.86	4.48	2,155,292	4.99c
1913.....	388,164	11.92	3.94	1,529,097	5.87c
1914.....	351,929	11.52	3.74	1,316,704	7.38c
1915.....	337,243	13.14	4.01	1,352,869	6.52c
1916.....	364,581	13.98	3.79	1,380,344	6.32c

(a) Exclusive of smelting and refining.

The regrinding plant has proven its ability to treat fresh tailing at a substantial profit. The tailings at the Lake Linden mills are the most extensive in the world, containing about 40,000,000 tons of stamp sand, carrying an average of 8 to 10 lbs. of copper per ton in the newer sands, and 12 to 20 lbs. in the older sands, these tailings carrying about 500,000,000 lbs. of copper—an amount greater than the total production of any but the largest copper mines of the world.

The No. 2 regrinding plant, begun 1912, operations started in 1914, is practically a duplicate of No. 1. The mill is equipped with 64 Hardinge conical mills and will retreat tailings in Torch Lake. These are obtained by means of a specially designed dredge, which will dig to a depth of 100' below the surface of the lake.

The reclamation plant (the dredge) worked continuously in spite of zero weather and 18" of ice on Torch lake. It treated 545,727 tons of tailing, containing 21.06 lb. copper per ton, saving 9.92 lb., or a total of 5,412,610 lbs., at cost of 4.586c per lb. in 1916. The treatment included leaching.

Results have been as follows:

	Tons Coarse Tailings Crushed	Lbs. Cu. per Ton	Lbs. Cu. Rec. per Ton	Lbs. Cu. Produced	Cost (a) per Lb.
1914.....	75,630	11.84	4.59	347,363	5.66c
1915.....	168,461	13.14	4.73	796,858	4.36c
1916.....	182,705	13.98	4.98	909,453	4.30c

(a) Exclusive of smelting and refining.

A leaching plant was completed in summer of 1916 to retreat tailings from the regrinding plants by leaching with an ammoniacal solution, the ammonia being reclaimed, and is taking 6 lbs. of copper from the tailings. The cost was 6c per lb. of copper produced, exclusive of smelting and selling charges.

The capacity of 2,000 tons daily is being doubled in 1917.

Water for the mills is supplied by 4 pumps, of which the "Michigan" is the most powerful in the world, having a daily capacity of 60,000,000 gals. Auxiliary pumps are the "Huron" and "Ontario" of 20,000,000 gals. capacity each, the "Erie" of 10,000,000 gals., and an I. P. Morris pump of 22,000,000 gals. daily capacity.

The electrification of the Calumet & Hecla was begun in 1904, and eventually will be completed, at mines, mills and smelters, except for some of the big compound hoists and air compressors at the mine, where a change from steam to electricity would be doubtful economy, as well as necessitating enormous initial outlays.

Machinery at the power plant includes the old engines "Saginaw" and "Gratiot," the former an Allis-Chalmers twin vertical tandem compound-expansion engine having 17x40x48" cylinders, each engine being direct connected to a 1,000 k. w. alternating current generator, and the Leavitt engines "Owego" and "Ontonagon," of 3,000 h. p. each, built originally for hoisting purposes, direct-connected to 2,000-k. w. generators. The electric equipment of the mills includes 15 motors, of 20 to 250 h. p. each.

Another 10,000-k. w. turbo-generator is being installed. This will make the total capacity of the power-plant 22,500 k. w.

The boiler house has twenty 500-h. p. Babcock-Wilcox tubular boilers. There are coal crushers, feeding an endless link-belt system with 308 steel link buckets, of 60 tons hourly capacity, taking coal to overhead bins, whence it is fed to the grates by Roney automatic stokers. Water requirements at the boiler plant are about 750,000 gals. daily, obtained from a 750,000-gal. reservoir, fed from Lake Superior via the Calumet pipe line.

The Torch Lake smelter is at Hubbell, about a mile south of the mills, on a 30-acre site having ample frontage on Torch lake, with deep water in front and 3 railways at the rear. The smelter has 4 stone furnace buildings, and a 50x70' furnace building, both blast furnaces and reverberatories having been rebuilt within the past few years. There are 18 reverberatories, which are top-charged, having platforms above on which the mineral is thoroughly dried before charging. The blast furnace is 40x128" at the tuyeres, its comparatively small size being due to the use of reverberatory furnaces for the bulk of the smelting work. A new steel-frame smelter building houses three 150-ton reverberatory-furnaces, of so-called Jumbo pattern, modeled after the furnaces of the Lake Superior Smelting & Refining Co. The practice of the smelting plant is fully abreast of the times, in all essentials.

Another furnace was blown in during November, 1916.

The electrolytic plant, 155x270', at Hubbell, has superseded the Buffalo reduction plant, which has been abandoned. It is built of steel and brick, contains four 7½-ton traveling cranes and 512 lead-lined wooden tanks, 3'x11'x3' 9" deep, in 4 sets of 128 tanks. Each set is arranged in 4 sections of 32 tanks, and each section in two tiers. The electric current is furnished by four 125-volt direct current generators driven by alternating current motors operating on current transmitted at 13,000 volts from the power plant at Lake Linden, transformed to 2,300 volts. There is a continuous circulation through the deposition tanks of the electrolyte which contain about 3 to 4% copper and 10 to 12% sulphuric acid. The plant has a capacity of 65,000,000 lbs. copper per year. Company markets its own copper. This plant also recovers several hundred thousand ounces of silver yearly, an item that is mentioned now in the balance-sheets.

There is 1 concentrate or mineral house, with a storage capacity of 18,000 tons, at Hubbell. Calumet & Hecla concentrate, locally called mineral, carries less than 60% copper.

The power plant at the smelter has three 125-h. p. boilers, and each of the two large reverberatory furnaces has a 300-h. p. boiler attached through which the waste gases pass.

The smelting works have an assay office and laboratory, office and large warehouse for supplies.

The dock system of the Calumet & Hecla is extensive, including a series of very large coal sheds at Lake Linden and a series of docks at the mills and smelters on Torch lake. The 750' coal wharf has 11 Hunt hoists, and three 52' movable derricks.

The Calumet & Hecla owns and operates the ship canal connecting Torch lake with the government waterways on Portage lake, this canal being 21' deep and accommodating the largest vessels plying the great lakes. Tolls, ranging from 10 cts. on soft coal to 50 cts. per ton on package freight, are charged by the company, on independent cargoes entering Torch lake through this canal.

A saw mill, at the head of Torch lake, receives logs by rafts, and ships sawed lumber and timber by a branch of the Hecla & Torch Lake railway. The company owns extensive tracts of pine, hemlock and hardwood timber along the southern shore of Lake Superior, this land carrying between 400,000,000' and 500,000,000' of standing timber. The company also has a long-term timber contract with the Keweenaw Association, Ltd., and buys extensively of jobbers, the requirements for underground timbering alone being 18,000,000' annually, in addition to the many million feet of timber and lumber used on surface at the mines, mills and smelters.

The conglomerate rock from the old Calumet & Hecla workings has

shown a strongly declining tendency in values for many years past, and a rather alarming decline within the past few years. Net returns were almost 5%, or 100 lbs. of fine copper per ton in 1873; 4.75%, or 95 lbs. fine copper per ton, in 1880; 3.012%, or 60.24 lbs. per ton, in 1889; 59.93 lbs. in 1900; 52.44 lbs. in 1902; 39.68 lbs. in 1907; 35.96 lbs. in 1908; 33.14 lbs. in 1909; 30.12 lbs. in 1910; 30.38 lbs. in 1911; 29.73 lbs. in 1912; 27.85 lbs. in 1913; 26.38 lbs. in 1914; 29.74 lbs. in 1915, and 29.97 lbs. in 1916.

Rock from the Osceola amygdaloid returned 18.45 lbs. per ton in 1907; 17.67 lbs. in 1908; 16.40 lbs. in 1909; 15.82 lbs. in 1910; 15.89 lbs. in 1911; 15.08 lbs. in 1912; 14.31 lbs. in 1913; 13.62 lbs. in 1914; 13.32 lbs. in 1915, and 13.60 lbs. in 1916.

Average for all rock milled, during the calendar year 1912, was 24.18 lbs. fine copper per ton; 22.11 lbs. in 1913; 20.70 lbs. in 1914; 22.38 lbs. in 1915, and 22.53 lbs. in 1916.

Detailed figures, by years, of both production and dividends, from the organization of the company, in 1871, may be found in the statistical chapter.

Production has shown a steady decline since 1906, in which year the high mark of 100,023,420 lbs. fine copper was reached, and in 1913 was only 45,016,890 lbs. copper, climbing to 53,691,562 lbs. in 1914 and 71,030,518 lbs. in 1915. Production in 1913 and 1914 was seriously affected by the labor strike, called by the Western Federation of Miners on July 23, 1913, and declared off on April 12, 1914, and by the extraordinary conditions prevailing in the copper market in 1914, due to the European war. The mine was operated on a ¼-time basis from Sept. 1, 1914, until Feb. 1, 1915, when work was resumed on full time.

Production and costs since 1910:

	Tons R'k Treated	Lbs. Cu. per Ton R'k	Mine Cost per Ton Exc. Cons.	Copper Produced Lbs.	Cost per Lb. for Cons.	Net Cost per Lb.	Rec'd per Lb.
1917**				60,000,000			
1916	3,166,274	22.53	\$2.03	71,349,591*	0.60c	11.03c	25.48c
1915	3,188,583	22.28	1.71	71,030,518	0.47c	9.33c	18.11c
1914	2,592,462	20.70	1.85	53,691,562	1.00c	11.35c	14.01c
1913	2,085,625	22.11	2.38	45,016,890	1.54c	14.25c	15.77c
1912	2,806,610	24.18	1.91	67,856,429	0.80c	9.86c	16.65c
1911	2,909,972	25.47	1.84	74,130,977	0.27c	8.52c	12.82c

Note: Production for first 10 months, 1917, 182,453,856 lbs. from C. & H. and its eight subsidiary companies.

* Plus 5,412,649 lbs. recovered from Torch Lake.

** 10 months.

Conglomerate Lode—

1916	1,727,704	29.97	2.63	51,785,016	.....	10.75	.....
1915	1,739,984	29.74	2.13	51,738,588	.....	8.69c	.....
1914	1,439,986	26.38	2.37	37,996,045	.....	10.42c	.....
1913	1,175,259	27.85	2.99	32,731,768	.....	12.67c	.....
1912	1,746,990	29.73	2.23	51,935,245	.....	8.86c	.....
1911	1,924,480	30.38	2.07	58,469,399	.....	8.25c	.....

Osceola Lode, Amygdaloid—

1916	1,438,480	13.60	1.32	19,564,575	.....	11.84c	.....
1915	1,448,599	13.32	1.07	19,291,930	.....	9.71c	.....
1914	1,152,476	13.62	1.19	15,695,517	.....	10.20c	.....
1913	842,162	14.31	1.53	12,051,238	.....	12.62c	.....
1912	1,040,600	15.08	1.36	15,692,199	.....	10.36c	.....
1911	985,492	15.89	1.34	15,661,578	.....	9.95c	.....

Kearsarge Lode, Amygdaloid—

1913.....	18,203	.....	.....	233,915	.....	.....	.....
1912.....	19,050	.....	.....	228,985	.....	.....	.....

Reviewing the 52 years' career of this company, several features deserve attention. To the investor, the total dividends, \$145,250,000 paid on an investment of \$1,200,000 is not only remarkable for its amount but because dividends have been continuous.

To the technical man this record is particularly noteworthy, when the mining record is considered. Beginning in 1866, with a small production from the rich native copper ore of the Calumet conglomerate, the company's present daily production of 10,000 tons now comes from 3 separate lodes, mined by 17 shafts, several of them a mile deep. The yearly production of copper is from 65 to 75 million pounds, with a record amount, 100 million, in 1906.

This production comes from very low-grade ore—lower, in fact, than that of the Utah Copper or other great porphyry deposits. The ore originally mined, carried nearly 5% or 100 lbs. of copper per ton, but the grade of ore decreased from year to year as depth was gained until it is now only 1½% or 30 lbs. copper per ton of ore. The maintenance of dividends despite this decrease in value is due to the ability of the management to steadily reduce costs from \$10 per ton to the present cost of \$2 per ton, so that a pound of copper is now produced as cheaply from the lean ore as it was from the richest ore. The company is also saving over 5,000,000 lbs. of copper annually by retreating the old waste or tailings made many years ago at its mills and dumped into the lake, and has installed a leaching plant which promises to give a new youth to the entire district, by its treatment of ore carrying flake copper.

In 1906 the company, realizing that the Calumet conglomerate lode, on which the company was started, would eventually be exhausted, began the purchase of other properties and of shares in other Lake Superior companies. Controlling interest in six companies, bought for \$8,592,000 by issue of company notes (all paid-off by February, 1917), has proved very profitable, these stocks returning \$6,156,124 in dividends, and meanwhile increasing in market value.

With its White Pine property and its new leaching plant, it looks as if a new era of prosperity had begun.

CASS COPPER CO.**MICHIGAN**

Address: Houghton, Mich.

Officers: Fred Smith, pres.; John T. Reeder, v. p.; John W. Black, sec-treas., with John H. Rice and Jas. P. Corgan, directors; A. H. Meuché, supt.

Inc. 1916, in Michigan, to take over the Norwich mine, owned by the Copper Crown Mining Co. **Cap.**, \$3,750,000; shares \$25 par; 40,000 shares were paid for the property and 20,000 issued to the public at \$3 per share, to pay for diamond drill campaign. Operating expenses for 1916 totaled \$33,079; cash in treasury, May 31, 1917, \$11,779. Annual meeting, last Monday in June.

Property: 1,980 acres, in Ontonagon county, T. 49 N. R. 41 W., near the Mineral Range R. R., has several well-known lodes crossing the ground.

Development: by 9,550' of diamond drilling, which discovered an unidentified lode of shot and mass copper. This will probably be developed by an old 1,000' tunnel. Work has stopped temporarily until materials and men can be had.

CENTENNIAL COPPER MINING CO.**MICHIGAN**

Subsidiary of Calumet and Hecla Mining Co.

Office: 12 Ashburton Place, Boston, Mass. **Mine office:** Calumet, Houghton Co., Mich. Rodolphe L. Agassiz, pres.; Jas. MacNaughton, v. p. and gen. mgr.; preceding officers, H. F. Fay, Dudley S. Dean, F. L. Higginson, E. B. Dave and E. V. R. Thayer, directors. C. H. Bissell, sec.-treas.; G. L. Osgood, jr., asst. sec.-treas.; J. H. Chynoweth, mg. capt.

Inc. 1896, in Michigan, as successor of Centennial Mining Co. **Cap.**, \$2,500,000, shares \$25 par; issued, \$2,250,000; paid in, \$19.50. Last assessment, 1905, was \$4. Calumet and Hecla owns 41,500, or 46%, of the 90,000 shares outstanding.

American Trust Co., Boston, transfer agent; **Old Colony Trust Co.**, Boston, registrar, Annual meeting, first Tuesday in April.

Profits were \$6,046 net in 1911, \$50,511 net in 1912, \$31,397 in 1913, \$3,213 deficit in 1914, \$142,440 in 1915, and \$276,546 in 1916.

Balance sheet for 1916 shows assets of cash and accounts receivable \$454,858, supplies \$30,344; total, \$485,204. Liabilities for accounts payable \$36,835; excess of assets over liabilities, \$448,368. Dividend No. 1, Sept. 21, 1916, \$90,000; No. 2, Mar. 20, 1917, \$90,000.

During 1916 the Centennial and Wolverine companies exchanged rights to mine on about 1 acre of ground each.

Lands: 670 acres, Sec. 12, T. 56 N., R. 33 W., and a triangular patch of about 30 acres, at the S. E. corner of the main tract, bought to secure the outcrop of the Kearsarge lode, and including about 10 acres, bought 1905, of the Old Colony, for the surface plant. The first work was done, 1863, by the Schoolcraft Mining Co., which failed to open a paying mine, and was reorganized, 1876, as the Centennial Mining Co., and again reorganized, 1896, with present title. Expenditures of upwards of \$1,500,000 were made by the old company in unsuccessful efforts to open a paying mine on the northern extension of Calumet conglomerate. Seven shafts, 3 of considerable depth, were sunk on this bed, No. 3, the deepest, being bottomed at 3,200'. The Centennial lands are in the great mining area of Calumet, and are available for building purposes. Two additions have been platted, and surface rights sold at good prices, mineral rights being reserved.

The present company did a little work, 1897, on the old conglomerate shaft, then turned attention to the Osceola bed, deepening 2 shallow shafts to 1,050' and 1,150' depth, respectively. The Osceola bed, where opened on the Centennial tract, averages about 15' in width, but is lean.

Work on the Kearsarge bed was begun Sept., 1899. Owing to the outcrop of the Kearsarge occurring on the 30-acre tract bought of the Osceola, with only a 100' right-of-way connecting it with the main tract, it was necessary to open the mine on the Kearsarge bed in a peculiar manner, by 2 shafts. These are but 90' apart, on surface, and continue parallel, on the dip of the bed, until the 13th level, when the main tract is reached, after which No. 2 shaft diverges from No. 1 at an angle of 15° on the plane of the bed, 300' being taken by the curve. This method of opening gives short drifts until the shafts enter the main Centennial tract. Each shaft is 17x18' inside of timbers, with 3 compartments, sunk at an angle of 39° with the horizon, through an overburden of about 100' depth. The Kearsarge bed averages about 16' in width, and showed fair copper values in the upper levels, followed by a comparatively barren zone until the 14th level, when there came a gradual improvement, which unfortunately has not been maintained, the mine as a whole proving disappointing. New openings, made during 1916, amounted to 2,208', all contributory to the No. 2 shaft.

No. 1 shaft was raised in the north compartment from the 37th level, a distance of 169', making a total depth of 4,000'. No other work has been

done here since 1910. No. 1 has a steel shaft rock-house, with 3,000-ton bins and a 32x72" Nordberg duplex hoist, with double-conical drum, good for depth of 6,000', operating 5-ton skips.

No. 2 shaft, 4,293' deep, shows fair ground from the 18th to the 31st levels, inclusive. This shaft shows poor ground to within 50' of the South Kearsarge boundary, where drifts were stopped. The South Kearsarge drifts are in rich ground up to the boundary, which seems strange.

Openings north of the shaft on 35th and 36th drifts have been extended to the Wolverine boundary. The 38th level has been driven north 250', but shows no copper.

Equipment: includes a cylindrical steel shaft rock-house, with 1,000-ton bins, and a 32x60" Sullivan duplex straight-face hoist, with 2 drums of 14' diameter and 15' 6" winding face, grooved for 1 $\frac{3}{4}$ " cable. The hoist is fitted with devices to prevent overwinding, and is calculated to raise 5-ton skips at the rate of 4,000' per minute, operating under 150-lb. steam pressure.

Trammers were scarce during 1917 so a rope-haulage system was installed on No. 37 level. This will handle ore sent from the 4 levels above.

The mine is served by the Copper Range and Mineral Range railroads, and has a private line connecting the shops and shafts.

Rock is stamped by the mill of the Lake Milling, Smelting & Refining Co., which is separately described. At No. 2 mill, Hubbell, two new stamps were installed in summer of 1917.

Production was seriously curtailed for a time in 1913 and 1914 by the Western Federation of Miners' strike, called July 23, 1913, and declared off on April 12, 1914. Conditions prevailing in the copper market after the European war started were the cause of the mine operating on three-quarter time from Sept. 1, 1914, to Feb. 1, 1915. In Aug., 1915, the rock-house of No. 1 shaft was gutted by fire and production suffered for a month at that time. Centennial at best is a small producer and this series of misfortunes has worked an extra hardship on it.

Production:

Year	Tons R'k Treated	Lbs. Min. Produced	Lbs. Cu. per Ton R'k Stpd.	Mine Cost per Ton (a)	Lbs. Copper Produced	Total Cost per Lb.	Rec'd per Lb.
1916.....	150,617	.....	15.72	\$1.916	2,367,400	13.44c	25.02c
1915.....	150,191	3,029,880	15.63	1.753	2,347,500	12.45c	18.14c
1914.....	138,136	3,311,780	16.56	1.838	2,287,130	12.56c	12.11c
1913.....	85,443	2,324,040	18.87	2.179	1,612,262	13.38c	15.36c
1912.....	106,517	2,567,385	16.36	1.920	1,742,338	13.46c	16.98c
1911.....	86,543	2,321,200	17.26	1.869	1,493,834	12.69c	12.92c
1910.....	102,133	2,380,820	15.40	1.948	1,572,566	14.48c	12.62c
1909.....	106,525	.....	14.15	.....	2,583,793	15.61c	13.28c
1908.....	169,693	.....	12.94	.....	2,196,377	18.49c	13.39c

Note.—Production for first 4 months, 1917, averaged 154,000 lbs. copper.

(a) Includes mining, transportation, stamping and taxes.

CHAMPION COPPER CO.

MICHIGAN

Office: 82 Devonshire St., Boston, Mass. **Mine office:** Painesdale, Houghton Co., Mich. **Mill office:** Redridge, Houghton Co., Mich.

Officers: Wm. A. Paine, pres.; Chas. J. Paine, Jr., v. p.; F. W. Paine, sec.-treas.; Frederick W. Denton, gen. mgr.; preceding, with Samuel L. Smith, Geo. P. Gardner, W. Cameron Forbes, F. W. Denton and Hon. Richard Olney, directors; H. Schacht, asst. gen. mgr.; John Jolly, underground supt.; Edw. Koepel, mill supt.; M. L. Cunningham, asst. mill supt.; H. F. Mercer, chief engr.; E. W. Kruka, chief clerk; W. J. Richards, master mechanic.

Inc. Dec., 1899, in Michigan. Cap., \$2,500,000; shares \$25 par, all issued, full paid in. Is controlled jointly by Copper Range Consolidated Co. and St. Mary's Mineral Land Co., through equal ownership of stock, and owns \$110,000 stock in the Michigan Smelting Co.

Balance sheet of Dec. 31, 1916, showed a net profit of \$5,870,606, and a surplus of \$1,671,933. Receipts from ore sales in 1916 were \$8,494,367.

Dividends: \$3 in 1903; \$2 in 1904; \$10 in 1905; \$12 in 1906; \$10 in 1907; \$5 in 1908; \$8 in 1909; \$9 in 1910; \$5 in 1911; \$11 in 1912; \$9 in 1913; \$31 in 1915; \$60.14 in 1916; \$51.20 in 1917, to Jan., 1918; a total of \$226.34 per share, or \$22,634,000.

Property: 1,240 acres, being the S. $\frac{1}{2}$ of Sec. 30, W. $\frac{1}{2}$ and N. $\frac{1}{2}$ of N. E. $\frac{1}{4}$ and S. W. $\frac{1}{4}$ of N. E. $\frac{1}{4}$ of Sec. 31, T. 54 N., R. 35 W., practically all on the mineral belt. Neighbors are the Copper Range and Trimountain on the north, lands of St. Mary's Co. and Hussey, Howe & Co. on the east; Hussey-Howe lands and the Globe tract on the south, and Copper Range lands on the west. The tract carries 9,047' on the strike of the bed, and, at the present angle of dip, the deepest shaft could go down to the impossible depth of 18,960' before reaching the western boundary.

Geology: development started in 1899, under direction of Dr. L. L. Hubbard, and 3 parallel amygdaloidal beds were uncovered by trenching, one of which, the Baltic, showed phenomenal copper values. The 2 amygdaloids paralleling the Baltic bed showed copper in sufficient quantities to render their future exploration advisable. A fourth amygdaloidal bed, about 15' wide, discovered 1901, east of the Baltic bed, carries heavy copper to an encouraging extent, and there also is a fissure vein of arsenical ore, apparently algodonite (copper arsenide) near "C" shaft. The width of this vein at surface is slight, and mineral contents variable, but on the second level the fissure is 2' wide, and well mineralized.

The dip of the Baltic bed at the Champion is about 70° and strike same as at the Trimountain, not the easterly trend of the Baltic mine. The bed runs 13 to 45' and averages 24' width, carrying more epidote than at the Trimountain and Baltic. The surface of the tract is very hilly, but the overburden is less than is found either to the northward or southward. The stretches of lean ground in the mine are few, and the bed carries heavy copper in profusion, mostly in barrel size, but running up to masses of 10 tons in weight. Only about 60% of the rock broken is hoisted, waste rock being sorted out and used for dry walling, packing itself.

All shafts are connected on numerous levels and about 2 miles of new workings are made yearly. The bed shows so little poor ground that nearly every level will be opened from end to end of the mine, eventually giving the longest average drifts of any Lake Superior property. The only really poor ground found in the mine was shown in "E" shaft, between the 3d and 4th levels, and the mine shows some stopes of phenomenal width and richness. The ground opened, 1914, was of average value. A large area of good ground was opened between Nos. 2 and 3 shafts in 1915.

Development: by 4 shafts, named from north to south: "B" shaft, the northernmost, 1,835' south of the Trimountain boundary, is 2,356' deep; "C" shaft, 1,050' south of "B," is 2,334' deep; "D" shaft, 1,300' south of "C," is 2,168' deep; "E" shaft, 1,300' south of "B" and 3,900' north of the Globe boundary, is 2,388' deep. The third level of "E" shaft has been driven 3,000' toward the Globe boundary. "F" shaft, started 1,300' south of "B," was abandoned on account of treacherous overburden, but the Baltic bed was located, 1907, by diamond drill at a new site, 1,800' south of "E," and 2,100' north of the Globe boundary.

New work in 1916 was: 11,791' of drifting, 722' of cross-cutting, 3,511' of raising and 27' of shaft sinking.

Equipment: the shafts are practically duplicates in all essential particulars, having 40x50' shaft rock houses, with 90-ton ore bins, enlarged, 1908, by the Wisconsin Bridge & Iron Co. Equipment at each rock house includes a steam hammer for heavy copper, and one 12x15" rock crusher, taking everything hoisted from the mine direct from chutes. The shafts have duplicate first-motion Nordberg hoists with 24x60" duplex cylinders and double conical drums of 14' diameter, with capacity for two 3,000' cables each, hoisting 6-ton skips. The boiler houses have Bradley and Burt boilers, with coal trestles connecting. Water for boilers is furnished from a 12,000-gal. dam.

Very extensive use is made of electric power on surface, and there are some underground electric pumps. The electric plant at "F" shaft has a 250-k. w. General Electric generator, direct connected to an Allis-Chalmers cross-compound vertical engine.

The main steel compressor building at "F" shaft has a 100-drill Nordberg quadruple expansion 2-stage air compressor, with capacity to compress 9,120 cu. ft. of free air per minute to a pressure of 70 lbs. per inch. The compressor operates at a steam pressure of 280 lbs., and has a regenerative feed-water system. Power is furnished by three 250-h. p. Geary water-tube boilers. At "B" shaft there is a 40-drill Ingersoll-Sergeant cross-compound 2-stage air compressor with vertical receiver inter-cooler. The electric plant, with a 100-k. w. generator, is in the main compressor building.

Buildings at the mine include a change house, dwellings and machine shop, with traveling crane and trolley rail for its entire length, with a 30-h. p. electric motor.

The stamp mill is at Freda, on Lake Superior, 2 miles west of Redridge. Lower-pressure turbine and accessories were installed in 1915. The mill has 6 Nordberg stamps, there being 4 compound stamps, with 15½" cylinders, each treating about 700 tons daily, and 2 simple stamps, with 28" cylinders, of about 660 tons daily capacity each, giving the mill a total capacity of fully 4,000 tons daily.

The concentration department was remodeled, 1908, and given additional tables and larger settling tanks. The wash for the heads has Hodge graduated adjustable-speed jigs, with plungers working simultaneously or alternately, in pairs, Woodbury jigs and Deister concentrating tables. Raggings are reground by Allis-Chalmers crushing rolls having 1 roll fixed and the other in a spring bearing. The preliminary discharge from the stamp heads is treated on very large jigs, having 30x48" sieves, of punched steel, with one-eighth inch openings, installed in connection with the head. Each head has a V-shaped settling tank, 40' long, 9' deep, 12' wide at the top and 6" wide at the bottom, slimes being drawn from spigots at the bottom. The flow of water through the settling tanks does not exceed 6' per minute.

The mill is heated by hot water from a Green fuel economizer.

The steel boiler house has four 200-h. p. Stirling boilers, 5 Dutch oven Scotch marine boilers and 2 Hawley down-draft furnaces. In 1916 a 235' concrete stack, 100" dia. at top, was constructed, and a new boiler installed. Coal is brought to the boilers by tram, and reduced to uniform size by a grinder before feeding to the grates, and ashes are washed into the lake through a launder. Exhaust steam passes through dry condensers, thence to a hot well, from which water is fed to the boilers. Power for the mill is supplied by a 500-h. p. Nordberg cross-compound engine and a turbine, with a 180-h. p. engine in reserve.

The steel pump house, with truss roof and traveling crane, has a 20,000,000-gal. Nordberg triple-expansion pump. Water for the mill and boilers comes from the lake through a 1,020' tunnel, the shore end having

a well with bottom 8' lower than the lake level, this being the longest tunnel ever driven under Lake Superior. The intake crib has an area of 45 sq. ft and, with a second crib, the tunnel could furnish water for 10 stamps. Water cost is less than 1½ cts. per ton of rock stamped. Screens have been installed in the tunnel, obviating the trouble formerly caused by sand and wood pulp in the water. A sand loading plant was erected in 1915. During the year 173,170 cu. yds. of stamp sand were run into the mine for fill. In 1916, \$225,567 was spent for additional equipment which included locomotives, changehouse, additional dwellings, etc., at mine and at the mill, a concrete stack, a boiler, steel railway trestles, turbine, mill equipment and fire proofing of mill.

Production:

Year	Rock Stamped Tons	Copper Produced Pounds	Yield per Ton Pounds	Cost per Pound	Price Received	Net Profits
1916.....	936,656	33,601,136	35.87	07.80c	25.28c	\$5,870,606.26
1915.....	923,743	33,407,599	36.17	06.30c	17.40c	3,709,049.02
1914.....	614,854	15,807,206	25.71	09.21c	13.38c	658,175.99
1913.....	421,849	12,080,594	28.64	10.71c	14.89c	504,767.61
1912.....	765,306	17,225,508	22.51	08.88c	16.16c	1,251,619.40
1911.....	734,392	15,639,426	21.29	09.63c	12.54c	454,588.61
1910.....	722,061	19,224,174	26.62	07.85c	12.74c	939,205.03
1909.....	753,908	18,005,071	23.88	08.45c	13.00c	816,637.55
1908.....	794,703	17,786,763	22.38	09.01c	13.39c	777,480.14
1907.....	708,685	16,489,436	23.26	11.76c	17.28c	909,383.88
1906.....	671,785	16,954,986	25.24	09.30c	19.06c	1,654,435.23
	7,376,147	199,266,913	27.01	08.58c	16.55c	\$15,891,513.49

The Champion is one of the largest and richest of Lake Superior mines and has been admirably managed.

CHEROKEE COPPER CO.**MICHIGAN**

J. A. Thomas, supt., Houghton, Mich. **Mine address:** Winona, Houghton Co., Mich.

Officers: W. A. Hodgson, pres.; Linus Stannard, 1st v. p.; Deen L. Robinson, 2nd v. p.; Wm. D. Calverly, sec.-treas.; preceding, with J. H. Rice, B. F. Sparks and F. W. Nichols, directors.

Inc. April, 1910, in Michigan. **Cap.,** \$2,500,000; shares \$25 par; issued, \$1,750,000, of which 49,000 shares were given for lands, 5,000 shares went to the promoters, and 16,000 shares were sold to the public at \$5. An assessment of 50c a share was levied and was due March 26, 1917. Cash on hand Feb. 9, 1917, was \$14,990.

Property: 800 acres, Sec. 2 and S. E. ¼ of Sec. 3, T. 51 N., R. 57 W., lying between the Bohemia and King Philip, 1 to 2 miles S. W. of the latter, formerly were owned by the Penn Mining Co., and later by the ill-starred Belt Mines Co., Ltd. Land, entirely on the mineral belt, formerly included what is now the Lake mine of the Lake Copper Co., and carries upwards of a mile of the copper-bearing formation, presumably carrying the Evergreen belt. In 1913 diamond drilling began. No. 6 drill hole cut a cupriferous amygdaloidal bed of 32' width, of which 5' carried good copper.

The vein is amygdaloid to epidotal amygdaloid in character with general N. E. strike and dip of 62°, having barrel and shot copper in surface workings, and a width of 30' to 45'.

Development: by shaft, down 250', with openings at 110'. At 220' there is a station with drifting underway. At 110', vein showed a width of 26'.

Equipment: hoist, compressor, pumps, etc.

CLARK MINE**MICHIGAN**

Idle. **Office:** care Dr. Léon Estivant, owner, 47 Ave. de l'Alma, Paris, France. **Mine office:** Copper Falls, Keweenaw Co., Mich. Fred W. Nichols, agent.

Property: 2,433 acres, includes mines formerly known as the Clark, Bell and Montreal, about 3 miles south of Copper Harbor, between Lake Fannie Hooe on the north and Breakfast Lake on the south, including Lake Manganese. Mine, opened 1858, for copper, also carries a promising 2' vein of pyrolusite, average of assays, 1900, by Duparc, of Geneva, giving 55.73% manganese and 1.36% copper. Has shipped about 1,200 tons of high-grade manganese ore. Was tested, 1905, and again, 1910, by diamond drills. Was under option, 1910, to United States Smelting, Refining & Mining Co. Fully described Vol. II.

CLIFF MINING CO.**MICHIGAN****Subsidiary of Calumet and Hecla Mining Co.**

Office: 12 Ashburton Place, Boston, Mass. **Operating office:** Calumet, Mich. **Mine office:** Phoenix, Keweenaw Co., Mich.

Officers: Rodolphe L. Agassiz, pres.; Jas. MacNaughton, v. p. and gen. mgr.; preceding with Geo. A. Flagg, R. C. Grew, W. E. L. Dillaway, Francis L. Higginson and Walter Hunnewell, directors; C. H. Bissell, sec.-treas.; Geo. L. Osgood, asst. sec.-treas.

Inc. Jan., 1910, in Michigan. Cap., \$2,500,000; shares \$25 par; issued, \$1,500,000, \$13 paid in. Is controlled through ownership of 19,400 shares, by Calumet & Hecla Mining Co. Ended 1916 with \$21,445 cash, and accounts receivable; and accounts payable of only \$110. State Street Trust Co., Boston, registrar; American Trust Co., Boston, transfer agent. Annual meeting, first Wednesday in April.

Property: includes the Cliff mine proper, and the South Cliff, connected underground on the 3d level. The Cliff mine, 2 miles N. E. of the Ojibway, is the oldest mine in the Lake Superior district, opened 1846, closed 1870, again reopened 1872, and abandoned 1878, paying dividends, 1849-79, of \$2,518,620. The old mine was opened on a fissure vein crossing the bedded formation at practically right angles, and was pretty thoroughly worked out before the property was abandoned. The main fissure vein had several feeders, and a number of independent fissure veins, including the West vein, which was rich in copper near surface, and the East Cliff vein, about an eighth of a mile east of the main vein. The Cliff was notably rich in native silver.

The Cliff carries the Kearsarge amygdaloidal bed for about 2 miles, and for practically unlimited depth, the shaft being a trifle less than 2 miles from the most northerly shaft of the Ojibway, which is the nearest opening on the Kearsarge lode. The Tamarack Mining Co., which owned the Cliff until 1910, secured a complete geological cross-section of the tract, by diamond drilling, 1908-07, the Kearsarge bed being located by 12 drill holes, the majority of which were said to show commercial values, and, in addition, the property carries about 20 other amygdaloidal beds, under the greenstone bluff, which is such a prominent feature of the landscape, rising to a height of several hundred feet. A temporary vertical shaft, with a single compartment, started Aug., 1910, was sunk 217', entering the bed near the hanging wall of the Kearsarge, the ground being considerably disturbed at this point. Work in this shaft was abandoned during the first half of 1913, as the Kearsarge vein at this place proved narrow, dry and barren.

Five diamond drill holes were put down during 1914 and 1915 to explore the beds eastward in the hope of finding a profitable vein towards the Eastern sandstone. The cross-section crossed the horizon of the Old Col-

ony, Mayflower and St. Louis amygdaloid lodes and the Bohemia and St. Louis conglomerate lodes, but very little copper was disclosed by this work.

The Cliff was the first mine ever opened on native copper, and production, 1845, was 19,903 lbs., which was the first commercial output of copper from Lake Superior. Total production, 1845-82, was 38,054,340 lbs. fine copper.

Equipment: includes a power house, with boilers, duplex hoist, and a 5-drill air compressor. Buildings include a smithy, changing house, combination office and warehouse, boarding house and a number of dwellings. The mine is reached by the Keweenaw Central railway.

Owing to the unsatisfactory results of the drill-holes, property has been idle during the past year.

CONTACT COPPER CO.

MICHIGAN

Office: 70 State St., Boston, Mass. **Mine office:** Houghton, Mich.

Officers: Harry F. Fay, pres.; C. J. Morrissey, sec.-treas.; preceding, with W. A. Mosman, W. S. B. Cram and John G. Stone, directors. G. S. Goodale, supt.

Inc. May, 1910, in Michigan. **Cap.**, \$5,000,000; shares \$25 par; paid in \$2.50; issued 111,125 shares. Annual meeting, third Thursday in March.

Company is a reorganization of the Elm River Copper Co., whose shareholders were given the privilege of exchanging their stock for shares in the Contact Copper Co. on the basis of share for share, on condition that they subscribed for additional shares at \$2 each, to the extent of 50% of their holdings in Elm River. Practically 75% of Elm River stock was exchanged and the Contact Co. has now acquired title to all the real estate and personal property of the former company, which has been dissolved and is now in process of liquidation.

Report Jan. 1, 1917, showed cash on hand, \$5,922. Company should receive \$6,500 in Sept., 1917, further payment on timber contract.

Property: 2,360 acres, in one continuous tract, within the limits of the copper-bearing formations in Houghton Co., Mich. Within these limits the property has a maximum distance along the strike of 16,900', a width of cross-section of 11,600' and embraces the horizons of all the copper-bearing beds of the Keweenaw formation, between the Eastern Sandstone and the upper part of the Ashbed series.

Nearly a complete cross-section has been secured by upwards of 11,600' of diamond-drill borings, despite the heavy overburden on nearly all of the tract. Borings have given cores carrying copper from a number of different beds, but not in commercial quantities. On July 1, 1915, drilling was resumed in the S. E. $\frac{1}{4}$ of Sec. 11, to investigate the horizon believed to contain the so-called No. 8 Amygdaloid opened on the neighboring Wyandot property and correlated with the Baltic lode on which all the mines of the Copper Range Co. are located. Up to March, 1916, about 5,271' of drilling had been done and the lode definitely located at depths of 450' and 950', respectively, from the outcrop. In hole No. 20, 2,518' of drilling was accomplished between March 1 and Jun 29, 1916. In hole No. 20 the lode was located between 1,878' and 1,958'; in No. 21 between 641' and 671'. In these 4 holes, a formation has been indicated of about 35' average thickness showing a uniformly favorable character of rock.

Equipment: includes a duplex hoist good for 1,000', 2 Burt marine boilers and a 4-drill air compressor. Water is taken from a dam by a Blake pump. Buildings include a carpenter shop, two-story warehouse, boarding house with accommodations for 100 men, school house and a number of dwellings.

In order to protect the company's cash, work was suspended in 1916, to await the result of active diamond drill work on the ground north and south of the company holdings.

COPPER CROWN MINING CO.**MICHIGAN**

Inc. July 18, 1902, in Michigan. **Cap.**, \$2,500,000; increased about 1911, to \$3,000,000; shares \$25 par; issued, 66,200 shares. Company in July, 1916, sold its property to the Cass Copper Co., for 40,000 shares of latter company's stock, which see.

COPPER RANGE COMPANY**MICHIGAN**

Office: 82 Devonshire St., Boston, Mass. **Mine office:** Painesdale, Houghton Co., Mich. **Sales Dept.:** 32 Broadway, New York.

Officers: Wm. A. Paine, pres.; F. W. Denton, v. p.; F. W. Paine, sec-treas.; above with Chas. J. Paine, Jr., J. R. Stanton, S. L. Smith and R. H. Gross, directors; William H. Schacht, gen. mgr. W. Parsons Todd, sales mgr., New York; John M. Wagner, purch. agent, Houghton, Mich. American Trust Co., Boston, transfer agent; State Street Trust Co., Boston, registrar. Annual meeting, 1st Wednesday in May.

Inc. 1899, in Michigan. **Cap.**, \$2,500,000, increased 1915 to \$10,000,000; shares \$25 par; issued, 390,336 shares; reserved for exchange 4,664; treasury stock, 5,000 shares. The company is now the successor of the Copper Range Consolidated, which Dec., 1901, took over 99,699 shares of the company's stock. On Oct. 18, 1915, this holding company was formally dissolved and the shares exchanged for those of the Copper Range Co.

Dividends: \$1,536,086 in 1905; \$2,304,810 in 1906; \$2,304,810 in 1907; \$1,536,740 in 1908; \$1,536,930 in 1909; \$1,537,340 in 1910; \$1,357,104 in 1911; \$788,428 in 1912; \$1,084,498 in 1913; \$1,182,003 in 1915; \$3,941,648, or \$10 per share, in 1916; \$2.50 per share quarterly in 1917; total dividends to Dec. 31, 1916, \$19,110,397.

The balance sheet shows:

Assets:	1916	1915	1914
Cash at Boston.....	\$2,647,943	\$853,641	\$177,249
Cash at Mine and supplies.....	813,945	615,559	627,460
Copper on hand.....	2,053,758	1,934,027	1,053,733
Copper Range R. R. Bonds.....	870,000	890,000	876,000
Accounts receivable.....	89,917	.....	82,414
Michigan Sm. Co. stock.....	340,000	76,470	340,000
	\$6,815,564	\$4,689,697	\$3,146,036
Liabilities:	1916	1915	1914
Notes payable.....	.....	.....	\$1,200,000
Mine indebtedness.....	\$194,319	\$189,949	237,400
Accounts payable.....	226,817	201,949	.....
One-half Champion.....	835,966	907,934	603,410
Excess of assets.....	5,558,460	3,390,464	1,105,226
	\$6,815,564	\$4,689,697	\$3,146,036

Net income for 1916 from operations of all the subsidiary companies before deducting dividends was \$6,078,189, or \$15.40 per share. The dividend was but \$10, the difference being added to surplus.

Holdings consist of the entire assets of the Copper Range Consol. Co., namely: 50,000 shares of Champion Copper Co., which is one-half the total

issue; 99,990 shares Baltic Mining Co.; 96,920 shares Atlantic Mining Co., and 42,443 shares of Copper Range Railroad Co. stock.

Trimountain Mining Co. and Baltic Mining Co. have been dissolved, as they are owned entirely by the Copper Range Co.

In 1917, the entire property of the South Range Mng. company was bought for \$50,000, consisting of 7,000 acres undeveloped mineral lands in Houghton and Ontonagon counties.

Property: 16,467.64 acres, mainly in Houghton County. Mining companies controlled own an additional 12,240.4 acres. Company secured an option on 3,500 acres lying to the south from the St. Mary's Mineral Land Co. and bought for \$50,000 scattered lands to the extent of 5,000 acres. Average yield of copper per ton of rock was 22.90 lbs. in 1914, 32.50 lbs. in 1915, and 33.07 lbs. in 1916, the highest figure yet obtained. The company's original tract of 9,360 acres mineral and 441 acres non-mineral land, lies between the Baltic mine (800 acres) on the south and the Trimountain (1,351 acres) on the north. The Champion lies between the Baltic and the St. Mary's Mineral Land property. The Atlantic mine has been idle since the mine was wrecked by air blasts in 1911. The Baltic mine, a highly mineralized amygdaloid bed 15'-60' wide, mined through three shafts, 2,500' deep. The Champion works three separate amygdaloid beds mined by four 2,000' shafts. The Tri-mountain output comes from the Baltic bed mined by 4 shafts, one 2,800' deep.

The company is the second largest producer of the Lake Superior district.

The total 1916 production of copper from which this company's profits are derived, that is, Baltic, Trimountain, and one-half of Champion, was 37,946,930 lbs., as compared with 37,035,642 lbs. in 1915. The average yield was 33.07 lbs. of copper per ton from 1,655,447 tons stamped.

Costs and Profits—1916

	Production Lbs.	Cost per Lb.	Profits	Price Rec'd
Baltic.....	12,425,804	10.85c	\$1,792,667	25.28c
Trimountain.....	8,720,558	11.1c	1,236,048	25.28c
Champion, one-half.....	16,800,568	7.8c	2,935,303	25.28c
	<hr/>	<hr/>	<hr/>	<hr/>
Copper Range Co.:	37,946,930	9.56c	\$5,964,019	25.28c
1915.....	37,035,642	8.06c	3,459,236.44	17.4c
1914.....	19,953,854	10.66c	541,961.06	13.38c
1913.....	18,767,359	11.71c	595,958.01	14.89c
1912.....	28,967,428	10.51c	1,631,876.10	16.16c
1911.....	29,310,579	9.74c	817,879.86	12.54c

The above table shows the effect of improvements in mining and of new mining and milling machinery. These improvements give assurance that operating results similar to those of 1916 may be expected to continue under average conditions.

Development: for 1916 totaled 39,665' and in addition there was 6,264' of raising.

Ore reserves: a satisfactory tonnage was developed in 1916, which was about equal in amount to that extracted. Tons of rock stamped in 1916 were 1,655,447. The new selling department of the company effected a substantial saving in commissions and proved an unqualified success. Copper Range is an assured success and worthy of all that has been said about it.

Copper Range Consolidated Co.

Company dissolved Oct. 18, 1915, shareholders receiving an equal number of Copper Range Co. stock in exchange.

Copper Range Railroad Co.

Office: 82 Devonshire St., Boston, Mass. Operating office: Houghton, Mich.

Officers: Wm. A. Paine, pres.; F. W. Paine, v. p. and sec.-treas.; preceding officers, John H. Rice, Frederick W. Denton, Thos. S. Dee, Wm. D. Calverley, Samuel L. Smith, F. R. Bolles, gen. mgr., directors.

Inc. 1899 in Michigan. Cap., \$5,000,000; shares \$100 par; issued, \$4,244,300. Debentures outstanding, \$2,280,000 first-mortgage 5% bonds. Company is authorized to issue bonds to extent of \$20,000 per mile of completed main line, and \$15,000 per mile of completed branch lines and side-tracks. Is controlled by Copper Range Company. Balance sheet of Dec. 31, 1916, gave cost of road at \$6,173,016, with equipment inventoried at \$871,500. Earnings were \$601,643 gross and \$186,979 net in 1914; \$811,346 gross and \$326,895 net in 1915; \$930,606 gross and \$324,131 net in 1916. Credit balance as carried to balance sheet, \$712,948. About 75% of the gross income is derived from transportation of ore, mineral and freight.

The railroad has upwards of 100 miles of trackage, the 65-mile main line running from Calumet to McKeever, and connecting with the Keweenaw Central at Calumet; the Duluth, South Shore & Atlantic, Hancock & Calumet and Mineral Range railways at Hancock and Houghton, and the Chicago, Milwaukee & St. Paul railway at McKeever. The company also has trackage rights over 19 miles of the Chicago, Milwaukee & St. Paul railway, between McKeever and Ontonagon, and operates a daily passenger service between Calumet and Ontonagon, with additional trackage rights of 73 miles over the same line, over which fast freights are operated between Calumet and Channing, Mich. Trackage rights have been given the Chicago, Milwaukee & St. Paul over the Copper Range between McKeever and Houghton, and a direct passenger service, with exceptionally good equipment, is operated jointly by the Chicago, Milwaukee & St. Paul and Copper Range lines, between Chicago and Houghton. Spurs connect the main lines with all of the principal mines along the right-of-way.

The company owns a half-interest in a bridge crossing Portage lake, between Houghton and Hancock; also extensive water frontage on Portage lake, in the western part of Houghton, with general office building, shops, roundhouse, warehouses and wharves for merchandise and coal. The coal wharf is equipped with modern unloading machinery, and has deep water alongside, capable of accommodating the largest freighters plying the great lakes. The Copper Range railway is a model small road.

Baltic Mining Co.

Company has been dissolved. Its properties are owned entirely by the Copper Range Company, including \$80,000 stock in the Michigan Smelting Co.

Paid dividends of \$7,950,000 to end of 1913, dividends being \$12.50 in 1905; \$14 in 1906; \$10 in 1907; \$9 in 1908; \$10 in 1909; \$10 in 1910; \$5 in 1911; \$7 in 1912; \$2 in 1913. Net earnings, 1916, were \$1,792,667, and company ended the year with a surplus of \$3,233,184. Total assets were given as: \$3,314,564, with total liabilities of \$81,380.

Lands: 800 acres, near the eastern limit of the Michigan copper belt, about 75 acres being on the eastern sandstone and non-mineralized. Hold-

ings comprise all of Sec. 21 except the S. E. $\frac{1}{4}$, and W. $\frac{1}{2}$ of Sec. 20, T. 54 N., R. 34 W. Lands are bounded on the north by the Wheal Kate and Sec. 16 of the Atlantic; on the east by St. Mary's Mineral Land Co.; on the south by St. Mary's lands, lands of Hussey, Howe & Co., and the Trimountain mine; on the west by the Trimountain. Exchanged 39 acres, 1905, with the Atlantic mine, which will enable the Baltic to sink No. 5 shaft to much greater depth than otherwise possible. To the southward the Trimountain and Champion mines are opened on the same bed, which has a strike of N. 68° E., from Baltic shafts 2 to 5, and to the northward is the Superior mine, on the same bed. The dip of the bed averages about 73°, being the sharpest of any developed cupriferous bed in the Lake district.

The Baltic amygdaloidal bed is exceptionally strong, ranging 15 to 60' in width, and so well mineralized that at most points it can be more or less thoroughly stoped from wall to wall. The great width of the stopes has brought about the use of a walling system, by which waste rock is built into dry walls along the drifts, thus saving timbering, while giving stronger walls than any timber could supply, and saving the cost of hoisting lean rock. The walling system of the Baltic has proven a success under actual test, and is now in general use in the Lake district, the credit being due Mr. Denton. A little melaconite is found in narrow fissures crossing the lode, these being too small to follow, but the black oxide ore mined in the stopes is saved in the milling, carrying 35 to 40% copper as dressed, and smelts readily with the native copper mineral. The native copper of the Baltic is arsenical, and it is probable that some copper arsenides are mined and milled, as narrow arsenical fissure veins occur occasionally in the district south of Portage lake. While the finished copper is arsenical, it makes wire of great tensile strength.

Development: shafts are numbered from south to north. In 1916, 20,143' of new openings and 584' of shaft sinking was done.

No. 1, the discovery shaft, located between Nos. 2 and 3, was sunk at a wrong angle, and was abandoned at depth of 219'.

No. 2, the southernmost shaft, is 2,773' deep, began production 1906 and furnished about half of the 1916 production. The surface plant at No. 2 includes a boiler house with two 250 h. p. Stirling boilers, and an engine house with a Nordberg air compressor reducing 4,000' of free air per minute to a pressure of 70 lbs. per square inch, and a Nordberg hoist with double-conical drum. The shaft rock house has a crusher operated electrically, and the shaft has concrete stringers.

No. 3 shaft, 1,170' northeast of No. 2 and 3,103' deep, has a steel shaft rock house of the circular type, with 1,200-ton bins, equipment including a 16x18" engine, two 18x24" Blake crushers and a large crusher operated electrically.

No. 4 shaft, 900' northeast of No. 3 and 2,867' deep, has a frame shaft rock house sheathed with steel, 36x71', with 17x31' wing, 88' high, with 1,400-ton rock bins and two 18x24" Blake crushers.

No. 5 shaft, the northernmost, 885' N. E. of No. 4 and 1,624' deep, has a rock house duplicating that at No. 4. Stoping was done on the 9th and 14th levels, inclusive, and drifts run to the Atlantic boundary. The ground was considerably disturbed in the upper levels, but is growing more settled at the bottom, and good showings are reported on the West lode. Hoist is a duplex Nordberg, good for 1,500' depth. Shaft has been abandoned and ground tributary thereto is mined and ore hoisted through the No. 4 shaft.

Hand power cranes for handling mass copper have been installed at all shafts, and the mine has electric pumps. In 1915 installation of addi-

tional dynamo for underground haulage and construction of transformer house for new transmission line from stamp mills was completed.

The compressor house, between shafts Nos. 3 and 4, is 36x58' in size, with concrete foundations, stone walls and steel roof, housing a compressor with capacity to reduce 4,000 cu. ft. of free air per minute to a pressure of 70 lbs. per inch. Adjoining is a boiler house of similar material, 49x76', with wing 2x62', having four 250-h. p. Stirling boilers and a 140' self-supported steel smokestack. This boiler plant supplies steam for shafts 3 and 4. A new boiler plant was constructed in 1916. Adjoining the boiler house is a 360' coal trestle, of 5,000 tons capacity, underneath being a 5x8' concrete tunnel, through which coal is hauled in tram cars, on a down grade, by endless cable. The mine has a complete electric light plant. A considerable town has grown up about the mine with well-built dwellings for employees, on lands owned by the company. The property is served by the Painesdale branch of the Coper Range railroad, under the same control as the mine.

The mill, on Lake Superior, one-half mile west of the Atlantic mill, went into commission Dec., 1901, and was enlarged, 1907. The building is of structural steel, on stone foundation, equipped with 4 Allis simple heads of 500 to 625 tons daily capacity each, and 2 Nordberg compound heads of about 800 tons daily capacity each, giving the mill a capacity of about 4,000 tons daily. Equipped with Wilfley tables, Woodbury jigs and Deister concentrating tables for treating the finer slimes. The mill has crushing rolls and a Huntington mill for regrinding, and a settling tank for slimes. Mineral carries about 60% fine copper. Power is furnished by a 500-h. p. 14x32" Nordberg cross-compound engine, and a 180-h. p. auxiliary engine.

Adjoining the mill is a boiler house with five 250-h. p. Stirling boilers and a Green fuel economizer. Draft is secured by a set of duplex fans, driven by the mill engine, with a concrete smokestack 226' high and 8' in diameter. Behind the boiler house is a 25,000-ton coal storage yard, for the joint use of the Baltic and Atlantic mills, coal being brought to the boilers, through tunnels, by gravity. A 1,250 k. w. electrical plant, installed 1912, at the Baltic mill, supplied power for number of regrinding mills at this and other stamp mills of the parent company.

Water for the Baltic and Atlantic mills is furnished by a \$150,000 gravity dam across the mouth of Salmon Trout river. The entire steel structure is anchored to a 2" steel base plate, at the bottom of the concrete, by a large number of 1½", 2", and 2½" steel rods of 15 to 30' length. Water is taken from the dam about 20' below the crest by three 38" riveted steel pipes, one on the Atlantic and two on the Baltic side. Surmounting this structure is a trestle of the Copper Range railroad.

Production:

	Rock Stamped Tons	Copper Produced Pounds	Yield per Ton, Lbs.	Cost per Pound	Price Received
1907.....	761,288	16,704,868	21.94	10.34c	17.28c
1908.....	764,117	17,724,854	23.19	08.28c	13.39c
1909.....	814,260	17,817,836	21.88	07.98c	13.00c
1910.....	781,419	17,549,762	22.46	08.32c	12.74c
1911.....	696,795	15,370,449	22.06	09.09c	12.54c
1912.....	652,433	13,373,961	20.50	10.94c	16.16c
1913.....	333,289	7,736,126	23.21	11.91c	14.89c
1914.....	324,433	7,001,945	21.58	11.17c	13.38c
1915.....	378,443	12,028,947	31.79	09.50c	17.40c
1916.....	369,287	12,425,804	33.65	10.85c	25.28c
Total.....	5,875,764	137,734,552	23.44	09.54c	15.40c

The ultimate productive capacity of the mine cannot be predicted with safety, but the present milling capacity is equal to making nearly 25,000,000 lbs. fine copper yearly, and ultimately this output, or even a greater production, should be reached.

Trimountain Mining Co.

Company was dissolved Jan., 1917, by Circuit Court, County of Houghton. Entire properties owned by the Copper Range Co.

Officers: John Jolly, supt.; Edw. Koepel, mill supt.; H. T. Mercer, engr.; Benj. D. Noetzel, clerk; Richard Bowden, mg. capt.; Wm. J. Richards, master mechanic.

Dividends: \$3 in 1903, \$5 in 1908, \$1.50 in 1910, \$3 in 1912, and \$2 in 1913.

Balance of assets Jan. 1, 1917, \$2,600,231, including \$1,946,358 cash and copper on hand amounting to \$94,572. Liabilities amounted to \$108,142, leaving a surplus of \$2,492,088 for the year.

Property: 1,120 acres, the E. $\frac{1}{2}$ of Sec. 19, W. $\frac{1}{2}$ of Sec. 20, N. $\frac{1}{2}$ of Sec. 29, and N.-E. $\frac{1}{4}$ of Sec. 30, all in T. 54 N., R. 34 W. The Baltic mine lies to the N. and the Champion to the S., with undeveloped lands to the E. and W.

Owing to a very heavy sand overburden the mine was opened by drop-shafts sunk through alluvium, with raises to surface on the angle of the dip of the stratified formation. The Baltic bed runs 15 to 50', with an average width of 25', on the Trimountain property. Heavy copper is found near the walls, and masses upwards of a ton in weight have been found, but values occur mainly disseminated in stamp rock.

The Trimountain shafts enter lean streaks or shoots, sometimes 500' in horizontal length, with flat northerly pitch or rake, underlain by copper ore. Lying parallel with and about 65' W. from the Baltic bed, is a wide amygdaloid, carrying some heavy copper and considerable stamp rock. This bed has not yet been worked, but may be made available for production at some time in the future. The great width of the lode has led to a dry-walling with waste rock, which is used also for building underground chutes, which are roughly circular, with inner diameter of about 5' and are filled about with waste, as stopes are carried upward, three chutes being built at a sharp pitch, the wedging of the surrounding waste rock serving to hold the walls immovable. The saving in timbering brought about by dry-walling and building chutes of mine rock is very great.

Development: No. 1 shaft, 210' north of the Champion boundary line, is sunk at an angle of 68°, with 1st level opened 168' below the collar, levels thereafter at 100' intervals. The upper levels tributary to No. 1 shaft have been worked out, and the shaft abandoned at depth of 2,284'. It now serves as a waste sand chute.

No. 2 shaft, 1,023' N. E. of No. 1, was 2,859' deep at the end of 1915, and a considerable improvement has been noted in ground below the 14th level, with the bottom levels the best opened in this shaft. The shaft rock house, has 2,000-ton rock bins, and is equipped with an engine, steam hammer and two crushers. Rock is raised by a 2,500-h. p. Nordberg direct-connected duplex hoist, with double-conical drum of 18' maximum diameter, capable of raising 6-ton skips from 1 mile depth.

No. 3 shaft, 1,027' N. E. of No. 2, sunk at an angle of 68°, was 2,563' deep at the end of 1915. Beneath 60' of sand, the rock was found to be badly fractured and barren down to the 2nd level, only becoming solid and payable below the 14th level.

No. 4 shaft, the northernmost, 2,715' deep at the end of 1916, is the best shaft of the mine.

During the year 9,084' of openings were made and 167' of shaft sinking was done. Tons of rock hoisted were 394,909, of which 45,405 tons were waste.

Equipment: the mine buildings near shafts Nos. 2 and 3, include machine and carpenter shops, smithy and warehouse. There is a 35-drill Rand air compressor at No. 2 shaft, with a Deane condensing plant in a separate building. The power plant at No. 3 shaft includes a battery of Stirling water-tube boilers and a 4,500' Nordberg air compressor. The mine has electric pumps and works about 60 drills. The property is served by the main line of the Copper Range railway, which reaches all the shafts and principal shops. Mine has underground electric haulage, on several of the levels.

The mine property has macadamized roads, a large boarding house, upwards of 100 dwellings, general store, hospital and a nurses' home.

Mill: The mill, at Beacon Hill, 2 miles west of Redridge, was destroyed by fire. It has not been decided, up to present time, to rebuild the mill. Output of mine is being treated in Baltic mill.

The mill boiler house has six 250-h. p. and two 200-h. p. Stirling boilers, the later maintaining a steam pressure of 180 to 200 lbs. per sq. inch.

The pump house at the mill has a 20,000,000-gal. Nordberg pump, taking water from a well connected with a tunnel running 1,960' to an intake crib in Lake Superior.

Production was begun Jan. 4, 1902, with 1 leased head at the Arcadian mill. The Trimountain began production with a return of 37 lbs. fine copper per ton, but fell off later to 27 lbs., and, when the present management secured control, the production fell sharply to 18 lbs. fine copper per ton.

Production:

	Rock Stamped, Tons	Copper Produced, Lbs.	Yield per Ton, Lbs.	Cost, c. per Lb.	Price, c. Rec.	Net Profits
1916.....	349,504	8,720,558	24.94	11.01	25.28	\$1,236,048
1915.....	349,684	8,302,896	23.75	09.53	17.40	654,746
1914.....	277,251	5,048,306	18.21	12.21	13.38	58,639
1913.....	229,149	4,990,938	21.78	12.62	14.89	113,363
1912.....	366,663	6,980,713	19.04	11.73	16.16	308,472
1911.....	347,885	6,120,417	17.59	11.55	12.54	60,370
1910.....	317,299	5,694,868	17.95	12.17	12.74	32,250
1909.....	323,408	5,282,404	16.33	13.89	13.00	(d)47,841
1908.....	334,929	6,034,908	18.00	12.69	13.39	41,842
1907.....	444,358	8,190,711	18.43	12.63	17.28	880,302
	<u>3,340,130</u>	<u>65,366,719</u>	<u>19.57</u>	<u>11.87</u>	<u>16.21</u>	<u>\$2,838,195</u>

(d) Deficit.

Champion Copper Co.

Owned jointly by St. Mary's Mineral Land Co. and Copper Range company, is described under its own title.

Atlantic Mining Co.

Office: 82 Devonshire St., Boston, Mass. **Mine office:** Painesdale, Houghton Co., Mich.

Officers: Wm. A. Paine, pres.; F. W. Paine sec.-treas.; preceding offi-

cers, John R. Stanton, S. L. Smith, Frank P. Son, F. W. Denton and J. H. Blodget, directors.

Inc. Dec., 1872, in Michigan; reincorporated, 1901, for 30 years. Cap., increased, 1902, to \$2,500,000, shares \$25 par; fully issued; paid in, \$11.80. Last assessment was \$2, Oct. 11, 1909, the first in 30 years. Has paid dividends of \$990,000, last in 1905. Owns \$40,000 stock in Michigan Smelting Co. Boston Safe Deposit & Trust Co., registrar; American Loan & Trust Co., Boston, transfer agent. Annual meeting, second Tuesday in March. The Atlantic Co. is controlled by Copper Range Consolidated Co., through ownership of 96,920 shares of the capital stock. Balance sheet of Dec. 31, 1916, shows surplus of \$259,657.

Lands: 8,217 acres, including 1,351 acres of mineral lands, 4,760 acres of timber lands, and 2,106 acres miscellaneous lands, latter including the mill site, and a valuable frontage on Portage lake. Mineral lands are S. $\frac{1}{2}$ of Sec. 4, except S. E. $\frac{1}{4}$ of S. E. $\frac{1}{4}$; N. $\frac{1}{2}$ of Sec. 9; N. W. $\frac{1}{4}$ of Sec. 10 and Sec. 16, all in T. 54 N. R. 34 W. Principal holdings are the old Atlantic mine, 640 acres, including the mines known before 1872 as the South Pewabic and Adams, located about 2 miles south of Portage lake and 4 miles southwest of Houghton, and the Sec. 16 tract of 640 acres. The mines, idle since 1911, are very fully described, Vol. X.

DETROIT & LAKE SUPERIOR COPPER CO.

MICHIGAN

Waterbury, New Haven Co., Conn. Is a half owner of the stock of the Lake Superior Smelting Co., which bought the plants of the Detroit & Lake Superior Copper Co. at Hancock and Dollar Bay, Houghton Co., Mich. Built a smelter at Detroit, 1850, and shortly after built another at Hancock, being the pioneer in Michigan smelting.

DOUGLASS COPPER CO.

MICHIGAN

Office: 705 Sears Bldg., Boston, Mass. Property north of Allouez and west of Ahmeek holdings in Allouez township, Keweenaw county, Mich.

Officers: Charles J. Paine, Jr., pres.; George P. Gardner, v. p.; Arthur E. Coe, sec.-treas.; preceding with R. S. Shelden, C. C. Douglass, W. A. S. Chrimes and A. S. Knight, directors. Inc. 1912, in Michigan. Cap., \$2,500,000; shares \$25 par; assessable; 50,000 shares given for land, marked \$10 paid in value.

Property: 440 acres in a compact tract, being E. $\frac{1}{2}$ of Sec. 30 and W. $\frac{1}{2}$ of Sec. 29, embracing eleven 40-acre tracts formerly owned by the Sheldon Douglas and the Northey estates, and the St. Mary's Mineral Land Co. This tract covers the underlay, or deep extension of the Kearsarge lode into which the rich oreshoot now worked in the Ahmeek, pitches. To open this ground a 3,800' vertical shaft must be sunk.

Management plans selling treasury stock to raise necessary funds for development work.

EVERGREEN BLUFF MINING CO.

MICHIGAN

In liquidation. Property owned by Mass Consolidated Copper Co.

FEDERAL SYNDICATE COPPER CO.

MICHIGAN

Office: Hosking Blk., Calumet, Mich.

Officers: A. C. Stielow, pres.; H. E. Murray, v. p.; Harry Olson, 2nd v. p.; Dr. P. D. MacNaughton, sec.-treas.; John D. Kerr, asst. sec., with P. L. de Voist, Ernest Le Duc and John R. Ryan, directors; Mortimer North, engr.

Inc. Oct. 12, 1916, in South Dakota. Cap., \$1,000,000; shares \$1 par. 152,272 issued on organization. The initial offering of stock May, 1917 was at 50c, changed June, 1917, to \$1 a share.

Property: approximately 360 acres in T. 57 and 58, N. R. 31 W., being the Salem tract, formerly owned by the Federal Copper Co., south of the

Phoenix shaft of the Keweenaw Copper Co. Lands cover a $1\frac{1}{2}$ mile stretch across the strike of the copper lode and near the Phoenix, St. Clair and Eagle River properties of the Keweenaw Copper Co., with Ojibway lands on west and east. Lands are crossed by Kearsarge amygdaloid which dips 30° N. W., giving 292.5 acres underlaid by this lode; whose copper content in this part of the range is as yet unprospected. Diamond drilling on this tract is planned for 1917-18.

FRANKLIN MINING CO.

MICHIGAN

Office: 60 Congress St., Boston, Mass. **Mine office:** Demmon, Houghton Co., Mich. **Mill office:** Point Mills, Houghton Co., Mich.

Officers: R. M. Edwards, pres.-gen. mgr.; Henry D. Forbes, v. p.; Henry Tolman, treas.; preceding, with C. W. Van Law, C. A. Hight, Sidney J. Jennings and Harry M. Howard, directors. Albert L. Wyman, sec. Enoch Henderson, supt.

Inc. April 3, 1857, in Michigan. **Cap.** \$500,000, and reincorporated, 1887, for 30 years; cap. increased, 1899, to \$2,500,000, and again increased, Nov., 1908, to \$5,000,000; shares \$25 par; issued, 166,473; paid in \$16.20, to Dec. 1915. Unissued stock has been set aside for the purpose of acquiring the total capitalization or 100,000 shares of the Rhode Island Copper Co. Has paid dividends of \$1,240,000, and has levied assessments of \$1,753,000, including a \$2 assessment called Aug., 1914. Federal Trust Co., Boston, registrar; American Trust Co., Boston, transfer agent. Annual meeting, third Wednesday in April.

Balance sheet of Dec. 31, 1916, showed a cash surplus of \$192,094, as compared with \$30,022 in 1915. The revenue in 1916 totaled \$834,616. All notes payable, amounting to \$155,000 on Jan. 1, 1916, have been paid from earnings, so the company has no indebtedness save current expenses.

Property: 3,280 acres of mineral property, and a 217-acre mill site, with 1 mile of frontage on Portage lake. The old Franklin mine (described Vol. VIII), 160 acres, was sold, July, 1908, to the Quincy Mining Co., for \$170,000, and Sec. 6, T. 55 N., R. 33 W., 640 acres, lying directly north of the Franklin Junior and west of the Rhode Island, was bought from St. Mary's Mineral Land Co., 1909, for 33,333 shares of stock.

Property carries 2 miles of the strike of the Pewabic amygdaloid and other cupriferous beds of the Keweenawan series. In addition to the main tract, there are 3 other tracts of mineral lands, of 160, 480 and 640 acres. The company also controls, and is absorbing, the Rhode Island Copper Co., which has 800 acres immediately north of the Franklin Junior mine.

Development: early work was on the Franklin Junior property, where two parallel lodes, the Allouez conglomerate and the Pewabic amygdaloid, 500' apart, have been worked. The amygdaloid worked prior to 1902, gave but 9.65 lbs. copper per ton, and was abandoned in favor of the conglomerate until the latter, decreasing in width and value on the 2,000' to 2,400' levels, was abandoned and work resumed on the Pewabic in the Franklin, Jr., shaft (No. 1), sunk about 20' in the footwall. The values being extremely low, mining was stopped, and only exploratory work done. In 1913, a crosscut was started eastward from the shaft at the 3,200' level to explore the entire eastern part of the company's holdings. At 550' from the amygdaloid this crosscut entered payable ore in the Allouez conglomerate, in the Autumn of 1913. Drifts were at once started to prove the extent and copper content of the orebody. Work continued until August, 1914, and was resumed in July, 1915, the orebody now being developed for 1,100' on the 32nd level. It is opened for stoping on each level from the 27th down to the 36th, an average of 700' on each level,

or a total of 7,043' of drifting, with a continuous raise, used as an ore chute from the 2,700' to the 3,700' level, where ore is gathered by electric motor trains and carried to the shaft. Besides this main raise there is another for men and supplies, the new raises in 1916 aggregating 391'. The shaft is down to the 37th level, and shows considerable improvement below a depth of 2,000'. Shaft is equipped with a steel circular rock house (Edwards design), formerly used at No. 2 conglomerate shaft. On the 28th level a crosscut driven in 1915 connects the lode with the shaft, and a similar crosscut has been driven on the 37th level. The old conglomerate shaft, bottomed at 2,400' on the incline, has not been connected.

The most important development in 1916 was the extension of No. 27 and 22 levels S. from No. 1 shaft to a point under No. 2 shaft. The lode here is richer and wider than the average of the conglomerate. This ground, up to No. 17 level, is untouched. No. 2 shaft which had caved, is being reopened and equipped. The work is difficult, but No. 14 level had been reached in June, 1917.

Underground costs were considerably reduced by mechanical haulage on No. 29, 30 and 31 levels.

Having cut the Allouez conglomerate, the exploration crosscut on the 32nd level was continued to a total distance, Dec. 31, 1916, of 4,542' from the Pewabic lode. The crosscut encounters and passes for 25' through the Calumet conglomerate at 2,150', the 10' Osceola amygdaloid at 2,820' and the Kearsarge conglomerate, 40' wide, at 3,380' from the shaft, but all three lodes were devoid of any copper. Twenty-two other amygdaloids were also cut, 9 of them copper bearing, but only 2 rich enough to warrant exploratory drifts and raises; the remaining 13 were barren.

The long crosscut on No. 32 level was driven through the Kearsarge lode and stopped on the footwall side of the Wolverine sandstone, 4,542' from the Pewabic amygdaloid. Ore of sufficiently good grade to warrant further exploration was found on the footwall side of the Kearsarge amygdaloid.

Production in 1916 came from drift-stopes and stopes so placed as to need short tramming. Total openings, development and exploratory, amounted to 8,577' in 1916. Company employs 340 men at mine and 80 men at mill.

Equipment: includes a Nordberg hoist at No. 1 shaft hoisting a 10-ton skip, and has special air-compression cylinders, storing up energy, otherwise wasted, in compressed air, the compressed air being mixed with steam, in the cylinders, as a prime motive force.

The mill is reached by the Mineral Range railroad. Equipment includes 5 Allis-Chalmers 2-way heads, with 20x24" cylinders, each capable of crushing 350 tons of conglomerate or 500 tons of amygdaloid rock daily. Each stamp is fed from a 1,000-ton rock bin, and equipped with hydraulic separators, which remove considerable heavy copper. The washing plant includes 8 Woodbury classifiers, 20 roughing jigs, 15 finishing jigs, 32 Wilfley and 10 Overstrom tables. The jigs are of the Hodge eccentric type, with centershield copper discharges, obviating skimming.

All stamp mortars are now on concrete foundations.

Power for the mill is furnished by a 16x32" Allis-Chalmers engine, and steam is supplied by two 500 h. p. Stirling boilers. The boiler house has a self-supporting brick-lined smokestack of 7' diameter, 165' high, on a 52' brick foundation. Water is furnished by a 15,000,000-gal. Allis-Chalmers vertical compound pump, having 12x42" high-pressure and 42x42" low-pressure cylinders, with 47" stroke and plungers of 37½" diameter. Water is drawn through a 36" pipe line, running 200' under the rock to a crib

protected by quarter-inch screens. The mill has a 5x12" duplex fire pump with fire hose, and electric light. There is a 267' wharf at the mill site, equipped with coal hoist and sheds, with 18' of clear water alongside. The mill site has about 20 dwellings for employees.

Production: in 1903 the recovery of copper was 15.25 lbs. per ton of rock stamped and in 1907 was only 11.48 lbs., falling, 1909, to 9.47 lbs. per ton of rock stamped. The largest production ever secured by the mine was 5,259,140 lbs. fine copper in 1902. Recent production has been: 4,206,085 lbs. in 1905; 4,228,650 lbs. in 1906; 4,401,248 lbs. in 1907; 3,703,421 lbs. in 1908; 1,615,556 lbs. in 1909; 966,353 lbs. in 1910; 820,203 lbs. in 1911; 1,710,651 lbs. in 1912; 1,021,440 lbs. in 1913; 93,283 lbs. in 1914. 1916 production was 286,603 tons hoisted, 19,317 being discarded and balance, 267,286 stamped, yielding 3,116,566 lbs. refined copper, equal to 11.7 lbs. per ton. The daily output 1917 is 1,100 to 1,400 tons of ore.

In 1918 company will attempt (once more) to develop the Pewabic or Quincy amygdaloid lode, as good rock was found in it on the 30th level.

Property is now on a profitable basis and management excellent.

GLOBE MINING CO.

MICHIGAN

Office: 15 William St., New York.

Officers: L. P. Yandall, pres.; R. D. Rickard, v. p.; J. R. Stanton, sec.-treas.; preceding officers, and W. H. Leggett, of Detroit, directors.

Inc. May, 1911, in Michigan. Cap., \$78,250; shares \$25 par; fully paid and fully issued.

Property: 3,200 acres, Secs. 1, 2, 3, 4 and 5, T. 53 N., R. 35 W., extending entirely across the Keweenaw trap formation, from the eastern to the western sandstone, lies next south of the Champion, and immediately north of the Challenge, carrying about 6,000' of the strike of the Baltic and all parallel beds. Mine was developed by the Copper Range Consolidated Co., under option, but option was relinquished, Feb. 1, 1909, after expenditure of upwards of \$500,000.

Development: diamond-drill borings, to locate the Baltic bed, gave some cores with excellent values, but disclosed a heavy overburden of sand and boulders, rendering it necessary to reach the solid rock by a vertical shaft. Work was begun early 1905, but the first shaft was abandoned, owing to quicksand, and was replaced by a new vertical shaft, about 700' south of the Champion boundary. The shaft is telescopic, inside measurements of timbers at the collar being 13' 3"x23' 3", with a second section below of 9x19' 6", and a third section of still smaller size.

The shaft is 1,040' deep, with first level 356' below surface, and plats were cut thereafter at 100' intervals. The Baltic amygdaloidal bed was tested by some diamond-drill boring, and about 900' of drifting on the seventh level, which is about 1,000' from surface, and showed a little copper, in patches, but on the whole was unpayable, and work was suspended Jan. 31, 1909, and property has been idle since. Notwithstanding the unfavorable results secured by the work done so far, the property is by no means devoid of promise.

GRATIOT MINING CO.

MICHIGAN

Idle. Office: 12 Ashburton Place, Boston, Mass. **Operating office:** Calumet, Mich.

Officers: Rodolphe L. Agassiz, v. p.; Geo. A. Flagg, sec.-treas.; Jas. MacNaughton, gen. mgr.; Walter Hunnewell and Francis L. Higginson, directors.

Inc. Feb. 16, 1906, in Maine. Cap., \$300,000; shares \$3 par, fully paid. Is controlled, through ownership of 50,100 shares, by the Calumet & Hecla Mining Co. Ended year Dec. 31, 1914, with debit balance of \$400,833.

Property: 600 acres, the N. W. $\frac{1}{4}$ of Sec. 26, N. E. $\frac{1}{4}$ of Sec. 27, S. E. $\frac{1}{4}$ of Sec. 23, and S. E. $\frac{1}{4}$ of Sec. 22, except the N. W. $\frac{1}{4}$ of the N. W. $\frac{1}{4}$, T. 57 N., R. 32 W. Property lies S. and E. of the Seneca and N. and E. of the Mohawk, carrying the Kearsarge amygdaloidal bed under about 175 acres, to a maximum depth of about 2,700'. Extensive drill borings were made before the shafts were started. The Kearsarge bed averages about 12' in width, with strike of N. 42° E., and average dip of 33 to 36° with the horizon, and its copper contents are painfully low.

Development: by two 3-compartment shafts, exact duplicates, sunk at an angle of 36° on the Kearsarge bed. Levels are opened at 100' intervals.

No. 1 shaft, about 1,500' from the Seneca boundary, is 1,900' deep, having a bed up to 18' in maximum width. Drifting has been done on the alternate odd-numbered levels, from the 1st to 9th, inclusive.

No. 2 shaft, 1,475' S. W. of No. 1, and 1,800' N. of Mohawk No. 1, is 1,520' deep, and drifting has been done on the 2nd, 3rd, 5th and 7th levels, the best showing being on the 5th.

Property is served by a $\frac{2}{4}$ -mile spur of the Mineral Range railway, built north from the Mohawk mine.

Production: begun July, 1910, was 28,552 tons of rock, yielding 265,-869 lbs. fine copper, and in 1911, was 1,347 tons rock, yielding 14,275 lbs. fine copper, or about 9.3 lbs. copper per ton of rock milled. The mine was shut down April 3, 1911. It is obvious that, owing to its comparatively small size and shallow depth, the Gratiot cannot work the Kearsarge bed profitably at the average price of copper, except on a very large scale, and it could be operated much more advantageously in connection with the Seneca than alone:

HANCOCK CONSOLIDATED MINING CO.

MICHIGAN

Hancock, Mich.

Officers: John D. Cuddihy, pres.; Capt. Thos. Hoatson, v. p.; John H. Hicok, sec.-treas.; preceding, with Allen F. Rees, Capt. Samuel B. Harris and Capt. Jas. Hoatson, directors; C. E. Weed, gen. mgr.; Richard Coombs, mg. capt.; Daniel Fisher, clerk; C. W. McDougall, engr.; Fred G. Schubert, master mechanic.

Inc. June 11, 1906, in Michigan. **Cap.**, \$5,000,000; shares \$25 par; issued, \$2,500,000; fully paid with \$3 assessment levied March, 1915, payable \$1 each, in May and Sept., 1915, and Jan., 1916. Old Colony Trust Co., Boston, Mass., registrar; State Street Trust Co., Boston, transfer agent. Stock listed on Boston Exchange. Annual meeting, third Wednesday in June.

Company began business with \$1,000,000 and paid \$552,623 for its property. Disbursements for year ending Dec. 31, 1916, were \$771,515, made up of \$705,778 for mining expenses, including smelting, freight, marketing, etc.; \$22,445 interest on notes; \$30,823 taxes and \$12,467 for Lake Milling, Sm. & Ref. Co. stock.

Profits for 1916 were \$103,688. Receipts were \$875,202 in 1916, made up of \$755,946 from 2,690,859 lbs. copper marketed at 28.093c; \$117,016 from assessments; \$2,240 interest.

Property: consists of 840 acres of mineral territory, immediately west and south of the old Quincy mine, in T. 55 N., R. 34 W., including the original Hancock mine, 136 acres, set aside, 1859, by the Quincy Mining Co., which reserved the mineral rights to the Pewabic bed. The Pewabic bed, on lands other than the original Hancock tract of 136 acres, is owned by the Hancock Consolidated. Lands carry the Pewabic, Quincy, West and Hancock of Sumner copper-bearing beds.

Perhaps the best part of the Quincy mine is tributary to No. 7 shaft, which is immediately north of the Hancock boundary.

In June, 1916, approximately 75 acres were sold to the Quincy Mining Co. for \$226,000. In part payment therefor the Hancock was granted the right to use Quincy No. 7 shaft and 1 stamp of the Quincy mill. Company also owns lots 6 and 7, Sec. 28, for a mill site.

The old Hancock mine, opened 1859, was closed June 1, 1885, on account of the low price of the metal, after producing 5,709,384 lbs. fine copper. The Hancock or Sumner amygdaloidal bed averaged about 12' in width below the fifth level, to a depth of 1,052', where the mine was bottomed.

The property carries the upper half of the Michigan series of cupriferos traps and conglomerates, and has 4 known copper-bearing beds, the Pewabic being the most important. The property also carries the underlay, but not the outcrop, of the 3 copper-bearing beds of the Quincy, these being the Quincy to the eastward, apparently of little value, followed by the Pewabic, which is the main bed of the Quincy and the so-called West lode of the Quincy. The known copper-bearing beds outcropping on the Hancock property are the Hancock or Sumner, mined in the old Hancock mine, and now known as No. 1 lode, lying about 1,100' west of the Pewabic; the old West bed, now known as No. 2 lode, lying about 300' west of No. 1, and the New West bed, now known as No. 3 lode, lying about 75' west of No. 2.

Development: No. 1 shaft is the old main 3-compartment shaft of the Hancock mine. It has a remodeled wooden shaft rock house, with a Lake Shore hoist good for 2,000' depth.

The new and main 5-compartment working shaft known as No. 2 is 2,200' N. W. of No. 1. It is vertical, with dimensions 9'6"x29'6", being the second largest in the Lake Superior district, and is 4,001' deep. This shaft intersects No. 3 bed at a depth of 2,038', the bed here showing a pitch of 37°, compared with 47° in the upper workings, this flattening of 10°, at depth, corresponding to a similar flattening shown to the northeast in the No. 7 shaft of the Quincy. The No. 4 lode is intersected by the shaft at a depth of 3,105'; it is 17' thick and carries payable ore.

Ground below the 53rd level, 4,000' below the surface, is reached by 2 subsidiary shafts sunk from the 49th level, connecting with the No. 2 shaft through chutes on the 53rd level and through drift connections on the 49th level.

Considerable drifting has been done on both No. 2 and No. 3 beds, No. 3 being opened by a winze from the 10th to 18th levels, with drifts on the 9th to 18th levels, inclusive, several of which are more than 1,000' long. No. 2 shaft has loading stations on the 13th, 18th, 23rd, 27th, 34th, 39th, 44th, 49th and 53rd levels, to which rock broken will be sent by chutes from the levels above.

No. 2 shaft has a shaft rock house that is the most modern in the Lake Superior district. The building has a total height of 128', with working floor 60' above the ground. The bins are of 1,000 tons capacity each.

Work in 1916 was confined to blocking out ground for mining in the lower workings tributary to No. 2 shaft and in extending levels south from Quincy No. 7 shaft into Hancock ground from the 66th to 71st levels. Stopping was done principally on No. 4 vein, on the west veins and on No. 8 lode, all between the 34th and 53rd levels. Total amount of work done was 7,615'.

Equipment: includes two 50-ton Farrel crushers and a smaller crusher to treat waste rock. The 2 large crushers are fed by 2 steel traveling-belt picking tables; crushers each have a 50 h. p. induction motor and each pick-

ing table has a 10 h. p. induction motor. Two men per shift are expected to do all work on the crushing floor.

The main engine house at No. 2 shaft is equipped with 2 hoists, main engine being a Sullivan Corliss direct-connected hoist, operating 2 skips in counterbalance, with capacity to hoist 8 tons of rock from a depth of 4,000', at a steam pressure of 150 lbs. There also is a Sullivan first-motion hoist.

The steel compressor house has an electric traveling crane, 13-drill and 16-drill air compressors and a new 35-drill tandem-compound air compressor. The boiler house has 2 batteries of 4 return tubular boilers, each 72" in diameter and 18' long.

Buildings at No. 2 include a machine shop, smithy, office, changing house and a number of dwellings. The main plant at No. 2 shaft is reached by a spur of the Mineral Range railway. Company employs about 200 men when running full time.

Electric haulage installed in lower levels of No. 2 shaft, 1917.

Production: in 1916 was 203,112 tons rock milled, producing 2,824,934 lbs. copper, or 13.9 lbs. per ton. Costs are estimated at 20c per lb. Output, 1,100 tons daily, October, 1917.

The mine has been developed very extensively and given a thoroughly modern and complete equipment. The ground opened, while by no means as rich as some in the Lake Superior district, is of fair average value and with exceptionally good equipment and an able and experienced management, the Hancock promises to make a successful low-grade mine.

HOUGHTON COPPER CO.

MICHIGAN

Office: 199 Washington St., Boston, Mass. **Mine office:** Houghton, Houghton Co., Mich.

Officers: Chas. J. Paine, Jr., pres.; Geo. P. Gardner, v. p.; A. E. Coe, sec.-treas.; preceding, with W. Cameron Forbes, Jas. P. Edwards and Frederick W. Nichols, directors; Rex R. Seeber, supt.

Inc. Jan., 1910, in Michigan. Cap., \$2,500,000; shares \$25 par; assessable; 67,000 issued; \$8 paid. Is controlled by St. Mary's Mineral Land Co., through ownership of 37,228 shares of the 67,000 shares outstanding. Old Colony Trust Co., Boston, registrar; State Street Trust Co., Boston, transfer agent.

Annual report for year ending Dec. 31, 1916, shows: total receipts, \$78,351, of which \$3,520 was from assessments and \$46,361 is due on copper sold. Expenditures for 1916 totaled \$78,694. Balance of assets was \$24,419, and 7,580 lbs. copper.

Property: 23 acres of surface rights, with mineral rights to 160 acres owned in fee, being the N. W. $\frac{1}{4}$ of Sec. 14, T. 54 N., R. 34 W., lying E. of the Isle Royale mine and adjoining the Superior mine. Diamond drilling was begun March, 1910, in the horizon of the Baltic-Superior bed, showing 2 cupriferous amygdaloidal beds, the Superior and East lodes, 17' and 20' wide respectively, with dip of 51°, separated by about 83' of trap and conglomerate, the lower bed overlying another conglomerate at a distance of about 150', these strata corresponding exactly with the Baltic formation. Maximum operating depth is figured at 2,800'.

Development: by 620' shaft, sunk about 60' in the footwall, and a winze sunk 513' below the 620' level, disclosing rich copper rock in the Superior lode. The ground penetrated by the shaft is soft and badly broken, necessitating close timbering and occasional concreting; the shaft has been lined with a concrete collar for depth of 300'. Work in 1916 included 1,312' of drifts and crosscuts on the 4th and 12th levels. Winze was sunk 113' to 1,133' cutting the Superior vein which is 40' wide at this

point and shows good rock on foot and hanging wall with about 10' of poor rock between.

The crosscut on the 12th level encountered the west lode which showed a little copper, but conditions do not warrant the sinking of the main shaft from the 6th level to this depth. On the 450' level drifting on the vein showed some copper, but not in commercial grade or quantity.

Equipment: includes a small power plant, and a 16-drill Nordberg electric air compressor. There are necessary buildings, including an office, changing house and warehouse, all of wood.

Due to the outbreak of the European war the mine was closed down from Sept., 1914, to July, 1915.

Production:

	Tons Rock milled	Lbs. Min. prod.	Lbs. Min. p. t.	Lbs. Ref. Copper	Lbs. Cu. p. t. Rock
1916	19,444	365,880	18.8	204,274	10.55
1915	14,656	258,900	19.5	156,766	10.69

Sale price for 1915 was 22.2c per lb.; for 1916, 29.21c.

The property, though small, for the Lake Superior district, is considered promising and management good. Company employs about 35 men.

The mine is almost paying expenses from ore shipped, but management is waiting for development in the adjacent Superior mine (31st level) before sinking shaft to the 8th level. In October, the Houghton company was cleaning out the 19th level of the Superior mine preparatory to extending it 300' or so into Houghton ground.

Is a promising proposition.

HULBERT MINING CO.

MICHIGAN

Idle. Albert S. Bigelow, pres., 199 Washington St., Boston, Mass. W. A. S. Chrimes, sec.-treas.; Fred W. Nichols, agt., Houghton, Mich.

Inc. about 1865, in Michigan. Cap., \$1,000,000; shares \$25 par; all issued.

Owens 1,640 acres of mineral land, in Houghton and Keweenaw counties, Michigan, undeveloped; part of the surface rights have been sold, but mineral rights reserved. Property valued at \$21,862. Gross receipts for 1912 were \$403. No mining done since organization.

HUMBOLDT COPPER CO.

MICHIGAN

Idle. Copper Falls, Keweenaw Co., Mich. Thos. Hoatson, pres.; C. A. Wright, sec., Calumet, Mich.

Inc. 1863, in Mich. Cap., \$1,000,000; shares \$25 par. Amount paid in, \$100,000 in real estate, and \$240,986 cash. Annual report of Dec. 31, 1915, shows \$2,281 cash on hand. Is controlled through ownership of 5/6 of the outstanding stock by the Keweenaw Copper Co. Annual meeting, fourth Tuesday in March.

Property: Secs. 16 and 21, the former fractional, T. 58 N., R. 31 W., all on the mineral belt, about midway between the Arnold and Phoenix mines, lying north of the greenstone, with the Eagle River and Natick mines to the south. The mine, opened 1853, though never a producer, has a single shaft about 300' deep, sunk on the ashbed, which shows the same characteristics as at the Arnold, carrying occasional bunches of rich ground.

In May, 1914, diamond drill holes numbered 12, 13 and 15 were bored through a portion of the hanging wall and across the lode. Holes 12 and 13 intersected the copper bearing part of the lode at 489 feet and 364 feet respectively from surface. Hole number 15 cut this same formation at 713 feet from surface, and disclosed vein matter of good width with good values in both the upper and lower portions of the amygdaloidal flow in each of the holes.

Equipment: includes an engine house, compressor building, smithy, warehouse and 4 dwellings.

No work was done, 1915-1917.

HUSSEY-HOWE MINING CO.

MICHIGAN

Address: care C. A. Senecal, Lake Linden, Mich.

Officers: Wm. H. Rea, pres., with Geo. W. Guthrie, Geo. W. Howe, C. G. Hussey, F. B. Nimick and G. H. Childs, all of Pittsburg, directors.

Inc. 1911, in Michigan. **Cap.**, 100,000 shares; \$25 par; 54,000 shares issued, fully paid; 45,000 going to owners for property; 9,000 sold for development.

Property: 320 acres, bounded by Indiana and Bohemia ground, includes N. E. $\frac{1}{4}$ Sec. 22 and N. W. $\frac{1}{4}$ Sec. 23, T. 51, R. 37 W., in Ontonagon county. Property shows outcrop of the Eastern sandstone and 100' west of it an amygdaloid vein supposedly the Baltic lode of 2 veins. It shows copper carbonates and oxides over a width of over 100' resembling the Baltic outcrop of Champion, 25 miles N. E. As the dip is 60 to 65°, the property contains a valuable area for working.

INDIANA MINING CO.

MICHIGAN

Office: 60 Congress St., Boston, Mass. **Mine office:** Dee Bldg., Houghton, Mich.

Officers: R. M. Edwards, pres. and gen. mgr.; Sidney J. Jennings, v. p.; Henry Tolman, treas.; preceding officers, Carlos W. Van Law and C. A. Hight, directors; Albert L. Wyman, sec.; Thomas Bennett, supt.

Inc. Aug. 11, 1909, in Michigan. **Cap.**, \$2,500,000; shares \$25 par; issued \$2,000,000; paid in \$12.50. State Street Trust Co., Boston, transfer office; Federal Trust Co., Boston, registrar. Annual meeting, third Thursday in April. Company gave 60,000 shares to owners of lands for its property and offered 36,000 shares, Aug., 1909, for public subscription. Receipts, 1916, were \$15,942, of which \$14,574 was from 1915. Expenditures, 1916, totaled \$46,179, accounts showing balance of liabilities at end of year of \$30,234, as compared with balance of \$14,574 in 1915.

Property: 1,200 acres bought 1909 from the Indiana Copper Co., the tract lying N. E. of the Lake and N. of the North Lake, in Secs. 21, 27 and 28, T. 50 N., R. 37 W. The property was worked on a small scale previous to the burning of the mill, 1864, but the old openings are inaccessible and no work has been done thereon by the present company. The lands are heavily timbered and can supply all mining timber for a considerable time. Ample water is available from the Fire Steel river. Transportation is furnished by a spur of the Copper Range railway, and the Mineral Range line is within a short distance.

The lands are traversed by the Evergreen belt of copper-bearing amygdaloidal beds and by a number of unidentified cupriferous beds lying between the Evergreen belt and the eastern sandstone. The southeastern part of the tract is in the hypothetical horizon of the Lake amygdaloidal bed. The Indiana is covered with a heavy overburden of sand, hampering drilling operations. The ground has been tested by extensive diamond-drill borings.

No. 2 drill hole disclosed phenomenally rich copper rock from a bed immediately under a 400' conglomerate. The nature of this ore is a subject of dispute, it having been called sandstone, conglomerate and felsite, but there is little question that it is an altered felsite; the rock consists essentially of quartz and light colored mica, with secondary infiltrations of calcite and small irregular grains of disseminated native copper. The even size of the quartz grains, with their interlocking texture, indicates an igneous origin. There are indications that the 40' of rich felsite rock and

a second zone of about 25' width, are parts of a single bed of approximately 265' width, the second zone of 25' being near the center of the wide bed. No. 5 hole and No. 9 hole both cut felsite carrying heavy copper, apparently a continuation of the same orebody.

Ground was broken, Jan., 1911, near No. 2, the discovery hole, for a vertical shaft, the overburden at this point being about 110'. The shaft is cylindrical, of 17' outside diameter, lined with steel and concrete, with inner dimensions of 8x12', and is 1,415' deep.

During 1916 new work totaled 1,029'; 379' on the 1,150' level and 644' on the 1,400' level, done to find the ore cut by No. 2 drill-hole at 1,450'. Rock of similar character-felsite was found on both levels, also copper at several places in the felsite near the felsite-trap contact, but not in commercial quantities. No. 2 hole was not found, but No. 9 was found 100' from its theoretical position. The conclusion is that the deposit cut by No. 2 hole cannot be of any great size, or have a regular trend. Although this has not been proved, it was decided to explore in the South Lake amygdaloid lodes, an incline shaft being sunk for this purpose. In July, 1917, at 150', the shaft passed through an amygdaloid lode 25' wide, but not containing commercial quantities of copper. Work will proceed to 300' depth.

Equipment: includes a steam hoist good for 2,500' depth, compressor and necessary mine buildings.

ISLAND COPPER CO.

MICHIGAN

Office: 1400 Alworth Bldg., Duluth, Minn.

Officers: Thos. F. Cole, pres.; Geo. C. Stone, v. p.; Frederick W. Nichols, sec.; preceding, with M. H. Alworth, Oscar J. Larson, Henry Nolte, Geo. G. Barnum, Geo. A. Tomlinson and Julius H. Barnes, directors; Edw. J. Maney, treas.

Inc. March 9, 1909, in Michigan. Cap., \$1,000,000; shares \$25 par; \$6.00 paid; issued, 26,735 shares at \$6 each, or \$160,410. Annual meeting, first Tuesday in June.

Property: on Isle Royale, over 92,000 acres out of the 125,000 acres comprising the island, includes the former holdings of the Isle Royale Land Corporation, Ltd., and the Island Mining Co. Idle. See Vol. XI, Copper Handbook.

ISLE ROYALE COPPER CO.

MICHIGAN

Office: 12 Ashburton Place, Boston, Mass. **Mine office:** Houghton, Mich.

Officers: E. V. R. Thayer, pres.; Rodolphe L. Agassiz, v. p.; E. B. Dane, Chas. O. Whitten, F. L. Whitcomb, E. C. Lewis, E. V. R. Thayer, G. R. Whitten and Chas. N. King, directors; James MacNaughton, gen. mgr.; Clarence H. Bissell, sec.-treas.; G. L. Osgood, asst. sec.-treas.; Jas. E. Richards, mine supt.; A. G. Andrews, Jr., mill supt.; Harry Reeder, engr.; John T. Reeder, chief clerk and purch. agt.; Harry E. Lukey, clerk; Edward Colenso, chief mg. capt.

Inc. March, 1899, in New Jersey, as a merger of the Isle Royale Cons. Mining Co. and Miners' Copper Co. Cap., \$3,750,000; shares \$25 par. Is controlled through ownership of 32,910 shares of outstanding stock, by the Calumet & Hecla. Old Colony Trust Co., Boston, transfer agent; State Street Trust Co., Boston, registrar. Company owns a one-sixth interest in the Lake Superior Smelting Co. Annual meeting, first Wednesday in April, at 243 Washington St., Jersey City, N. J.

Company ended 1916 with balance of current assets, \$923,551. Net profits 1916 were \$1,396,655, as compared with \$498,277 in 1915, and \$24,374 in 1914.

Dividends: \$1 per share was paid March 31, 1913; and \$5 in 1916, equal to \$750,000. The dividend rate for 1917 is higher than in 1916, due to extra distributions.

Property: 3,520 acres and an 80-acre mill site. Mineral lands include the old Isle Royale, Grand Portage and Huron mines, the Dodge and Frue prospects, the mineral rights in the Montezuma tract of about 200 acres purchased, 1913, for \$100,000, and sundry undeveloped tracts. The Hussey-Howe tract of 280 acres, lying N. E. of the Superior, supposed to carry the extension of the Baltic bed, was bought, 1907, for \$220,000. Lands include all of Secs. 1, 2 and 11, and parts of Secs. 3, 9, 10 and 15, T. 54 N., R. 34 W.; also 160 acres in Sec. 6, T. 54 N., R. 33 W., 40 acres in Sec. 31, T. 55 N., R. 33 W., and 160 acres in Sec. 36, T. 55 N., R. 34 W., giving a compact tract carrying about 2½ miles of the strike of the system of copper-bearing beds.

The Isle Royale has 3 parallel amygdaloidal beds, with strike of N. 32° E. and average dip of 56°, of which 2 have been extensively opened, these being the Isle Royale and Portage beds, the latter lying approximately 200' W. of the former. The shafts are on the Isle Royale, but the Portage bed is opened on many levels by crosscuts. East of the amygdaloids is the "Mabbs vein," lying near the Eastern sandstone, 4 to 7' wide and rich in mass and barrel copper, but deficient in stamp rock. It was opened to a depth of about 250' by John and Austin Mabbs, about 1875, and has been tested to some extent by the present owner. There also are unidentified and unexplored copper-bearing amygdaloids lying W. of the Portage bed and occasional narrow fissure veins carrying arsenical copper ores.

The 3 old mines included in the present Isle Royale tract produced 48,452,590 lbs. fine copper, under primitive conditions, at a net aggregate loss of about \$2,500,000. The old Isle Royale and Grand Portage mines were opened in 1853 and the Huron in 1855. The history of these 3 mines is given in detail in Vol. II.

Development: considerable diamond drilling has been done. Underground openings were 19,106' in 1912; 13,626' in 1913; 9,694' in 1914; 14,446' in 1915; and 17,455' in 1916. About 75 rock-drills are used.

No. 1 shaft, near the northern boundary, was completely gutted by fire, Dec., 1903, and was abandoned. This shaft had 3 compartments and is 1,614' deep, opened on the Isle Royale bed, with crosscuts driven on the 11th to 15th levels, inclusive, to the Portage bed, lying 150 to 220' W., with about 2 miles of drifts opened thereon, stoping having been about equally divided between the 2 beds, which were found markedly similar in characteristics and copper values. Concrete dams have been built across the south drifts of No. 1 at the 13th and 14th levels, holding back the mine water. Surface water is collected on the 8th level and sent to No. 2 shaft for taking out. The surface plant at No. 1 was dismantled, 1908, machinery going to No. 4 shaft.

In May, 1914, work was started to retimber the shaft, preparatory to sinking and exploring the Portage lode. In Feb., 1916, the work had been finished down to the 16th level and hoisting was being done from the upper levels.

No. 2 shaft, with 3 compartments, 2,280' S. W. of No. 1, is 3,467' deep. This shaft produces less mass copper than formerly, and the north drifts have not looked especially well for several years, the average of ground being below that of the mine as a whole, about half of the ground opened carried copper.

No. 2 shaft has a combination shaft rock house, with Portage Lake

crushers. The engine house is equipped with a hoist capable of raising 6-ton skips from a depth of 6,000'.

No. 3 is merely a site for a shaft, to reopen the old Huron mine.

The new shafts, Nos. 4, 5, 6 and 7, are all on the Isle Royale bed, at the southern end of the property, and have several miles of workings showing considerable heavy copper. These shafts are unconnected with the former workings, in shafts Nos. 1 and 2, at the northern end of the property. Shafts 4, 5 and 6 are connected by drifts on the upper levels.

No. 4 shaft, about 3,100' S. of No. 2, is 2,244' deep, developing stamp rock of very fair average grade. Equipment includes a Nordberg duplex-cylinder hoist, good for 1 mile depth and a 35-drill air compressor, both taken from No. 1 shaft. There is a cylindrical steel shaft rock house, built by the Wisconsin Bridge & Iron Co., having cylindrical rock bins 42' in diameter and 32' high.

A skip-road was constructed in the N. compartment. No. 1 to 11 level. North drifts are connected with the Huron workings. There were 22 drills operated, 1916, and 75% of the ground opened shows ore equal to the average of the mine.

No. 5 shaft, about 5,100' S. of No. 2, on Sec. 2, was started Oct., 1906, and was 1,965' deep, Jan., 1917. The shaft is sunk in the footwall, and is equipped with a hoist, good for a depth of 3,000'. There were 15 drills operated.

No. 6 shaft, about 7,300' S. W. of No. 2, near the center of Sec. 11, has 3 compartments and was 2,084' deep, Jan., 1917, developing very good average ground, the bed showing much epidote. The levels are opened at 100' and 120' intervals. On surface there is a circular steel shaft rock house, similar to that at No. 4. The plant at No. 6 includes a brick engine house, with hoist and 45-drill air compressor, and a steel boiler house. Drills used totaled 25 and 66% of the ground opened contains copper.

No. 7 shaft, 2,400' S. of No. 6, was started in 1913. Work was stopped on account of the strike and was not resumed until late in 1915. During 1916 it was sunk 820', making bottom 946' deep. Ore is good.

"A" shaft, started Sept., 1908, on the Hussey-Howe tract, is 972' deep, with the first plat cut at depth of 350'. A 205' crosscut, at depth of 474', discloses only the bed in which the shaft is sunk. On the 3rd level, at depth of 714', a drift was run S. to within 50' of the Houghton Copper Co. boundary, disclosing a fair amount of amygdaloidal rock, not carrying copper in promising quantities. "A" shaft is supposed to be sunk on the Baltic bed, but there is very great doubt as to whether the shaft really is opened on the northern extension of the Baltic, and failure to locate the twin Baltic bed, within a distance of 205' in the crosscut on the 474' level, accentuates this doubt.

The Sec. 12 shaft, begun Oct., 1905, and discontinued Jan., 1908, at depth of 812', also was sunk in search of the Baltic bed and drifts and crosscuts were opened in 4 directions, without securing satisfactory results. The shaft was sunk in a badly disturbed amygdaloidal bed, practically barren of copper.

A shaft was started, 1904, on Sec. 10, but was discontinued because of the heavy overburden, and a diamond drill substituted, the drill cores showing an amygdaloidal bed of which about 5' in width carried stamp-copper in fine grains.

The main plant, at No. 2 shaft, includes No. 2 engine house, a compressor house having a 35-drill Nordberg 2-stage air compressor; a 44x72' boiler house, with a 16x72' coal-storage addition and a 3,000-ton coal trestle, having three 150 h. p. 84" Burt horizontal boilers, taking water from a dam

300x500x6'. The machine shop is of steel, on stone foundations. Shaft houses and rock houses are lighted by electricity, commercial current being taken from the Houghton County Electric Light Co. The company has a private telephone system. There are about 150 dwellings on the company's lands. At No. 2 shaft in 1916 a new collar house, skip dumps in ore house, 100' stack and flues were built.

At No. 5 shaft a new ore house was erected and 2 Farrell crushers installed, also 2 C. & H. sorting pans.

The Isle Royale railway, owned by the company, connects the mine and mill with about 5 miles of main line, having easy grades. Equipment includes 35-ton, 55-ton and 60-ton locomotives, and 40 forty-ton steel rock cars, equipped with air brakes. A 3,700' spur was laid in 1916.

The mill site, at the mouth of Pilgrim river, has nearly 1 mile of frontage on Portage lake. The old mill, insured for \$100,000, was burned Dec. 24, 1914. Work on a new 2,000-ton mill was started immediately and in June, 1915, the first stamp head was operating. By the end of August the 3 heads were working. The mill cost \$220,000 and has three 300-ton rock bins and 3 Nordberg stamps having circular mortars and $\frac{1}{2}$ " screen openings. The stamps rest on concrete bases, 20' thick, and are fitted with steple-compound steam cylinders. Each stamp has a maximum capacity for 700 to 750 tons daily. The dressing floor has 78 rough jigs, 6 finishing jigs and 55 Wilfley tables to treat slime. There are rolls with fixed bearings to regrind coarse gravel from the mortars.

The mill has a complete machine shop on the second floor, power being furnished by a 600 k. w. mixed pressure G. E. Curtis turbo-generator, taking steam from five 200 h. p. boilers in a boiler house at the rear of the mill.

There is a 32x600' wharf, with deep water alongside, at the mill site, with appliances for unloading coal and general freight and for the dispatch of mineral, in scows to the Dollar Bay smelter, 2 miles across Portage lake.

Water is furnished the mill by a 16,000,000-gal. Nordberg Corliss pump, especially designed to handle muddy water, having a triple discharge into a 30" riveted steel water main, running 2,200' from pump house to mill, the pump being located some distance from the mill, to obviate stamp sand clogging the intake. Three 100 h. p. boilers furnish power for the pumps, fuel being taken from a large coal trestle at the rear of the pump house boiler rooms. A dam near the mill supplies feed water for the boilers.

Recent production: has been as follows—

Year	Tons R'k Treated	Lbs. Min. Produced	Lbs.	Mine	Lbs. Cu. Produced	Total Cost per Lb.	Rec'd per Lb.
			Cu. per Ton R'k Stpd.	Cost per Ton (a)			
1916	925,419	.....	13.4	\$1.53	12,412,111	15.75c	25.86c
1915	680,270	13,727,832	13.7	1.45	9,342,106	14.94c(b)	18.36c
1914	474,349	9,451,115	13.9	1.49	6,601,235	13.05c	13.16c
1913	314,679	5,887,000	13.2	2.12	4,158,548	13.81c	15.29c
1912	531,105	11,461,410	15.4	1.54	8,186,957	11.89c	16.66c
1911	457,440	10,339,171	16.4	1.47	7,490,120	10.85c	.....
1910	520,860	10,433,060	14.5	1.42	7,567,399	11.84c	.....

(a) Includes mining, transportation, stamping and taxes.

(b) Includes nearly 2c per lb. extraordinary expense of rebuilding stamp mill, reopening No. 1 shaft, and No. 7 shaft expense.

Isle Royale's production in 1914 was greatly restricted by the Lake Superior labor strike; normal production was again resumed in June, 1914.

to be soon followed by the demoralized copper market due to the outbreak of the European war; the property operated on a three-quarters time basis until Feb., 1915.

Operations in 1916 were affected adversely by a general scarcity of labor.

The Isle Royale is a low-grade mine, but shows itself capable of earning substantial profits. In 1915 the property made amends for its shortcomings of the previous 2 years; and at present more men are employed and more rock is being hoisted than ever before in its history. The output in May, 1917, was 86,000 tons of ore, yielding at the rate of 1,300,000 lbs. of copper per month. Large ground reserves are maintained and necessary, and with a still larger output in prospect, profitable operations for many years to come are confidently anticipated.

"The Isle Royale is one of the instances of low-grade copper production in this district. When it had become evident that there was only one hope for a mine that produced an ore that averaged but 12 or 13 lb. of copper per ton, and that was by the output of an enormous tonnage of rock, there was little to the future for the Isle Royale except hope. Now the Isle Royale is running on an average of better than 15 lb. of copper per ton. The average for July, 1917, was 15 lb. and for August, 16 lb. The output of rock is keeping its own stamp-mill running to capacity and sending 450 or 500 tons daily to the Point Mills plant, and it could send 1,000 tons daily to the custom-mill if the miners could be secured. The property is operating profitably. The seventh shaft is down to the ninth level and the most southerly openings are in rock which runs a little better than was anticipated and as good as anything recently opened in any of the Isle Royale shafts."—M. & S. Press, Aug. 25, 1917.

KEWEENAW COPPER CO.

MICHIGAN

Office: Calumet State Bank Bldg., Calumet, Mich. Mine near Mandan, Keweenaw Co., Mich.

Officers: Thos. F. Cole, pres.; Spencer R. Hill, v. p.; Capt. Thos. Hoatson, 2nd v. p. and mining director; F. W. Taylor, sec.-treas.; W. J. Uren, gen. mgr., and G. G. Hartley, directors; John C. Shields, railway supt.

Inc. March 11, 1905, in Michigan. **Cap.**, \$10,000,000; shares \$25 par; issued \$4,062,884; paid in \$20. Last assessment was \$1, Sept., 1915. Stock listed on Boston and Duluth Stock Exchanges. Controls, through stock ownership, the Phoenix Consolidated Copper Co., Meadow Mining Co., Humboldt Copper Co., Keweenaw Central Railroad Co. and Washington Copper Mining Co. Has about 2,300 shareholders. American Trust Co., Boston, registrar; Old Colony Trust Co., Boston, transfer agent. Annual meeting, second Monday in March.

Balance sheet, Dec. 31, 1916, shows: assets, \$4,070,746, which includes real estate, \$1,405,227, securities, \$1,545,291; cash, \$63,254; development account, \$706,818; accounts receivable, \$344,607; current liabilities include accounts payable, \$5,152; misc. revenue, \$118; interest, \$2,592.

The Keweenaw Central Railroad Co. is a reconstruction of the old Lac La Belle & Calumet railway. The entire capital stock issue, \$730,000, is owned by the Keweenaw Copper Co. The railway company has \$500,000 bonds, not issued, and ended 1915 with accounts and bills payable of \$197,046, owing mainly to the Keweenaw Copper Co., and a deficit of \$11,627. The railway, with about 40 miles of main line, spurs and branches, cost \$856,935, and runs from Centennial, a northern suburb of Calumet, where connection is had with the Copper Range line, to Lac La Belle. Service is discontinued from Nov. to May.

Property: 25,195 acres, mainly mineral lands, heavily timbered, in

3 main groups, carrying the strike of the Keweenaw mineral belt for about 14 miles, including practically all of the amygdaloidal and conglomerate cupriferous beds of the district, as well as numerous copper-bearing cross fissures. Lands are in T. 58 N., of Rs. 27, 28 and 29 W., and include the tracts formerly owned by the Aetna Copper Harbor, Empire, Girard, Hanover, Keweenaw, Mandan, Medora, Pennsylvania & Boston, Resolute and Vulcan companies, in addition to lands controlled through stock ownership in subsidiary corporations.

The company's lands carry nearly 2 miles of water frontage on either side of the Montreal river, including Fish cove, 1 mile east of the river's mouth, which might be made a fair harbor at comparatively small expense. The lands include 5 miles of the course of the river, on both banks, and, with other holdings, give the company the entire water-frontage of Mosquito lake, making possible the development of a great water power, with a hydro-electric installation at the mouth of the river. There is a mill site on Bete Gris bay, at the mouth of the Montreal river, having about 5 miles of water frontage.

The company also owns the Lac La Belle, or Mendota, ship canal, 1 mile long, connecting Lac La Belle with Lake Superior. This canal has a 14' channel, and leads to a splendid haven that should be made a harbor of refuge.

The Medora mine, opened about 1860, had 3 old shafts, about 100' apart, deepest 140'. The Medora amygdaloidal bed, traversing lands of the company for about 4 miles, lies immediately under the Allouez conglomerate, and outcrops several hundred feet north of the Montreal river bed. The Medora, about 12' in average width, is a soft chocolate-colored amygdaloid, carrying considerable prehnite, calcite and quartz, in connection with fine stamp copper and occasional heavy copper, a 30" paystreak along the foot-wall carrying some barrel work, the bed as a whole being bunched.

The Medora tract also carries other copper-bearing beds, among these being the Medora fissure vein, outcropping about 225' E. of No. 1 shaft, but making into the shaft at depth. About 100' S. of the Medora amygdaloid is another bed carrying copper in small quantities, and to the northward are the Wolverine amygdaloid, of about 15' width, and the Allouez conglomerate, lying about 280' N. of the Medora bed, at surface.

The Medora mine was reopened on a considerable scale to depth of 1,700' and length of 1,800', with about 2 miles of workings. All work in the mine was stopped Sept., 1909. The Medora workings are fully described in Vol. VIII.

The Empire mine also carries the Medora bed, about 3 miles E. of No. 1 shaft, and some trenching and test pitting, done 1906-07, on the Empire tract, showed a bed of about 15' width, carrying some copper at surface. The Empire also carries the Montreal river amygdaloid, on which the Manitou did considerable work.

The Medora-Mandan-Resolute tract of 2,440 acres carries the Kearsarge bed under practically its entire territory. The shaft on the Kearsarge bed, known as No. 2, is about a mile S. of the old Medora workings, and was 1,355' deep when abandoned, 1911.

The company owns a diamond drill outfit and has made extensive borings, securing a cross section of the Medora, Mandan, Resolute and Empire tracts. Operations, 1912-1914, were confined to exploratory work in the horizon of the Ashbed lode, and the first drill hole located a copper deposit of considerable promise, early 1913, at a depth of about 500'. Mine has been idle since May 28, 1914.

Development: reported satisfactory results on No. 7 and 14 levels of

Phoenix mine, on the Ashbed lode, in charge of C. A. Wright. Commenced treatment in Oct., 1916, at the old Phoenix mill, of ore from the Ashbed lode. In Aug., 1917, 4,170 tons was stamped, yielding 12.64 lbs. refined copper per ton, giving a 72% recovery, which is to be increased by improvements.

KEWEENAW LAND ASSOCIATION, LTD.

MICHIGAN

Office: Room 33, No. 87 Milk St., Boston, Mass. Operating office: Marquette, Mich.

Officers: A. B. Emmons, chairman; Nathaniel Wilson, sec.; Dudley S. Dean, treas.; John M. Longyear, gen. agt.

Is a land corporation, holding 400,000 acres, mainly timber lands, but with some mineral lands, partly on the Keweenawan copper belt, in the upper peninsula of Michigan, taken over from the Lake Superior Ship Canal, Railway & Iron Co.

LA SALLE COPPER CO.

MICHIGAN

Office: 12 Ashburton Place, Boston, Mass. Mine office: Calumet, Houghton Co., Mich.

Officers: Rodolphe L. Agassiz, pres.; Jas. MacNaughton, v. p. and gen. mgr.; preceding, with W. Hunnewell, F. L. Higginson, T. N. Perkins, D. S. Dean and Lindeley Loring, directors; G. G. Endicott, sec.-treas.; H. L. Bennett, asst. sec.-treas.; Ole Hallingby, supt.; Wm. Skewes and Josiah Bartell, mining captains.

Inc. Dec., 1906, in Michigan. Cap., \$10,000,000; shares \$25 par; issued, 302,977 shares. Company absorbed the Caldwell Copper Co. and controlled the Tecumseh Copper Co., through ownership of practically the entire issue, giving $1\frac{1}{2}$ shares of La Salle for 1 of Tecumseh, and bought the entire property of the Tecumseh, May 11, 1910, for \$1,648,000. Is controlled, through ownership of 152,977 shares, by the Calumet & Hecla Mining Co. The Calumet & Hecla contributed \$1,000,000 cash to the company's treasury, taking pay in stock, and agreed to loan \$750,000 additional cash, as needed. Operations for 1916 show total receipts, \$368,253; total expenses, \$289,398, leaving a profit of \$78,855, against a deficit of \$15,522 in 1915. Balance of assets, Dec. 31, 1916, \$173,492. Annual meeting, second Wednesday in June.

Property: 2,360 acres, also the Gregory mill site, on Torch lake, nearly opposite the Calumet & Hecla mills. The Tecumseh and Caldwell contributed 560 acres each and 540 acres were furnished by the Calumet & Hecla, St. Mary's Mineral Land Co., Sheldon & Douglass Estate, and other interests, these lands being put into the company at a novel basis of valuation, figured upon zones of 2,500' depth on the dip of the Kearsarge bed, allowance being made for decreased land values on zones carrying the underlay at increase depths. There are 4 shafts, 2 on the Tecumseh and 2 on the Caldwell tract, with room for 3 additional shafts, to give a total of 7 shafts, at intervals of about one-third mile. The property carries the strike of the Keweenawan formation for about $2\frac{1}{2}$ miles.

Development: property has been prospected by diamond drilling, more than 30 diamond-drill holes having been bored on the Tecumseh and Caldwell tracts, a few years ago.

The first work at the Tecumseh mine was done on the Calumet conglomerate, many years ago, when a 1,000' shaft was sunk that found no payable ore. During the second era of activity, 1889-1902, a shaft was sunk 2,300' on the Osceola amygdaloid, but this bed, being found practically barren of copper, work was abandoned Nov., 1902. It is probable that the old Osceola shaft will eventually be reopened, as the southern drifts of the No. 6 shaft of the Osceola, below the 4,000' level, near the Tecumseh boundary, are among the best in that mine.

An arrangement was made in 1916 with the Osceola Consolidated, whereby No. 42 level S. of No. 6 shaft, Osceola mine, was extended into La Salle ground 692'. The result was encouraging. The drift was stopped in June, 1917, as the cost of tramping was so high. For 1,100' the ground opened was good; the last 400' was poor. The total length was 3,350'. No. 45 level is also to be extended into La Salle ground.

La Salle No. 1 shaft, formerly known as No. 1 Tecumseh, sunk on the Kearsarge bed, has 3 compartments, 2,146' deep, and shows the Kearsarge lode to be 8' to 12' thick, but is characterized by irregularly distributed values. The workings have encountered large areas of good ore, some of it with very rich patches of coarse copper that is rather showy though the average value has been, on the whole, somewhat disappointing in the mill. Equipment includes a 250 h. p. boiler and a hoist.

Operations in 1916 were confined to Nos. 11, 12, 13, and 15 levels. The stopes were generally rather lean.

La Salle No. 2 shaft, formerly known as No. 2 Tecumseh, is located about 1,700' S. of No. 1 and is of the same size; it is 2,079' deep, and shows a bed of workable thickness but not carrying much copper. The power plant has a 125 h. p. boiler, a hoist good for 2,500' depth, and a 15-drill air compressor. Buildings include a changing house. A branch of the Mineral Range railroad was built to the shaft in 1913. Development at this shaft during 1916, revealed both fair and poor ground.

Hoists at No. 1 and 2 shafts are now of 18x24" Lidgerwood types

No. 5 shaft, originally known as No. 1 Caldwell, and later as No. 1 La Salle, is 1 mile S. of No. 1 shaft; is 1,450' deep, shows a poorly-defined bed, with unsatisfactory copper contents, and work was discontinued Nov., 1910.

No. 6 shaft, known as No. 2 La Salle, sunk at a point 1,500' S. W. of No. 5, was abandoned, June, 1909, at depth of 882', because the lode showed little or no copper; the surface equipment was removed to No. 2 shaft.

The Kearsarge bed is comparatively thin in the Tecumseh tract, ranging from 7 to 11', with an average thickness of about 9'. It is estimated that approximately 1,000,000 tons of stamp rock were blocked out in the No. 1 Tecumseh, to the end of 1912, the greatest length of lateral opening being on the 12th level, where a stretch of about 1,000' of good stoping ground has been developed.

Development: in 1913 No. 1 shaft was unwatered down to the 17th level and stoping started in July. The big labor strike started on the 23rd of the month and the mine was closed down. Operations, started in Jan., 1914, continued until Aug., at the time of outbreak of the European war. Work was again resumed in June, 1915. Total development work amounted to 141' in 1913; 1,123' in 1914; 1,127' in 1915, and 3,323' in 1916. At the present time daily shipments are 600 tons of rock, while development work is also being pushed.

Production:

Year	Tons R'k Treated	Lbs. Cu.	
		per Ton R'k Stpd.	Lbs. Cu. Produced
1916	144,829	9.53	1,380,352
1915	80,959	9.67	782,493
1914	45,509	11.88	540,731
1913	2,221	19.76	43,906
1912	.....	.....	.....
1911	18,970	14.77	280,598

Both the Ahmeek and Franklin mills are treating La Salle ore.

Price received for copper in 1916 averaged 25.68c per lb. Net cost per pound was 19.96c and cost of mining, etc., \$1.79 per ton of ore. Copper output in first four months of 1917 averaged 180,000 lbs. per month.

Property has improved considerably of late.

LAKE COPPER CO.

MICHIGAN

Office: 85 Devonshire St., Boston, Mass. **Mine office:** Lake Mine, Ontonagon Co., Mich.

Officers: Wm. A. Paine, pres.; John H. Rice, v. p.; Robt. H. Gross, sec-treas.; preceding with Wm. F. Fitzgerald, Reginald C. Pryor, Wm. S. Rooney, F. Ward Paine, directors. Elton W. Walker, mgr.; James McKie, supt.

Inc. Nov. 27, 1905, in Mich. Cap., \$2,500,000; shares \$25 par; \$5 paid, fully issued. Shares are listed on the Boston Stock Exchange. Federal Trust Co., Boston, registrar; State Street Trust Co., Boston, transfer agt. Annual meeting, third Tuesday in June.

Report for fiscal year, ending April 30, 1917, shows: total receipts, \$450,-497, which includes: copper sold, \$442,696; miscellaneous, \$7,800. Expenditures total \$342,302, including mine expenses, \$247,000; smelter, freight and marketing copper, etc., \$31,357; shaft equipment and development, \$46,936; taxes, \$17,007. Surplus May 1, 1915, \$187,145; surplus April 30, 1916, \$254,164; April 30, 1917, \$362,359. Profit for year, \$108,194.

Property: 2,010 acres, including 1,150 acres of mineral land, 680 acres of timber lands and 180 acres of cutover lands. The company bought 20 acres immediately E. of the shaft from St. Mary's Mineral Land Co., to provide room for a surface plant, the purchase carrying with it mineral rights to a depth of 100' thus caring for the upper portion of the Lake shaft, collar of which is almost divided by the section line. Property includes the S. E. $\frac{1}{4}$ of Sec. 29, S. E. $\frac{1}{4}$ of Sec. 30, N. W. $\frac{1}{4}$ of Sec. 32, and E. $\frac{1}{2}$ of Sec. 31, T. 51 N., R. 37 W.

The first work of the company was done on the Knowlton and Butler beds, with a little work on what formerly was supposed to be the Evergreen, principal work being on the Knowlton amygdaloid, on which there were old shafts of 170' and 300', latter having been deepened to 600' by the present company. Considerable copper was taken from the Knowlton bed, but it was thought wise to transfer work to virgin territory, at the southern end of the property, and the wisdom of this move was demonstrated by the outcome. There also is a 90' shaft on the Tresidder bed, 1,000' E. of the Knowlton, which was sunk 1865, and is said to have paid for sinking from the copper extracted. Considerable diamond drilling has been done, and the borings of the Adventure, on adjoining lands, indicate that the Lake should have several other promising amygdaloid beds, in the same general horizon as the Lake bed now being opened.

Geology: the strike of the Lake amygdaloid in the immediate vicinity of the shaft is about N. 6° E., with dip of about 35° W. It was at first thought that the Lake bed was a fissure, but that this is not the case was proven conclusively by the disclosure of parallel strata, including a conglomerate lying about 400' thereunder. The Lake bed, which is a typical Lake Superior amygdaloidal trap flow, barring its unusual strike and dip, is exceedingly wide for a copper-bearing bed, ranging from 50 to 100'. The hanging-wall of trap is fairly well defined but the footwall is extremely irregular, there being no marked line of separation between copper rock and trap. The Lake bed appears to carry 3 well-defined shoots of enriched copper ground, raking northward with depth. An attempt was made to locate the northerly extension of the Lake bed by diamond drilling from surface, but without success, though 3 holes were bored and it is now

known that the lode turns W. and passes into South Lake ground. Thirteen diamond drill holes have been bored aggregating 1,628'. The northernmost bottom workings of the mine show a deflection to the westward, with a strike, at the extreme north, of N. 15° W., which corroborates the hypothesis of Dr. L. L. Hubbard, that the Lake bed is the third and the East lode, the fourth bed from the top in the series of 4 amygdaloid beds cut by the drill holes of the South Lake.

There are two other lodes only 50' W. of the Lake with commercial ore. The long crosscut on the South Lake proves Dr. Hubbard's theory.

The mine is operated by a 1,500' incline shaft, ore being extracted from all levels from the 2nd to the 11th. The lode is bunchy with very rich spots and some mass copper, but the general average is about 2%, which is equivalent to 25 lbs. of refined copper.

The Knowlton shaft was unwatered Aug., 1916, to mine ore from the Knowlton lode, which though narrow, shows good copper values where opened. The Butler and Evergreen lodes can be reached by an 800' crosscut from this shaft.

Development: the mine has about 30,000' of workings, a very large proportion of the drifts being in neither the footwall nor the hanging-wall, giving a rather indifferent line on the actual values in the bed. New work during last fiscal year totaled 4,196'.

Equipment: include a 32x72" Nordberg duplex-cylinder double-conical-drum hoist, capable of lifting 10-ton loads from depth of a mile; old 6-drill and 15-drill air compressors, taken from the equipment of the old Belt mine, and a new 50-drill 2-stage cross-compound air compressor, in a steel compressor house. Mine structures include a machine shop, smithy, changing house, office and boarding house. There are 9 dwellings and a number of old houses at the Belt location. The property is served by the main line of the Copper Range railway, which passes through the old Belt location, with a 1½ mile spur to the shaft, and a siding has been built to within 500' of the shaft by the Mineral Range railway, giving the mine the advantage of competitive railway rates. About 150 men are employed.

Production: fiscal year ending April. Work resumed in May, 1915, after a 2-year shutdown.

	Tons R'k Stmpd.	Mineral Lbs.	Lbs. Cu. per Ton R'k	Lbs. Cu. Produced	Cost per Lb.	Rec'd per Lb.
1917.....	70,440	2,346,970	21.14	1,489,247	20.00(c)	29.726
1916(a).....	59,848	2,511,216	26.42	1,581,071	15.622(b)	20.149
1914.....	.....	.....	14.95	275,647	.....	15.074
1913.....	83,109	2,153,128	15.39	1,300,562	19.5(c)	.....

(a) Did not produce during first 3 months. (b) Includes 1.036c charge due to resuming operations. (c) Approximately.

Shipping 300 tons rock daily, July, 1917, to the Baltic mill, carrying 25-28 lbs. copper per ton. Costs are too high to allow of much profit at normal metal prices.

The management is both experienced and capable, and the mine, though small, is most promising.

LAKE MILLING, SMELTING & REFINING CO. MICHIGAN

Office: 12 Ashburton Place, Boston, Mass. Operating office: Calumet, Mich. Works office: Point Mills, Houghton Co., Mich.

Officers: R. L. Agassiz, pres.; Jas. MacNaughton, v. p. and gen. mgr.; Geo. G. Endicott, sec.-treas.; preceding, with H. F. Fay and D. L. Dean, directors.

Inc. 1891, in Michigan. Cap., \$2,500,000; shares \$25 par; fully issued;

\$11.85 paid in. Stock distribution is as follows: Allouez Mining Co., 36,164 shares; Centennial Copper Mining Co., 16,164 shares; Hancock Cons. Mng. Co., 10,000 shares; Isle Royale Copper Co., 18,836 shares; Superior Copper Co., 18,836 shares.

Owms 2 mills; one, called the Centennial-Allouez mill, is at Point Mills, on the shore of Portage lake, on land adjoining the Franklin mill site. The mill was built by the Arcadian Copper Co., and was bought, 1904, by the Centennial Copper Mining Co., and later transferred to the present corporation. The mill of 4,000 tons daily capacity is equipped with 6 Nordberg stamps and crushing rolls to treat oversize material. Power is furnished by a 600 h. p. Nordberg cross-compound engine, and water is supplied by a 15,000,000-gal Nordberg pump. A new boiler house containing 8 boilers was completed in 1915. The other mills, known as Lake No. 2 mill, is at Hubbell and has 4 stamps in operation. A wharf, running 675' into deep water, is equipped with a modern coal hoist and coal shed.

LAKE SHORE MINING CO.

MICHIGAN

Idle several years. **Office:** 990 West Kensington Road, Los Angeles, Calif. Mine near Green, Ontonagon Co., Mich. W. H. Garlick, pres.

Inc. in Michigan. Cap., \$500,000; shares \$25 par.

Property: 821 acres, patented, on the shore of Lake Superior, is reported to carry bedded deposits, between slate walls, of 5' and 12' width, showing copper oxides and chalcocite giving average assays of 2% copper, 0.5 oz. silver and 40 to 80c gold per ton. Apparently the orebody is of the secondary or Porcupine series of the Keweenawan formation, and ores may change to native copper at depth. A little prospecting has been done.

LAKE SUPERIOR DEVELOPMENT CO.

MICHIGAN

Office: care Clyde Mackenzie, sec., Houghton, Mich. Jos. Croze, pres.; Jos. W. Selden, treas.

Property: 400 acres, held under option, the N. ½ of Sec. 25, and S. ½ of S. W. ¼ of Sec. 24, T. 57 N., R. 32 W., about ½ mile E. of the Gratiot and about 1½ miles of the Ojibway. Lands are on the Keweenawan formation. Drill boring made 1910-11, gave much encouragement, and company hopes to resume operations.

LAKE SUPERIOR SMELTING CO.

MICHIGAN

Office: 12 Ashburton Place, Boston, Mass. **Works office:** Dollar Bay, Houghton Co., Mich.

Officers: R. L. Agassiz, pres.; C. H. Bissell, sec.-treas.; preceding with Geo. A. Flagg, F. L. Higginson, F. W. Hunnewell and Jas. MacNaughton, directors. Jas. MacNaughton, gen. mgr.; Harry B. Conant, supt.

Inc. July, 1891, in Michigan. Cap., \$1,200,000; shares \$25 par, fully paid and issued. Is controlled through ownership of 25,000 shares, by the Tamarack Mining Co., and by the Osceola Cons. Mining Co., which has 15,000 shares, and the Isle Royale Copper Co., which has 8,000 shares.

The smelter, closely connected with the plant of the Tamarack-Osceola Mng. Co., has 11 reverberatory furnaces and 3 refining furnaces. There is a mechanical ladling and casting device having a 1,100-lb. ladle, and a casting machine with molds linked into an endless belt, dumping over sprockets into cooling tanks, whence the ingots are delivered mechanically by cleat elevators to inspection and loading platforms. About 300 men are employed.

The smelter treats ore from the Tamarack, Osceola, Isle Royale, Ahmeek and Centennial mines. The company also owns the dismantled smelting plant at Hancock, Houghton Co., Mich.

LAURIUM MINING CO.

MICHIGAN

Office: 12 Ashburton Place, Boston, Mass. **Mine office:** Calumet, Houghton Co., Mich.

Officers: Rodolphe L. Agassiz, pres.; Jas. MacNaughton, v. p. and gen. mgr.; with W. Hunnewell, F. L. Higginson, G. A. Flagg, directors; G. G. Endcott, sec.-treas.; H. L. Bennett, asst. sec.-treas.

Inc. in Michigan. Cap., \$1,000,000; shares \$25 par; fully issued. Is controlled, through ownership, of 39,288 shares, by the Calumet & Hecla Mining Co. Has paid dividends of \$4 per share, through sale of town lots in the village of Laurium. Company ended 1916 with balance of liabilities of \$24,473. Annual meeting, second Tuesday in June.

Property: 575 acres with mineral rights, including 325 acres whose surface is also owned. Company originally owned 640 acres, lying next east of the Calumet & Hecla, but a triangular tract of about 65 acres, carrying both surface and mineral rights, was sold to the Calumet & Hecla, and about 250 acres of surface rights have been disposed of since as building lots, with reservation of mineral rights. The property carries about 1½ miles of the strike of the Kearsarge bed, with 280 acres of underlay, giving the Laurium a chance to develop this bed to a depth of about 4,400'.

Development: the Laurium shaft, started Aug. 7, 1909, as a result of previous diamond-drill borings, is about 2,200' from the S. W. corner of Sec. 26, and about one-half mile N. of No. 1 Tecumseh shaft. The shaft is 1,661' deep, with about 7,000' of workings. The mine was closed July, 1913, at the time of the strike and has not been reopened since. When operations were suspended workings on the 12th, 14th and 15th levels were in poor ground, showing very little copper.

Equipment: includes a boiler house, engine house with a large hoist and air compressor, and a changing house.

MASS CONSOLIDATED MINING CO.

MICHIGAN

Office: 79 Milk St., Boston, Mass. **Mine office:** Mass, Ontonagon Co., Mich.

Officers: John W. Linnell, pres.; Theo. O. Nicholson, v. p.; Wilfred A. Bancroft, sec.-treas.; Elton W. Walker, supt.; preceding with Francis L. Maguire, Wm. F. Fitzgerald, Jas. B. Hill, D. Allison Carrick and Fred J. Schultheis, directors. E. Fenner Douglass, mill supt.; A. P. Bennetts, mg. capt.; Jos. Bice, master mechanic.

Inc. 1899 in Michigan. Cap., \$2,500,000; shares \$25 par; issued, 97,317 shares; paid in, \$24; \$8 paid on organization, balance in installments. Old Colony Trust Co., Boston, transfer agent. Annual meeting, 2nd Thursday in March.

Balance-sheet for 1916 shows receipts, \$1,255,896; net profit, \$430,528; balance of cash assets, \$449,255. Construction in 1916 cost \$94,556.

Dividends: initial dividend paid, Aug., 1916, with total for 1916 of \$194,634. In 1917, \$2 per share was paid to mid-year, equal to \$194,634. Dividend payments suspended, Oct., 1917.

Property: about 5,500 acres, lying in a very irregular but fairly compact tract, in Secs. 33, 34 and 35, T. 51 N., R. 38 W., in Secs. 4, 5, 6, 7, 8, 9 and 16, T. 50 N., R. 38 W., and in Sec. 1, T. 50 N., R. 39 W., holding being bounded on the N. by the Union, Adventure and farm lands, on the E. by the Adventure and Toltec, and on the S. by various farm lands, and on the W. by the Flint Steel, Adventure and St. Mary's Mineral Land Co. Holdings include 4 old mines, the Ridge, Evergreen, Mass and Ogima, also 2 old prospects, the Merrimac and Hazard, joint production of which, under previous managements, was 11,131,023 lbs. fine copper. These 5 properties are described, in detail, in Vol. II, Copper Handbook.

The Mass tract carries 6 of the 7 cupriferous amygdaloidal beds of the Evergreen belt, these varying greatly in width from point to point but averaging about 10', with a sharp bend in their strike, which varies from N. 32°

E., on the north, to N. 37° E. at the southern boundary. The dip of the beds varies from 38° at the Ridge to 47° at the old Mass mine. The copper-bearing beds of the Evergreen belt on the lands of the Mass Consolidated are as follows, from north to south:

1. Knowlton. Carries heavy copper and stamp rock.
2. Mass. Lies 140' south of the Knowlton, and carries a little heavy copper and stamp rock.
3. North Butler. Lies about 75' south of the Mass bed, is wide and fairly mineralized in places.
4. Butler. Lies about 200' south of the North Butler, is 12' to 35' wide, carrying mainly stamp copper with occasional heavy copper.
5. Ogima. Lies about 100' south of the Butler. Carries mainly stamp copper with some barrel-work, being 5' to 10' wide and showing some good ground.
6. Evergreen or Ridge. Lies about 250' south of the Ogima and is one of the best beds of the property, ranging 4 to 40' in width and usually being richest where widest. Is very bunchy but shows some excellent stopes yielding mass copper and stamp-rock of good grade.
7. New Mass. This bed which is the lowest of the series of the Evergreen belt and brings the number of cupriferous beds to 7, corresponding with the number in the adjoining Adventure property, lies about 120' under the Evergreen bed and was opened by crosscuts from "A" shaft on the 15th and 18th levels. The bed averages about 12' in width carrying considerable epidote and is very showy, but the copper is exceedingly fine, most of it being of a flaky nature, very deceptive to the eye. A mill test of the rock from this bed, 1909, gave a recovery of only 18 lbs. of mineral per ton.

Development: The Mass has openings on all its copper-bearing beds, and rock is hoisted through the nearest shaft, workings on each level being connected by crosscuts. The Mass carries the outcrop of the copper-bearing beds of the Evergreen belt for about 1½ miles. Shafts "A" and "B" are connected on the Butler lode down to and including the 10th level. The mine as a whole is notably rich in mass copper and carries silver values, but the ground is exceedingly bunchy, ranging from very rich to absolutely barren. Considerable rock selection is made underground, bringing the average contents of stamp rock to 16.51 lbs. per ton. About 50% of the rock broken is hoisted, and about 25% of the recovery is in mass copper.

"A" shaft, 1,757' deep, with two compartments, sunk on the Evergreen bed has been abandoned.

"B" shaft, 875' S. W. of "A" has 3 compartments, and is bottomed at 1,857'. Levels are at variable intervals; those at considerable intervals permit a larger saving in drifting through poor ground and sub-levels can be run where needed.

"C" shaft, 2,148' S. W. of "B" and bottomed on the 14th level, is the old Ogima shaft, sunk on the Butler bed, but the Evergreen bed is opened by a 400' crosscut on the 3rd, 5th and 7th levels. Some high-grade ground was opened on these and on the 9th levels west on the Butler bed during 1912. The company has concentrated work upon the Butler though work was also done on the Ogima and Knowlton beds, tributary to "C" shaft, in 1910, results on the whole being promising.

"D" shaft, 150' deep, is idle.

Considerable diamond drilling has been done south from the Evergreen bed into the horizon traversed by the so-called Adventure lodes, cut by diamond drills on the Adventure property, and also north of the Knowlton bed. Diamond drilling was done, 1910, in the N. E. ¼ of Sec. 5, to test amygdaloidal and conglomerate strata outcropping at that point, which is

quite a distance under the hypothetical horizon of the so-called Adventure lodes, with distance to the eastern sandstone undetermined.

Development during 1916 totaled 2,931'. Results were satisfactory, the quantity of ore opened more than equalled that extracted. The grade increased from 14.35 lbs. in 1915 to 16.51 lbs. in 1916. The Evergreen lode on No. 5 level is well mineralized as far West, as "C" shaft in virgin ground. This lode yielded 61,580 tons, and the Butler lode 219,965 lbs.

The shaft rock house at "B" is equipped with a steam hammer, Good Roads crusher, and a 50x24" Nordberg engine; "C" shaft has a steel shaft rock house; both have been equipped with devices permitting automatic handling of rock.

The central power house has a 24x48" Allis-Chalmers duplex hoist good for one-half mile depth. The power plant includes a 50-drill Rand 2-stage cross-compound air compressor, a 75-k. w. dynamo for electric light, and three 335-h. p. Babcock & Wilcox water-tube boilers.

In addition to the usual mine buildings, there are about 80 good dwellings. The company also has a town site, Mass City, which is the terminus of the Mineral Range railroad, and a station on the C., M. & St. P. railway; the village having a considerable population, with a number of hotels and business houses.

The Mass mill is at Keweenaw bay, on an arm of Lake Superior, at the junction of the Mineral Range and Duluth, South Shore & Atlantic railway, 16 miles S. of Houghton and 34 miles N. E. of the mine. Equipment includes 2 Nordberg stamps, 1,350 tons daily capacity.

The mill boiler house contains 6 Stirling water-tube boilers. Ashes and cinders are washed into the lake through a launder.

The pump house has a 16,000,000-gal. Nordberg vertical pump, connected with a tunnel running 300' under the bed of the bay to the intake.

Production: begun 1899, with an output of 42,800 lbs. fine copper, gradually increased to 2,576,447 lbs. in 1903, decreasing thereafter, through loss of the Evergreen bed. Recent production has been as follows: 2,007,950 lbs. fine copper in 1905; 2,106,738 lbs. in 1906; 2,078,677 lbs. in 1907; 1,766,930 lbs. in 1908; 1,723,436 lbs. in 1909; 1,321,885 lbs. in 1910; 1,326,898 lbs. in 1911; 2,045,006 lbs. in 1912; 1,213,545 lbs. in 1913; 2,955,952 lbs. in 1914; 4,638,452 lbs. in 1915; 4,752,588 lbs. in 1916.

Ore treated in 1916 totaled 287,900 tons. In June, 1917, the monthly rate was 22,000 tons, a falling-off due to labor shortage.

Cost of refined copper in 1916 was 15.37c and price received 26.27c per lb.

The Mass Consolidated has had every sort of misfortune that befalls mines, but through the acquisition of the Evergreen Bluff property, has been placed in better mining position than ever before. The experience of 14 years has given a thorough knowledge of the vagaries and possibilities of the cupriferous beds of the Evergreen belt; though bunched, two of the number are of real promise, the Evergreen and Butler. It is probable that other beds can be worked occasionally, but the future of the mine rests on the Evergreen and Butler beds. There also is the possibility of locating and developing other and richer beds to the southward of the main workings, in the horizon of the Lake and Adventure beds.

Management is both progressive and experienced.

MAYFLOWER MINING CO.

MICHIGAN

Office: 705 Sears Bldg., Boston, Mass. Mine office: Houghton, Houghton Co., Mich.

Officers: Chas J. Paine, Jr., pres.; Geo. P. Gardner, v. p.; preceding, with Harry F. Fay, Geo. E. Clarkson, A. L. Dickerman, F. W. Nichols, directors. Arthur E. Coe, sec.-treas.; Geo. S. Goodale, supt.

Inc. 1899 in Michigan. Cap., \$2,500,000; shares \$25 par; \$10 paid. St. Mary's Mineral Land Co. owns 25,000 shares of the capital stock. American Trust Co., Boston, transfer agent. Old Colony Trust Co., Boston, registrar. Annual meeting, third Wednesday in March.

In March, 1917, company was consolidated with the Old Colony Copper Co., under title of Mayflower-Old Colony Copper Co. (which see), on a share for share basis.

Balance-sheet for 1916 shows receipts \$63,043, including \$52,991 from 1915 and \$7,081 from assessments, and expenditure \$17,729. Balance of assets at end of 1916 was \$45,314.

Property: 840 acres, near Calumet, Mich., between the Kearsarge and Old Colony mines and east of the South Kearsarge and Wolverine mines. Lands comprise Secs. 7 and 8, T. 56 N., R. 32 W. Prospecting, begun in 1899, was continued 5 years. No. 1, or Faull shaft, 400' deep, has considerable drifting on the 1st and 2nd levels and a crosscut opens 2 parallel cupriferous amygdaloids, showing occasional patches of copper, but nothing of promise.

Development: four shafts. No. 2, or Isle Royale shaft, 160' deep, has several hundred feet of drifting and shows a bunched amygdaloid, 10 to 12' wide, carrying more or less copper in a 2' streak next to the hanging wall. No. 3, 60' deep, in a badly broken amygdaloid. No. 4 shaft, 580' deep, starts from surface on an unnamed amygdaloid, lying approximately 2,000' east of the Kearsarge bed and at a depth of 425' runs into a parallel amygdaloid lying 90' to the eastward of the first bed. The copper showing is poor.

A fairly complete geological cross-section has been obtained by diamond-drill borings and exploratory work was resumed July, 1909, after 3 years' idleness. Up to date 42 holes have been put down which, together with the holes on the Old Colony tract, prove up a big and well mineralized amygdaloid bed, called the Mayflower lode, for a distance of 6,000' and a depth of 1,500'. The lode lies on the extreme eastern side of the copper range, near the Eastern sandstone. In 1915 only 800' of drilling was done. Hole No. 2 started N. E. of No. 41, was stopped at 2,697' in Oct., 1917. To a depth of 2,100', where it showed St. Louis conglomerate, the hole indicated a uniformly favorable condition of the strata. From 2,100 to 2,653' many zones of crushed and highly-decomposed ground were encountered, making drilling difficult. Conditions were similar to No. 41 at 2,635', and work on No. 42 was stopped on account of the sandy material. In all, 2,763' of drilling was done in 1916.

Earlier drill-holes were sufficiently promising for shaft-sinking, provided the Old Colony Copper Co. agreed to share the expense. This suggested consolidation of the companies was agreed to in Feb., 1917.

Thirteen holes on the Mayflower and 10 on the Old Colony ground showed commercial ore; hole No. 20 showed 101' of 1.65% rock; hole No. 22, nearby, showed 100' of 1.2% copper ore, 60' of which carried 1.9%; holes Nos. 16 and 17, in this locality, showed 87' and 95' widths.

MAYFLOWER-OLD COLONY COPPER CO.

MICHIGAN

Address: 70 State Street, Boston, Mass. **Mine office:** Houghton, Mich.

Officers: H. F. Fay, pres., with R. L. Barstow, G. E. Clarkson, G. P. Gardner, W. A. Moseman, C. J. Paine, Jr., and F. W. Nichols, directors; C. J. Morrissey, sec.; A. E. Coe, treas. G. S. Goodale, supt.

Inc. March 5, 1917, in Michigan, as a consolidation of the Mayflower Mining Co. and Old Colony Copper Co., which see. Cap., \$5,000,000; shares \$25 par; \$12 paid in. American Trust Co., Boston, transfer agent. Old Colony Trust Co., Boston, registrar. Annual meeting third Wednesday in March. Shares listed on Boston Stock Exchange.

- **Property:** about 2,040 acres near Calumet, Mich. Diamond-drilling to 1917 amounts to 42 holes in the Mayflower and 25 holes in the Old Colony. These were carefully studied, and it was calculated that on an assumed dip of 50°, there is 32,000,000 tons of ore. The lode is continuous for one mile, is of unusual width, and good grade. Results warrant sinking a shaft, for which there is ample equipment. An assessment of 50c per share provided \$100,000 for exploration.

Development: shaft was 50' deep in Aug., 1917.

MEADOW MINING CO.

MICHIGAN

Idle. **Office:** c/o C. A. Wright, sec., Calumet, Mich. Mine near Copper Falls, Keweenaw Co., Mich.

Inc. 1898 in Michigan. **Cap.** \$1,500,000; shares \$25 par; \$252,813 outstanding; 37,500 shares were given in payment of property. Is a reorganization of the Meadow Mng. Co., inc. 1863, under special Michigan charter. Is controlled by the Keweenaw Copper Co.

Property: 364 acres, adjoins the Humboldt and Phoenix mines and carries the Ashbed lode, which was first opened 1851, with a little mining previous to 1860. Where the Ashbed is crossed by transverse fissures, bunches of ore occur and such places usually show pits of prehistoric miners. Fully described Vol. II, Copper Handbook.

MICHIGAN COPPER MINING CO.

MICHIGAN

Office: 15 William St., New York. **Mine office:** Rockland, Ontonagon Co., Mich.

Officers: J. R. Stanton, pres.; Geo. W. Drucker, sec.-treas.; preceding officers, Jas. S. Dunstan, Alfred M. Low and L. P. Yandell, directors. Samuel Brady, supt.; Henry Stubensky, clerk.

Inc. Jan. 5, 1899, in Michigan. **Cap.** \$2,500,000; shares \$25 par; fully issued; \$22 paid in. Last assessment levied Feb. 15, 1917, was \$1 per share, equal to \$100,000. Old Colony Trust Co., Boston, registrar; American Trust Co., Boston, transfer agent. Annual meeting, first Tuesday in May. Listed in Boston.

Balance sheet for 1916 showed receipts, \$42,036; \$16,075 from copper and \$25,961 from assessments. The year ended with a deficit of \$40,590, making total deficit \$158,497. Sum of \$66,819 was spent on development.

Property: The Minnesota, Rockland and Superior mines, 4,870 acres of mineral territory, 1,466 acres of timber and miscellaneous lands and a 150-acre mill site, giving total holdings of 6,686 acres, mineral lands being in Secs. 1, 2, 3, 9, 10, 11, 13, 14, 15, 16, 17, 21, 22, 23, 24, 25, 26 and 27, T. 50 N., R. 30 W.

The main tract is 3 miles east and west by 4½ miles north and south, in addition to which there are 4 scattering tracts to the westward, 1 of 40 acres, 2 of 80 acres each and 1 of 160 acres, all carrying the outcrop of the Calico amygdaloid. The Superior mine produced 567,331 lbs. fine copper, 1856-69 and 1876-79. The Rockland, lying next east of the Minnesota, was operated 1853-70, making 6,210,309 lbs. fine copper from the Minnesota contact vein which averaged about 2' width and carried considerable silver in that mine. The old Minnesota mine, opened 1847, closed 1870, made 34,704,668 lbs. fine copper and paid dividends of \$1,820,000. The Minnesota mine is fully described Vol. II, Copper Handbook.

Geology: the Michigan tracts carry the following known copper beds of the Evergreen belt: Calico, Contact, Minnesota, Branch, North Contact, Knowlton, Mass, Butler, Ogima, North Amygdaloid and South Amygdaloid, and presumably the other parallel beds, in addition to various other unidentified copper-bearing beds of the Keweenaw series. The Knowlton, or northernmost of the Evergreen belt of parallel beds, lies about 1,000'

south of the old Minnesota shafts and the 7' amygdaloidal bed supposed to be the Butler, opened to some extent in Peninsula bluff 2,000' south of "B" shaft, shows some heavy copper and stamp rock. There are 3 old shafts on the Butler bed and a tunnel cutting several parallel copper-bearing strata. There also are cupriferous amygdaloidal outcrops north of the Calico bed on which no work has been done.

Development: mine has 3 shafts on the Calico bed and about 10 miles of workings. "A" shaft is 2,133' deep; "B" is bottomed at the 14th level and "C" at the 11th level. The lode grew steadily poorer with depth and showed a tendency to pinch, being only about 5' wide on the 16th level of "A" shaft, though well charged with copper. The mine was closed down Oct., 1909, continuing about 25 men in exploratory work until the end of 1910, when the property was turned over to tributors, who continued to scam the mine with some profit to themselves and the company until May, 1913, when all work was stopped.

In July, 1915, work was resumed in the old "E" shaft, 265' deep, on the Butler lode; it was sunk 30' below No. 6 level, a total of 630'. At 550' mass and mill copper was exposed, and continued to 615'. Fair to rich ore was opened for 275' contiguous to this shaft.

Generally, results in 1916 on the Butler, Ogima, and Evergreen lodes were highly encouraging.

Ore reserves at end of 1916 were 4,200 tons of stamp rock.

Buildings include a machine shop, smithy, carpenter shop, warehouse, office and changing house.

The mill, construction of which was begun April, 1906, is about 1 mile north of the Mass mill, on Keweenaw bay, with ample water frontage. Construction was suspended, 1907, though perhaps no more than \$10,000 would be required to complete the mill, on which about \$175,000 has been expended.

In 1916 the water-supply was completed, bins lined, and tables overhauled, and plant is ready for operation.

Production: 1900-1905, 6,113,500 lbs. copper; 2,875,341 lbs. copper in 1906; 2,665,404 lbs. in 1907; 3,000,206 lbs. in 1908; 1,979,305 lbs. in 1909; 36,682 lbs. in 1910; 327,778 lbs. in 1911; 162,590 lbs. in 1912, and 90,000 lbs. in 1916.

The mine in the past has proved a disappointment, and untoward financial conditions have restricted the exploratory and development work that are clearly called for. Recent developments have been rather promising and the mill is to be started at an early date. Shaft sinking underway, 1917.

The property is very fully described in Vol. X, Copper Handbook.

MICHIGAN SMELTER CO.

MICHIGAN

Office: 82 Devonshire St., Boston, Mass. **Works office:** Houghton, Houghton Co., Mich.

Officers: Wm. A. Paine, pres.; John R. Stanton, v. p.; F. W. Paine, sec.-treas.; Frederick I. Cairns, supt., and Chas. A. Snow, directors; John Mufford, asst. supt.

Inc. 1903 in Michigan. **Cap.**, \$500,000; shares \$25 par. The entire stock issue is owned by 6 mining companies, the Copper Range group holding 12,000 shares and the Stanton companies 8,000 shares, holdings in shares being as follows: Champion, 4,400 shares; Trimountain, 4,400; Baltic, 3,200; Mohawk, 3,200; Wolverine, 3,200; Atlantic, 1,600. No dividends have been paid, profits having been turned back into improvements. Annual meeting, second Monday in January.

Company owns and operates the Michigan smelter, 3 miles west of Houghton, near the old Atlantic stamp mill, with frontage on Portage lake. It was designed by Frank Klepetko and is the largest and most modern

smelter in the Lake Superior district, with a capacity of 90,000,000 lbs. fine copper yearly.

The plant is terraced throughout, permitting automatic handling of material. The copper ore (locally mineral) is delivered in 40-ton bottom-dumping steel cars by the Copper Range railroad, which also hauls away the refined copper for shipment from the Copper Range wharves in Houghton.

The 3,000-ton storage bins hold 10 days' supply for the works. Mineral is dehydrated in rotary dryers by water gases from the furnaces, taken to the furnaces in tram cars and dumped into hoppers on the charging floor. Coal trestles, on an upper level, hold 15,000 tons of hard and soft coal, with tunnels underneath through which fuel is taken in tram cars, descending by gravity to the furnaces and boiler rooms. There also are separate storage bins for charcoal, sand and limestone.

The reverberatory furnace buildings has three 5-ton traveling cranes and 6 furnaces. Alternating with the larger reverberatories are one 300-h. p. and two 200-h. p. Stirling water-tube boilers, heated by waste gases from the furnaces. After leaving the boilers the gases are drawn through a 6x8' subterranean flue, with arched roof, up the hill to a 150' smokestack, with base 100' above the furnace building.

The blast-furnace building has 2 blast furnaces. Blister copper is cast, mechanically, in moulds upon a circular casting table, cooled in water, and carried by a link elevator to the loading platform. Slags are carried mechanically to the sampling mill and reduced in a 30-ton crusher of 1,000 tons daily capacity for resmelting. The slag from the final fusion is granulated by water and discharged through launders to low ground northward for grading.

The combination machine shop and power house has a complete equipment driven by an independent engine, and a 300-h. p. Nordberg horizontal tandem-compound engine, driving a 200-k. w. generator, actuates the rotary blowers for the blast furnaces. Electric power is used for operating the drying plant, cranes, casting machinery and lighting. There are 3 specially designed Jeffrey electric locomotives.

Miscellaneous buildings include office, laboratory, warehouse, barn, etc. Water is obtained from the old Atlantic dam, on Cole's creek, through a 4,300' flume with capacity of 5,000 gals. per minute, leading to a 50,000-gal. storage tank, 100' above the works, giving good pressure at all points. The plant is well planned and well handled.

MINONG COPPER CO.

MICHIGAN

Office: 122 Winder St., Detroit, Mich. Louis O. Broadwell, pres.; Hugh A. McPherson, sec.

Inc. Dec. 16, 1874. Cap., \$1,000,000; shares \$25 par.

Property: 1,455 acres in Secs. 22, 23, 26, 27, 34 and 35, T. 66 N., R. 35 W., lying at the head of McCargo's Cove on the Isle Royale, shows a line of ancient pits, largest 400' and about 1½ miles long. Idle since about 1881.

MOHAWK MINING CO.

MICHIGAN

Office: 15 William St., New York. Mine office: Mohawk, Keweenaw Co., Mich. Mill office: Gay, Mich.

Officers: J. R. Stanton, pres.; G. W. Drucker, sec.-treas.; above with W. A. Paine, J. S. Dunstan and F. W. Denton, directors.

Inc. Nov., 1898, in Mich. Cap., \$2,500,000; shares \$25 par; all issued; assessable; paid in \$18. Stock listed on Boston Exchange. Boston Safe Deposit & Trust Co., registrar; American Trust Co., Boston, transfer agt. Annual meeting last Tuesday in March.

Profit in 1916 was \$2,270,054. Dividends absorbed \$1,700,000. Surplus at end of 1916 was \$2,333,839.

Dividends: (paid semi-annually, Feb. and Aug.) \$5 in 1906; \$9 in 1907; \$2.50 in 1908; \$3 in 1909; \$2 in 1910; \$1.75 in 1911; \$3.50 in 1912; \$5 in 1913; \$1 in 1914; \$6 in 1915; \$17 in 1916; \$20.50 in 1917; a total of \$7,625,000.

Property: 800 acres, in an irregular tract, having its axis on the strike of the Kearsarge amygdaloidal bed, in Secs. 27, 28, 33 and 34, T. 57 N., R. 32 W., about 4 miles N. E. of Calumet, with the Ahmeek and Seneca mines on the north and Ahmeek to the west. In May, 1916, purchased 900 acres near Dollar Bay, lying between Torch and Portage lakes, with a long strip of shore on each side, thus acquiring an excellent millsite on Torch lake.

Geology: property carries the Kearsarge amygdaloidal bed, which ranges from 15' to 18' in average width, or about the same as at the Wolverine, and the upper workings carry about the same percentage of copper as in the Wolverine mine, but the lower workings are by no means so rich. The Kearsarge bed is crossed at approximately right angles by a number of narrow fissure veins, with nearly vertical dip, that are yielding a considerable amount of mass copper and in addition there are 3 cross-fissures carrying copper arsenides, including mohawkite, keweenawite, mohawk-whitneyite, and stibio-domeykite, the first two being peculiar to this district and first found in this mine. The fissures carrying mohawkite range 3" to 3' in width, are well mineralized where crossing the amygdaloidal bed and for an indefinite but usually short distance on either side, the mohawkite and allied arsenides occasionally occurring massive, but commonly being disseminated in an arenaceous gangue. Values in the arsenides decrease with depth and recent production has been small. There also are other cupriferous amygdaloidal beds in the stratified series that may be given attention later.

Development: 6 shafts, numbered from north to south, of uniform size, 8x18' inside of timbering, with solid cribbing through the overburden and with identical equipment. No. 5 shaft has a concrete collar 10½"x23"x100' deep, and No. 6 is concreted for a depth of 90'. The skipways are laid with concrete stringers, which prove very satisfactory. The mine is equipped with Richmond electric signals and operates about 65 power drills. New work in 1916 totaled 15,224'.

No. 1 shaft, about 1,500' south of the northern boundary, is bottomed at the 22nd level and is 2,598' deep. No. 1 hoist, in the central power-plant at No. 2 shaft, operates two 4-ton skips in counterbalance. No. 1 shaft has a combination shaft rock house, equipped with a 12x24" Nordberg engine and crushers. In 1916 new openings showed less mineralization than in 1915.

No. 2 shaft is 2,364' deep. Like No. 1, it had good ore near surface with impoverishment at depth, followed by improvement below the 12th level. The power plant at No. 2 shaft, serving both Nos. 1 and 2, includes an engine house and boiler house. Hoists are Nordberg double-conical-drum duplex-cylinder engines, good for 6,000' depth, each handling two 4-ton skips in counterbalance. The boiler house has 2 locomotive firebox boilers, with foundations for 3 additional boilers, and the engine house has 2 Ingersoll-Sergeant air compressors, of 40 drills aggregate capacity.

No. 3 shaft is 1,600' deep, and has been abandoned, as the ground tributary to No. 3 can be reached to better advantage through shafts Nos. 2 and 4. No. 4 shaft is 2,302' deep, developing good average ground from surface. Equipment includes a steel shaft rock house with 3 crushers and a steam hammer. The engine house has a Nordberg double-conical-drum hoist, good for 6,000' depth. A compressor plant, at No. 4 shaft, has a 60-

drill Nordberg and a 60-drill Ingersoll-Sergeant cross-compound 2-stage compressor.

No. 5 shaft is 1,709' deep. Equipment includes a new all-steel shaft rock house and a Bullock hoist good for 2,000' depth.

No. 6 shaft, the southernmost and newest, is about 2,600' south of No. 5 and 2,600' from the Ahmeek boundary, commanding about three-fourths of a mile of the strike of the Kearsarge bed under about 160 acres, or approximately as much ground as the entire Wolverine mine. This shaft, located about 60' in the footwall rock, is 1,307' deep, and can be sunk to a maximum of 4,000'.

New openings at No. 4, 5, and 6 shafts in 1916 showed ore of fine quality. Mechanical haulage was installed on No. 8 level of No. 6 shaft.

The mill, near the mouth of the Tobacco river, on Traverse bay, Lake Superior, opposite the mill of the Wolverine, is 178x206' in size, of steel frame sheathed with iron, on foundations of sandstone. A steel trestle, 350' long and 50' high, leads into the mill, loaded cars being pulled up the incline by a winding engine. The mill has 4 stamps, all compounded, giving a daily capacity of 2,800 to 3,000 tons. The mill has a Chilean mill and 8 sets of auxiliary crushing rolls, with fixed bearings, to reduce oversize material from the mortar boxes of the heads, this averaging 20 to 25% of rock stamped. Mineral from the wash discharges automatically and is sluiced into the basement, where shoveled into 1½-ton mineral cars, having 14-mesh perforated steel bottoms that allow the drainage out of water, after which the cars are weighed, then lifted by a cage elevator and dumped into bins. The bin house has 4 compartments, each with cement floor and steam-pipes underneath, for drying the remaining moisture from the wash. The mineral is taken from the bin house, in self-dumping steel mineral cars to the Michigan smelter at Houghton for reduction. Tailings from the mill are dewatered, then raised by bucket elevator, and stacked by belt conveyor, some distance from the mill. To utilize exhaust steam from stamps a 1,250-k. w. turbo-generator has been installed.

Water for both the Mohawk and Wolverine mills is furnished from a joint pump house, standing near the Tobacco river, from which water is taken. The pump house has a 20,000,000-gal. triple expansion Snow pump, supplemented by a 9,000,000-gal. Nordberg pump, giving an ample water supply for both mills.

A 30x300' wharf, on Traverse bay, a short distance from the mill, with 14' of clear water alongside, is fitted with coal hoists and storage sheds, ample for the needs of both mills. Employs about 700 men.

Yield of fine copper, per ton of rock stamped, averaged 15.79 lbs. for the decade ended 1912.

Production:

	Cost		Cost		Lbs. Cu.	Mineral Lbs.	Ref. Cu. Lbs.	Cost per Lb.		Sell. Price Cts.
	Tons Rk. Hoisted	per Ton Hoisted	Tons Rk. Stmpd.	per Ton Stmpd.				Cts.	Cts. (a)	
1910...	700,412	\$1.47	664,547	\$1.54	20.82	18,468,100	13,334,034	8.52	8.85	25.25
1915...	865,029	1.16	829,789	1.20	19.15	20,705,600	15,882,914	7.21	7.48	17.00
1914...	665,852	1.21	649,649	1.24	17.08	14,591,000	11,094,859	8.23	8.58(b)	12.47
1913...	395,100	1.53	366,458	1.64	15.76	8,018,000	5,778,235	10.42	13.22(b)	15.36
1912...	868,841	1.34	787,941	1.47	15.22	15,901,500	11,995,598	9.67	10.61	16.08
1911...	902,859	1.294	802,548	1.406	15.07	15,760,700	12,091,056	9.33	10.399	12.63
1910...	906,243	1.287	802,537	1.433	14.22	15,013,500	11,412,066	10.076	11.441	13.00

(a) Includes construction. (b) Includes strike expense.

The mine was closed from July, 1913, to April, 1914, due to the Western Federation of Miners' strike. Toward the close of 1915 recovery amounted to over 21 lbs. copper per ton of rock, and costs were down to about 7½¢ per lb. Production, 1917, is at the rate of 1,100,000 lbs. per month.

Finlay in 1911 estimated 176,000,000 lbs. extractable copper, and a life of

15 years further. Our present estimate is 250,000,000 lbs. and a life of 22 years.

The Mohawk, while a much lower grade mine than was anticipated at the beginning, is a fine property with an assured future and has the benefit of a strong, honest and thoroughly economical and competent management.

MULOCK MINE**MICHIGAN**

Idle. **Office:** care R. P. Mulock, owner, Colfax, Ia. Mine near Matchwood, Ontonagon Co., Mich.

Property: 240 acres, the N. W. $\frac{1}{4}$ of Sec. 9 and the N. W. $\frac{1}{4}$ of N. W. $\frac{1}{4}$ and S. W. $\frac{1}{4}$ of S. W. $\frac{1}{4}$ of Sec. 15, T. 49 N., R. 41 W., one-half mile N. W. of the Norwich mine. Exploratory work, 1903-05, showed 4 cupriferous amygdaloidal beds, of which two, about 400' apart, averaging 6' and 15' in width, were opened by several pits, showing copper.

NATICK COPPER CO.**MICHIGAN**

Office: Leopold Bldg., Houghton, Mich. Mine near Copper Falls, Keweenaw Co., Mich. F. W. Nichols, resident mgr.

Property: 200 acres, the N. E. $\frac{1}{4}$ and E. diagonal $\frac{1}{2}$ of E. $\frac{1}{2}$ of N. W. $\frac{1}{4}$ of Sec. 28, T. 58 N., R. 31 W., surrounded by holdings of the Frontenac Copper Co. Property slightly explored in early days, has been idle many years.

NATIONAL MINING CO.**MICHIGAN**

Idle. **Office:** 6 Beacon St., Boston, Mass. **Mine office:** Rockland, Ontonagon Co., Mich.

Officers: B. T. Morrison, pres.; Harry Highley, sec.-treas.; Chas. M. Baker, Harry M. Howard and W. S. Warn, directors.

Inc. 1848, in Michigan; rechartered 1878, cap. increased later to \$2,500,000; shares \$25 par; issued, \$1,875,000, and rechartered 1908. Paid dividends, 1861-72, of \$320,000, and levied a 40c assessment 1909. The company has no debts.

Property: 1,852 acres, having the Michigan on the north and east and the Victoria on the south and west, carries the western continuation of the contact vein of the old Minnesota mine, now owned by the Michigan Copper Mining Co. The property showed, when work was begun, the relics of ancient mining operations, including a shaft of 50' depth, timbered and scaffolded, with a nearly continuous sheet of copper extending down one side. The company had considerable litigation with the old Minnesota company over the title to 115 acres of land, the National finally winning. The company stopped work 1893.

NATIVE COPPER CO.**MICHIGAN**

Idle since 1855. **Office:** 68 Devonshire St., Boston, Mass. Mine at Delaware Mine, Keweenaw Co., Mich.

Officers: Ashley Watson, pres.; Chas. E. Adams, sec.-treas.; Ashley Watson, Frederick Hoitt and Frank L. Van Orden, directors.

Inc. 1849, and reincorporated March 29, 1880, in Michigan. **Cap.** \$1,000,000; shares \$25 par; fully issued. Annual meeting, first Wednesday in March.

Property: 480 acres, being the S. $\frac{1}{2}$ of Sec. 3 and N. W. $\frac{1}{4}$ of Sec. 10, T. 58 N., R. 30 W., all on the Keweenawan trap belt. A little work was done, 1852-55, on a fissure vein crossing the Ashbed, the company levying assessments of about \$39,000.

NAUMKEAG COPPER CO.**MICHIGAN**

Office: 61 Broadway, New York. **Mine office:** Houghton, Mich.

Officers: J. Parke Channing, pres.; Sam A. Lewisohn, v. p.; E. H. Westlake, sec.-treas., with Adolph Lewisohn, I. J. Sturgis, F. L. Van

Orden, Theo. L. Herrmann, J. H. Susmann and Chas. J. Paine, Jr., directors; Sidney S. Lang, supt.

Inc. March 21, 1912, in Michigan. **Cap.**, \$5,000,000; shares \$25 par; \$10 paid in; issued 102,000 shares. U. S. Mortgage & Trust Co., registrar. Annual meeting, third Wednesday in March.

Company ended 1916, with a cash balance of \$6,074; investments, \$126,250; development expenses, \$118,240, or \$150,532 since 1912.

Property: 1,200 acres, in Secs. 34 and 35, T. 55 N., R. 34 W., and Sec. 3, T. 54 N., R. 34 W., just west of Houghton, on the south shore of Portage lake, carries practically all of the Ashbed amygdaloidal beds, including the Atlantic and the Quincy-Pewabic lodes.

Development: property was slightly explored under former owners, but efforts were sporadic and altogether unimportant. Operations by present owners were begun July 10, 1912, in the horizon of the Hancock lodes. Drill borings yielded good showings of copper at depth of 513' in what is presumed to be an extension of Hancock No. 3 lode, and again at a depth of 1,301' where a 6" streak of coarse copper was encountered.

In 1914, the main, or Dakota Heights adit on the old Pewabic lode was extended 126', encountered the lode at 100', and drifts No. 2-A north and south were continued for 70' and 63'. A total of 1,936' of drifting was done during the year. This work indicated a lode, 6-8' wide, for 700', showing copper ore, but not of commercial value. During 1915 exploratory work was confined to the workings from the Dakota Heights, or No. 4 adit; a total of 1,172' of drifting on the Pewabic lode showed considerable copper on the No. 2 North drift. A 200' winze was sunk from this drift and 1,602' of drifts and crosscuts driven from the lower level. About 1,000' of drifts and crosscuts were driven in crosscuts No. 4 East, No. 3 West and drift No. 2 South. No beds of value were found in the southern part of the property.

In 1916 all exploration was confined to workings from No. 4 adit at N. end of property. No. 2 drift was put out 352' on the old Pewabic lode, showing no copper. Work from No. 4 E. crosscut disclosed nothing worth further exploration, save the bed in which the breast of crosscut is in.

An electric hoist was installed near top of main winze, and the winze sunk 220' to 410' level. Some small lenses of fair ore were opened during this work. Possibilities of 400' level are better than at 190'.

Equipment: includes hoist, compressor, pump and electric power.

The property is considered promising and the management is excellent.

NEW ARCADIAN COPPER CO.

MICHIGAN

Houghton, Mich.

Officers: Robt. H. Shields, pres. and gen. mgr.; Col. Sylvester T. Everett, v. p.; Wm. F. Miller, sec.-treas. **Directors:** Wm. B. Anderson, John Merton, John C. Shields, L. W. Killmar, Jas. W. Shields, Allen F. Rees, R. H. Shields, S. T. Everett and Herman W. Fesing, engr.; Otto Lieber, mg. capt.

Inc. April 27, 1909, in Michigan. **Cap.**, \$3,750,000; shares \$25 par; assessable; paid in, \$12.50. Last assessment levied in July, 1917. This company succeeded the Arcadian Copper Co., a corporation organized in New Jersey that had non-assessable stock, and exchanged shares, *pari passu*, levying an assessment of \$1 per share, 1909. Property was transferred, by deed, from the old company to the new, May 30, 1909. Company owns 24,000 shares of stock of the New Baltic Copper Co. Boston Safe Deposit & Trust Co., registrar; American Trust Co., Boston, transfer agent. Annual meeting, first Tuesday in May.

Revenue in 1916 totaled \$139,731; including \$7,384 from sales of copper, \$24,141 from assessments, \$40,000 from sale of land, and \$66,743 from 1915 balance. Cash at end of 1916 amounted to \$21,316.

Property: 3,500 acres, includes 5 old mines worked at various periods in the past. The Arcadian Copper Co., predecessor of present company, operated the property with great vigor, 1898-1901, and equipped it with machinery, and a 3-stamp mill at Grosse Point. Operations on the Isle Royale bed proving unsatisfactory, all work was suspended June 15, 1903; the hoist, machinery and shaft houses were sold to the Trimountain Mining Co., the stamp mill to the Centennial Copper Mining Co., and the property dismantled. The floating debt of the old company was liquidated by the sale of 800 acres of land, for \$750,000, to the Quincy Mining Co. The old mine and equipment were fully described in Vols. I and II of the Copper Handbook.

Development: exploratory work was resumed Oct., 1905, by the old company, on an amygdaloidal bed about one-fourth mile east of the Isle Royale amygdaloid previously worked, and crosscutting from the 200' level of the exploratory shaft disclosed 5 cupriferous beds in a distance of 110'. Work was suspended March, 1908, until organization, and was resumed Aug., 1909, by diamond-drill boring from the bottom of the 200' exploratory shaft, which is in the S. W. $\frac{1}{4}$ of Sec. 29. Exploratory work, 1910-13, included considerable trenching and test pitting, but was devoted mainly to securing 3 cross-sections, nearly 1 mile apart, by diamond drilling, and 26 holes, aggregating over 26,000', have been drilled. Drill hole No. 22 cut a promising amygdaloid lode, in the north area. A shaft started June, 1912, on this lode, was 1,660' deep in Aug., 1917, and is to be sunk to a depth of 2,500 to 3,000'.

Crosscutting was done on the 750' level to explore the 2 copper-bearing amygdaloid beds disclosed by diamond drilling, one 300' east, the other 150' west of the shaft. On this level an amygdaloid vein of great promise has been opened up 150' east of the shaft. Crosscuts and drifts have also been driven on the 250', 600', 900' and 1,050' levels and disclosed good copper contents. The 600' level has 600' of drifting on this lode. On the 900' level, No. 8, conglomerate was cut and found to be well mineralized at this point. During 1916, 2,114' of drifting was done and 747' of crosscutting.

Ore crushed at the Franklin mill last year, totaled 1,391 tons, yielding 23 lbs. refined copper per ton. Several thousand tons ore to be treated.

Equipment: includes a steam plant, with boilers, a hoist good for 2,500', a 15-drill air compressor, necessary mine buildings, and a fully equipped rock-house with an 18x24" crusher.

New openings in 1916 were of generally favorable nature. On the 1,500' level the vein is up to 20' wide, has been opened for 270', and is of good grade.

Owing to its immense acreage on the mineral belt, the property is considered promising and management is good.

NEW BALTIC COPPER CO.

MICHIGAN

Houghton, Mich.

Officers: R. H. Shields, pres. and gen. mgr.; Herman W. Fesing, v. p.; John Edwards, sec.-treas.; other directors, S. T. Everett, J. W. Shields and John Merton; Herman Fesing, engr.

Inc. Dec. 14, 1909, in Michigan. **Cap.**, \$2,500,000; shares \$25 par; assessable; issued, \$2,175,000; \$10 paid. Beacon Trust Co., Boston, transfer office; American Trust Co., Boston, registrar. Company succeeded the New Baltic Exploration, giving stockholders therein share for share, giving 30,000 shares to the Edwards estate and 10,000 shares to the New Arcadian

Copper Co., for lands, and selling 20,000 shares to the public, at \$8. Company began operations with \$120,000 cash. Two assessments realized a total of \$116,254. All officers with exception of general manager serve without pay. Annual meeting, third Wednesday in April.

Statement for 1916 shows receipts, \$82,531, of which, \$60,659 was from assessments and \$20,361 from 1915 balance. Development cost, \$18,101, and land purchased, \$40,000. Cash on hand at end of 1916 was \$21,648, plus \$55,595 due for assessments called.

Property: 800 acres, Sec. 16, T. 55 N., R. 33 W., with mineral rights to the N. W. $\frac{1}{4}$ of the N. W. $\frac{1}{4}$ reserved by the New Arcadian Copper Co. Exploratory work, begun June 10, 1909, included extensive trenching in the horizon of No. 3 conglomerate, supplemented by boreholes put down by a Calyx shot drill, cutting a 3 $\frac{1}{2}$ " core, considerable trouble having been experienced in getting down stand pipes. No. 3 borehole, at a depth of 330', cut 2' of exceptionally good copper-bearing rock, with 6" of heavy copper, and a drill core fairly charged with copper was taken, Sept., 1909, from what was thought to be the western Baltic bed, at depth of 300'. In Nov., 1909, a drill hole pitched at an angle of 60°, cut an amygdaloidal bed estimated to pitch at 60° in opposition, giving cores of 105' aggregate depth, showing copper at various points, the final 7' being well charged with fine stamp copper and a considerable amount of very coarse stamp copper. The drilling also disclosed an unidentified amygdaloidal bed of about 75' width, carrying considerable copper in masses approaching barrel-work size. Deepest hole bored was 1,200'.

Ground was broken June, 1910, for an exploratory shaft, which was started about 35' in the footwall trap, and sunk to a depth of 500'. Although the shaft was started in the foot, the formation rolls so that the bed was cut at 3 points in the depth of 310'. At 200' the shaft cut the footwall of the amygdaloidal bed, carrying much calcite but devoid of copper. At depth of 310' the bed was cut again, carrying extremely heavy copper of a grade materially better than the average of the payable mines of the district. Drifts on the 350' and 500' levels disclosed exceedingly bunched ground, with occasional pockets of rich copper, and a crosscut on the 500' level showed further copper ground in an unidentified amygdaloidal bed underlying No. 4 conglomerate bed, distant about 1,500' from the shaft. This crosscut was continued to a point over 1,900' from the shaft. Facts concerning this vein were obtained from work done on it by the New Arcadian, the adjoining property.

The drilling campaign ended with No. 7 hole at a depth of 1,235' in 1916. No. 8 conglomerate was 41' thick at depth of 1,192'. Hole passed through good-looking amygdaloid veins, with copper in beds at 329', 493', 652', 792' and 1,192'. The New Arcadian vein is probably that cut at 792'. A shaft was started to cut the N. extension of this vein, and was down 250' in Aug., 1917. At 60' it cut the vein sought, well charged with copper.

Equipment: in 1916, a new hoist, compressor, boiler-house, etc., were erected. Management, which is good, considers that property offers great possibilities.

NEW YORK CONSOLIDATED MINING CO. MICHIGAN

Charter expired and corporate existence of company being wound up by F. W. Nichols, receiver, Houghton, Mich.

Property sold to J. H. Rickard, trustee and final proceedings taken to dissolve company, 1917.

NORTH LAKE MINING CO. MICHIGAN

Office: 60 Congress St., Boston, Mass. **Operating office:** Shelden Bldg., Houghton, Mich.

Officers: R. M. Edwards, pres. and gen. mgr.; Arthur C. Paine, v. p.; Henry Tolman, treas., with H. D. Forbes and S. L. Powers, directors; A. L. Wyman, sec.

Inc. Aug. 26, 1908, in Michigan. **Cap.**, \$2,500,000; shares \$25 par; fully issued; \$10 paid in.

Company paid \$144,000 for 360 acres of land, bought of St. Mary's Mineral Land Co., one-half in cash and one-half in 9,000 shares of stock at \$8, beginning business with \$300,000 cash in the treasury. The company suffered heavily by the failure of S. R. Dow & Co., Sept., 1912, losing \$160,188 in cash and interest unlawfully borrowed by its former president, S. R. Dow, and at the end of 1912 was \$19,000 in debt. This indebtedness was wiped out by an assessment of \$1 per share, levied April 18, 1913. Federal Trust Co., Boston, registrar; American Trust Co., Boston, transfer agent. Shares are listed on the Boston Stock Exchange. Annual meeting, third Thursday in April.

Annual report for 1916 shows total receipts of \$100,333, and expenses, \$71,745, leaving a balance of \$28,587. Cash on hand, \$26,683, accounts payable, \$6,520. An assessment of \$1 per share, in June, 1916, made \$100,000 available for development, of which \$38,487 was spent.

Property: 1,120 acres, in Secs. 28, 29, 32 and 33, T. 51 N., R. 37 W., lying immediately north and east of the Lake Copper Co. Property was supposed to carry about 7,000' of the strike of the Lake amygdaloidal bed, but apparently the Lake bed curves to the westward, rather than to the east. Property also carries the copper-bearing series of the Evergreen belt of amygdaloidal beds, and various other unidentified cupriferous strata. The company's lands are crossed by the Fire Steel river, and are traversed by both the Mineral Range and Copper Range railways.

Exploratory work has been planned thoroughly and systematically, the preliminary work consisting of diamond drilling to give 2 complete cross-sections, of about 8,500' and 9,500', respectively, to determine the strike and dip of all the strata on the property. These sections are about 1,000' apart, and the contact of the Keweenaw series with the eastern sandstone has been definitely located by drilling. Numerous drill holes have been bored, with depth ranging from 200' to more than 2,000'.

Diamond drilling was begun 1909, and ended 1911, with the No. 15 hole. Several cupriferous amygdaloidal beds were disclosed, and 2, underlying Nos. 6 and 8 conglomerates, have been correlated as extensions of Nos. 1 and 2 of the Adventure series of lodes. No. 1 bed, of about 33' width, showed 10' fairly charged with copper and No. 2 bed was lean. The formations above No. 8 conglomerate bed are practically unexplored, and excepting the work done in holes Nos. 3 and 7 remain entirely untouched. The results obtained from holes 3, 7 and 13, below this conglomerate bed, were very promising and a vertical shaft was therefore started July, 1913, in the vicinity of No. 3. At a depth of 300' a crosscut to the N. W. was started. This cut through No. 8 conglomerate at 210' from the shaft. At 730' the crosscut broke through into overburden. A 200' winze, 30° incline, was sunk and 100' gained in depth. On the 400' level exploratory work for the lodes developed on South Lake property was continued, but with little success in finding commercial rock. At a distance of 1,050' N. W. of the shaft the crosscut broke through into the overburden. In the summer of 1915 shaft sinking was resumed, and by June, 1916, had been bottomed on the 800' level.

Crosscuts at right angles to the general trend of the formation were driven in both directions from the shaft on the 800' level. In July, 1917, the S. E. crosscut was in 1,800'. Progress in each direction is 110' monthly.

A lode found at 765' in has been opened by 400' of drifts. The S. E. crosscut will continue through the copper bearing amygdaloids found by drilling.

Equipment: includes a Nordberg hoist good for depth of 1,200', a small air compressor, boarding house and other necessary mine buildings.

The North Lake is an exploration company, but in view of the encouraging results secured by diamond-drill borings on this and adjoining properties, is considered promising and the present management is good.

OJIBWAY MINING CO.

MICHIGAN

Office: Suite 3300, 120 Broadway, New York City. **Mine office:** Calumet, Mich.

Officers: Thos. F. Cole, pres.; Thos. Hoatson, v. p.; Jos. B. Cotton, v. p.; Frederic R. Kennedy, sec.-treas.; Henry B. Paull, auditor; above, with G. A. Tomlinson, Walter B. Congdon, E. R. Grochau and Sam'l Brenner, directors; Wm. J. Uren, mgr.

Inc. June 8, 1907, in Michigan. **Cap.**, \$2,500,000; shares \$25 par; assessable; issued, \$2,100,000, \$15 paid. Levied a \$2 assessment Jan., 1910, payable \$1 March and \$1 Oct. and a \$1 assessment Dec. 10, 1912. Balance sheet, May, 1917, shows: assets, mining property, \$459,919; due on calls, \$42,953; cash, \$24,593; accounts receivable, \$4,381; supplies and suspense items, \$8,356; deficit, \$719,797. Liabilities, capital stock, \$1,260,000.

Boston Safe Deposit & Trust Co., registrar; American Trust Co., Boston, transfer agent. Shares are listed on the Boston Stock Exchange. Annual meeting, first Tuesday in June.

Property: 1,560 acres, bounded on the north by the Cliff and on the south by the Seneca, includes the old Manhattan tract, Bacon & Jacob lands, bought of the Union Copper Land & Mining Co.

The Kearsarge bed was located, 1904, on the Miskwabik tract, about 4 miles N. E. of Mohawk No. 1 shaft, and was proven by 5 bore holes drilled across the formation at intervals of 1,200'. Four of these holes gave good cores, being especially rich well toward the northern limits of the tract. The drill holes showed the Kearsarge amygdaloidal bed to be divided into 7 alternations of amygdaloid and trap, immediately above the geological horizon of the Wolverine sandstone, the different cores each showing copper from either one or more of four horizons. Drilling indicates that copper values alternate from bed to bed, or layer to layer, if the cupriferous zone of the Ojibway be considered a single strata; only two of the amygdaloidal layers being well mineralized in a given cross-section, as a rule.

Development: by two 3-compartment shafts. No. 1, or north shaft, 1,500' from the northern boundary of the property, is 2,051' deep, disclosing copper from grass roots. Developments in this shaft show that the Kearsarge stratum is split in two, having distinct beds of 20' and 13' respectively, separated by 13 to 15' of trap. The 1,600' and 1,700' levels show good ore.

No. 2 shaft, 1,116' S. W. of No. 1, is sunk about 90' in the footwall, and is 1,954' deep, disclosing very little copper ground above 800', though a material betterment is noted below that depth, and a very marked improvement is noted below 1,500' depth. This shaft is sunk in unusually firm ground, requiring very little timbering. Work was suspended June 30, 1913, for lack of working capital.

The mine is equipped for development to a depth of 2,000'. Development has been systematic, but the former management planned making a mine upon 5-drill cores, which, as development has proven, gave rather too favorable an indication of the richness of the lode.

OLD COLONY COPPER CO.**MICHIGAN****Office:** 70 State St., Boston, Mass. **Mine office:** Houghton, Mich.

Inc. 1898 in Michigan.

By vote of stockholders, Feb. 26, 1917, company was consolidated with the Mayflower Mining Co., on a share for share basis, under the title of Mayflower-Old Colony Copper Co., which see.

Property: about 1,200 acres on the Mineral Range, Houghton Co., Mich., in Sec. 17-18, T. 56, N., R. 32 W., east of the Calumet & Hecla, and south of the Mayflower mines.

Development: a cross-section was secured, 1899-1901, by a tunnel driven about 3,000' and by diamond drill borings eastward to the western end of the tunnel; this cross-section showed upwards of 75 amygdaloidal and conglomerate beds, a number of which carried a little copper in the drill cores and where cut in the tunnel. There are 5 shafts, aggregating about 2,200' in depth, and over 6,000' of drifts and crosscuts, all of which have shown indifferent results. Work was discontinued in 1909, and resumed again in 1911 by diamond drilling. In April, 1912, having finished the first and second sections of the original plan to drill the southern and eastern part of company's lands, the drills were moved to the north, and hole No. 14 was located between 400' and 500' S. E. of Mayflower hole No. 16, which has been called the "discovery" hole, and in which the so-called Mayflower lode was first cut on that property, disclosing a lode of unusual width and a high degree of mineralization. Two drills have been employed continuously in this work which has progressed in a general S. W. direction along the strike of the strata.

This diamond drilling campaign was an entirely original exploration of an unprospected territory, and met many puzzling geological problems but the work was thoroughly and scientifically performed and the lode has been located within an area of 3,000' N. and S. by 2,000' E., and the general average of values is good.

ONECO COPPER MINING CO.**MICHIGAN****Office:** 78 Devonshire St., Boston, Mass. **Mine office:** Hancock, Mich.

Officers: John D. Cuddihy, pres.; John Brooks, sec.-treas.; preceding, with F. L. Maguire, J. E. Fitz Gerald, Jr., directors; John L. Harris, gen. mgr.

Inc. Dec., 1898, in Michigan. Cap., \$2,500,000; shares \$25 par; \$5.50 paid in; issued, \$1,750,000 June 9, 1913. Levied a 50c assessment, Jan. 15, 1906, a \$1 assessment, Feb. 21, 1910, and a \$1 assessment, Oct. 10, 1912. Annual meeting, third Thursday in March. Stock traded on Boston curb. Company its own transfer agent; Federal Trust Co., Boston, registrar.

Property: 800 acres in Houghton county, all on the Keweenaw copper formation, in Secs. 2, 10 and 11, T. 56 N., R. 33 W., forming a main tract of 640 acres, and a smaller tract of 160 acres, adjoining diagonally, on the N. E. corner. The property lies east of the Franklin Junior and Rhode Island mines, but is separated therefrom by a quarter mile of intervening lands.

Development: the mine was opened 1862, and exploring was done 1890 and 1898. Work was begun by the company June 26, 1899, on a 2-compartment shaft that was sunk 500'. Drifting on the upper levels showed a bed of fair width, carrying a little copper, and the shaft cut a narrow fissure, rich in copper, this being of interest because it is one of the few productive crossveins found in the Portage Lake district. The bed on which the shaft was sunk has been variously identified as the Isle Royale, Grand Portage and Kearsarge amygdaloids, but is now termed the Oneco amygdaloid.

Work was suspended 1900 until Aug., 1909, when diamond drilling was begun, 10 drill holes being bored, cutting the Oneco bed on which the shaft is sunk, and an unidentified amygdaloidal bed, called the Torch Lake or Tomahawk lode, about 1,200' west of the Oneco, cores from both beds showing more or less copper. Drill holes were bored to depth of 1,000' to 1,700', locating the eastern sandstone and giving 2 complete cross-sections, 2,700' apart.

The mine was reopened Nov., 1910, and drifting resumed on the 4th level. The shaft has been sunk to a depth of 1,250' and extensive drifting on the 9th, 10th, 11th and 12th levels, both north and south, has shown the vein to be 10 to 20' wide and well mineralized. Mine has been idle since 1914; due to lack of funds.

ONONDAGA COPPER CO.

MICHIGAN

Houghton, Mich.

Officers: Reginald C. Pryor, pres., treas. and gen. mgr.; C. H. Lang, v. p.; Wm. Duffney, sec., with Ward B. Smith and D. L. Robinson, directors.

Inc. April 22, 1912, in Michigan. **Cap.**, \$3,750,000; shares \$25 par; \$4 paid; issued, 99,955. Stock listed on the Boston Curb Exchange. State Street Trust Co., Boston, transfer agent; Commonwealth Trust Co., registrar. Balance, Dec. 31, 1916, \$33,130.

Property: 10,230 acres in Ontonagon Co., Mich., near the White Pine mine of the Calumet & Hecla Co. The formation, a fine-grained sandstone, has been exposed by surface trenching at several points and found to carry flake copper in considerable quantity. The values appear to be patchy, but as the ore frequently averages 10% where cross-faults occur, a commercial average may reasonably be expected.

Development: is confined to diamond drill work. The first hole completed in Jan., 1913, has a depth of 1,912' and is apparently in the horizon of the Isle Royale-Arcadian lode. Hole No. 2 is 1,500' deep. Hole No. 5 driven in 1913 to 2,000' depth, failed to reach the contact. In 1914 holes Nos. 6, 7, 8 and 9 were drilled, making a complete cross-section from the S. E. corner of Sec. 14 to the N. W. corner of Sec. 4. None of the lodes cut in the holes gave cores showing copper in commercial quantities. Owing to unsettled conditions work was discontinued Sept. 21, 1914. Drilling near the northern boundary was started July, 1915, each hole exploring the territory farther south. In the extreme S. E. corner the lode was located at 1,100' depth, but revealed no copper values. In 1916, drilling gave cores from the lode in several places, but revealed no commercial values, so operations were stopped, Aug., 1916, and management will await results of development on neighboring properties.

OSCEOLA CONSOLIDATED MINING CO.

MICHIGAN

Office: 12 Ashburton Place, Boston, Mass. **Mine office:** Osceola, Houghton Co., Mich.

Officers: E. V. R. Thayer, pres.; Rodolphe L. Agassiz, v. p.; Wm. H. Dwelly, E. V. R. Thayer, J. M. Longyear, Wm. D. Calverly, D. S. Dean, Benj. Joy and Guy W. Currier, directors; C. H. Bissell, sec.-treas.; G. L. Osgood, asst. sec.-treas.; James MacNaughton, gen. mgr.; Frank H. Haller, supt.; A. Lincoln Burgan, mill supt.; Chas. D. Hohl, chief engr.; Jas. Rowe, mng. capt. **Osceola branch:** Jos. Discombe, mng. capt. **North Kearsarge branch:** Frank Lands, mng. capt. **South Kearsarge branch:** John T. Reeder, purch. agt.; Wm. Veale, chief clerk.

Inc. 1873, in Michigan, and reincorporated 1903 for a term of 30 years. **Cap.**, \$2,500,000; shares \$25 par; issued, \$2,403,750. State Street Trust Co., Boston, registrar; American Trust Co., Boston, transfer agent. Shares

are listed on the Boston Stock Exchange. Annual meeting, second Thursday in March. Company is controlled by the Calumet & Hecla Mining Co., through ownership of 32,750 shares.

Balance sheet of Dec. 31, 1916, shows net earnings of \$2,776,160, and a surplus of \$2,677,547.

Dividends: company has paid 87 dividends, beginning 1878, to August, 1917, aggregating \$16,217,975. Recently dividends have been \$2 in 1904; \$4 in 1905; \$16 in 1906; \$7 in 1907; \$2 in 1908; \$14 in 1909; \$8 in 1910; \$7 in 1911; \$12 in 1912; \$7.50 in 1913; \$3 in 1914; \$8 in 1915; \$19 in 1916; \$12 to Aug., 1917.

Net earnings were: \$677,105 in 1908; \$1,070,645 in 1909; \$758,586 in 1910; \$664,628 in 1911; \$1,163,288 in 1912, equivalent to \$12.09 per share; \$381,967 in 1913; \$353,677 in 1914; \$1,610,860 in 1915; \$2,776,160 in 1916.

Property: 2,120 acres, in 4 separate tracts, also an extensive mill site, in Houghton Co., and miscellaneous lands in Houghton and Keweenaw Counties, Michigan. Company's property includes the Osceola, North Kearsarge, South Kearsarge and Tamarack Junior mines.

The **Osceola** mine proper, 720 acres, lying next south of the Calumet & Hecla, was opened, 1873, on the Calumet conglomerate; this bed proving unremunerative, work was begun on the Osceola amygdaloidal bed, parallel and 730' east of the Calumet conglomerate. The Osceola amygdaloid has a strike of approximately N. 39° E., and is opened by six shafts numbered from north to south. Crosscuts have been sent from the Osceola workings to the Calumet conglomerate, at various depth, without encouragement, and diamond drilling was done, 1904, to locate and test the Kearsarge amygdaloid on the old Osceola tract, but the results were not encouraging. It is said that the company ceded the right to mine the Kearsarge bed on its property to the Laurium Mining Co., in exchange for certain surface rights.

The 4 northernmost shafts of the Osceola mine proper are abandoned. No. 5 Osceola shaft, 700' S. E. of No. 3, is 4,667' deep. No. 6 Osceola shaft, formerly known as the Opechee, 1,300' S. W. of No. 5, is 4,734' deep. This shaft shows some good stopes, especially on the lower levels in the southern drifts, toward the Tecumseh mine.

Some work was done at No. 3 shaft in 1916, but stopped 1917, until labor and mill arrangements improve. Mining was limited to No. 6 shaft, where, on No. 38 and 39 levels S. the ground was rich. No. 42 was driven into La Salle ground (which report see). An auxiliary shaft was started 1,800' S. of No. 6, and is operating between No. 43 and 45 levels. Rope-haulage was installed on No. 45 to tram ore from this new shaft.

Osceola contributed 225,030 tons of 14.89 lb. copper ore in 1916.

The compressor house is equipped with a 50-drill Nordberg 2-stage cross-compound air compressor.

Water is secured from Lake Superior through a 1½-mile line of 6" pipe, connecting with a stand pipe at the Tamarack mine, leading to a 130,000-gal. concrete reservoir between Osceola shafts Nos. 5 and 6.

The **Kearsarge** or **North Kearsarge** mine, 1,120 acres, lies north of the Wolverine, with which it has underground connections. Extensive diamond drilling, 1905-1907, showed considerable good stamp rock in the foot and hanging walls, at points where the main bed was impoverished. Diamond-drill boring costs were \$2 to \$3 per foot, as against \$6 to \$8 per foot for drifting. The Kearsarge amygdaloidal bed ranges 16 to 20' in width, in this mine, and has proven very bunched, though with very good average values. The southern workings, approaching the Wolverine, have shown improve-

ment, but the mine is richest near the Ahmeek, to the north. About 60 power drills are used in this branch.

No. 1 North Kearsarge shaft is 4,092' deep and has a Nordberg hoist good for 6,500' depth, operating two 6-ton skips in balance. No. 2 North Kearsarge shaft was abandoned at depth of 2,400', some years ago.

No. 3 North Kearsarge shaft, 1,825' N. E. of No. 1, is 3,403' deep and develops a large area of good ground, especially in the northern drifts. No. 4 North Kearsarge shaft, begun 1907, sunk 75' in the footwall, is 1,622' deep. The shaft is lined with concrete for 185' from surface, and has large loading bins just below the 10th and 13th levels, to which rock is milled through chutes, from the levels above. Equipment of the rock house includes two 40-ton crushers, driven by a special Nordberg engine.

Shaft No. 3 was repaired during 1915 and 1916, and is producing 450 tons daily, all from above No. 20 level. Copper-content of ore from No. 1 and 4 shafts improved over previous years.

The steel frame boiler house at No. 4 has three 84" Pratt boilers, with room for 2 additional.

The North Kearsarge surface plant includes a stone compressor house and a 30-drill compressor at No. 1 shaft, where are located also the combination machine and carpenter shops, warehouse and office, all of wood.

North Kearsarge contributed 651,079 tons of 14.23 lb. copper ore during 1916, which was considered a profitable period for the mine.

The **South Kearsarge** mine, 160 acres, lying south of the Wolverine and east of the Centennial, was known formerly as the Iroquois. Development was begun Sept., 1899, and the best stopes are toward the Centennial line, the Kearsarge bed averaging about the same width as in the North Kearsarge and Wolverine mines, and being remarkably uniform in copper values. This mine is completely developed, both shafts and all but a few of the drifts having reached the boundaries of the property, and the mine is officially stated to have a life of but 2 years, at the present rate of extraction, without taking into account about 700,000 tons in the pillars and arches; the mining of these will be a slow operation and costs higher than at present.

Mining pillars continued in 1916 to a limited extent. Over 33% of the ore treated from this mine (408,572 tons of 17.06 lb. copper) came from footwall work, cleaning up finished stopes, and a surface dump. When these are finished the 1917 yield will be lower.

No. 1 South Kearsarge shaft, the northernmost, is 2,820' deep, and practically at the boundary. The shaft rock house cares also for rock from No. 2 shaft, with which it is connected by an 1,100' trestle. Two skips are operated in balance. No. 2 South Kearsarge shaft is 1,992' deep.

A 350-gal per min. motor-driven pump was installed in 1916 to handle the water coming through caved workings.

The **Tamarack Junior** mine, 120 acres, lying between the Centennial and Calumet & Hecla, has 2 vertical shafts, on the Calumet conglomerate, No. 2 being 3,360' deep, with 12 levels opened. The Tamarack Junior has been idle since 1903, and apparently is dead, so far as the conglomerate is concerned, with indifferent prospects of finding other workable cupriferous beds on the tract.

Rock is transported from the various mines to the mills by the Hancock & Calumet railway, a branch of the Duluth, South Shore & Atlantic system.

Mill: is built in 2 sections, the main section being 176x213', of steel frame, with 4 Nordberg steeple-compound stamps. These stamps, which are now in very general use in the Lake Superior district, were invented by

B. Nordberg as the result of some years of experimentation. The stamps have circular mortars, with $\frac{5}{8}$ " screens, and hydraulic separators, about 20% of the copper secured in milling coming from the mortar discharges and separators. The older section has 3 stamps with circular screens having $\frac{3}{8}$ " openings, and is otherwise a duplicate of No. 2 mill.

The wash department of the 2 mills are equipped with Woodbury classifiers and jigs with 6 round tables and 1 Wilfley table for each stamp, the Wilfleys taking headings from the round tables. An Allis-Chalmers Chilean mill reduces over-size material from the stamp mortars and there are crushing rolls and Hardinge mills. Stamping costs were 16.95c per short ton in 1905, and only 11.71c in 1907, the latter figure being the lowest ever reported by any mill for this work, and milling costs were 13.36c per ton in 1908. No figures of stamping costs have been made public since the change in management.

Mill improvements in 1916 amounted to \$24,645. The fire-protection system was connected with the Calumet & Hecla.

The steel boiler house, adjoining the mills and furnishing power for both, has three 250-h. p. 72" boilers, delivering steam at 150-lbs. pressure, and nine 250 h. p. 84" boilers operated under 105-lbs. pressure, all of the locomotive-firebox type.

The power plant has an Allis-Chalmers Corliss engine, operating a 100 k. w. Morgan-Gardner d. c. generator, furnishing current for 220-volt incandescent enclosed arc lamps.

The joint pump house of the Osceola and Tamarack mines has two 40,000,000-gal. triple-expansion Nordberg pumps having 22", 40" and 60" cylinders, with three 30" horizontal plungers of 52" stroke and 42" discharge. Water is taken through an 8' tunnel, running 1,275' under Torch lake, with 3" intake holes, guarding against clogging by ice.

Production:

	Tons R'k Treated	Lbs. Min. Produced	Lbs. Cu. per Ton		Mine Cost	Total	
			R'k Stpd.	per Ton(a)	Lbs. Cu. Produced	Cost per Lb.	Rec'd per Lb.
1916.....	1,284,681	26,901,015	15.2	\$1.36	19,586,501	11.69	25.73
1915.....	1,361,089	26,777,790	14.5	1.18	19,731,472	10.03	18.19
1914.....	1,108,447	20,997,900	13.5	1.29	14,970,737	10.79	13.14
1913.....	735,044	14,945,645	15.4	1.60(d)	11,325,010	12.30	15.50
1912.....	1,246,557	24,282,312	14.8	1.23(c)	18,413,387	10.36	16.63
1911.....	1,246,596	24,452,912	14.8	1.14(b)	18,388,193	9.28	.....
1910.....	1,217,720	25,669,913	15.9	1.28	19,346,566	9.37	.....

(a) Includes mining, transportation, stamping and taxes per ton of rock.

(b) 63,449 tons No. Kearsarge rock stamped at Tamarack mills at a cost of 27.28c per ton.

(c) 77,937 tons No. Kearsarge rock stamped at Tamarack mills at a cost of 24.32c per ton.

(d) 13,379 tons No. Kearsarge rock stamped at Tamarack mills at a cost of 27.88c per ton.

In 1916 the mine costs per ton at the different mines operated by the company were as follows: Osceola, \$1.84; North Kearsarge, \$1.30; South Kearsarge, \$1.18.

Strike conditions and inefficiency of green labor in 1913-14 and the outbreak of the European war later in 1914 contributed to low production and high costs during that time. From Sept. 1, 1914, to Feb. 1, 1915, the

mines were operated on a three-quarters time basis. Osceola is a low-grade mine whose profitable operation is ensured by the efficient management of the Calumet & Hecla control.

Copper yield for the first 4 months of 1917 averaged 1,519,000 lbs. per month; nearly 40,000 tons of ore was treated in June, 1917.

PACIFIC COPPER CO.

MICHIGAN

Office: 705 Sears Bldg., Boston, Mass. **Mine office:** Leopold Bldg., Houghton, Houghton Co., Mich.

Officers: Geo. P. Gardner, pres.; Chas. J. Paine, Jr., sec.-treas.; preceding, with W. Cameron Forbes, Chas. E. Perkins, Nathaniel H. Stone, E. V. R. Thayer, T. N. Perkins, Walter Hunnewell and R. R. Goodell, directors; F. W. Nichols, agent.

Inc. Aug., 1890, in Michigan. Cap., \$1,250,000; shares \$25 par; issued, \$1,000,000, \$2 paid. Is controlled, through ownership of about 20,000 shares, by St. Mary's Mineral Land Co. Paid a \$1 dividend Nov. 18, 1910. Ended 1916 with \$7,706 cash on hand.

Property: 820 acres, the N. W. $\frac{1}{4}$ and the S. W. diagonal half of the S. W. $\frac{1}{4}$ of the N. E. $\frac{1}{4}$ of Sec. 4, and Sec. 5, T. 54 N., R. 34 W. Land lies just N. W. of the Atlantic mine, and supposedly carries the northern extension of the Atlantic ashbed, on which a little exploratory work was done previous to organization. Has done no mining work since 1890.

Of the \$40,000 originally raised by sale of 20,000 shares, one-half was spent in prospecting work. The timber on the lands has been sold at various times and 140 acres sold to the Naumkeag Copper Co. From these sales and interest on funds, company has distributed \$40,000 cash and 4,000 shares of Naumkeag Copper Co. stock to its stockholders.

PHOENIX CONSOLIDATED COPPER CO.

MICHIGAN

Controlled by Keweenaw Copper Co.

Office: Calumet, Mich. **Mine near Phoenix, Keweenaw Co., Mich.**

Officers: Thos. F. Cole, pres.; Spencer R. Hill, v. p.; F. W. Taylor, sec.-treas.; preceding, with G. G. Hartley and Thos. Hoatson, directors; W. J. Uren, gen. mgr.

Inc. April, 1899, in Michigan. Cap., \$2,500,000; shares \$25 par; \$14.50 paid in. Is controlled by the Keweenaw Copper Co., through ownership of about 90% of the share capital, acquired by an exchange of shares on the basis of 10 shares of Phoenix for 1 share of Keweenaw.

Report for year ended Dec. 31, 1916, showed assets of \$1,804,842, which includes: real estate, \$505,213; development and exploration expense prior to 1916, \$1,065,785; exploration and development during 1916, \$74,988; cash, \$15,980.

Liabilities: Keweenaw Copper Co., \$112,995; mine accounts and liabilities, \$41,847. Last assessment was \$2 per share, July, 1915.

Property: 2,505 acres, carrying 5 different fissure veins, on which more or less mining has been done, at various times. The old Phoenix mine, included in the present consolidation, is famous for having produced the largest mass of native copper ever found, weighing upwards of 500 tons. The Phoenix fissure, on which work was begun 1846, was opened to a depth of only about 90', yielding considerable mass copper and silver. There also are possibilities on the Ashbed lode, which has been slightly developed by an exploratory tunnel. The mine has extensive openings and a modern equipment, and was worked for 6 years without success, until closed down, June 15, 1905.

Diamond drilling on the Ashbed lode, 1910, gave encouraging results and a resumption of this work late in 1913, after several years of idleness, showed fair copper values. In 1916, 32 holes were drilled, aggregating 1,824'

on the 4th, 6th, 8th, 10th and 12th levels, all the cores showing copper either in the drifts or towards the walls.

New work in 1916 totaled 5,426'. Shaft sunk 201' to 1,616' in depth and good copper ground was found on the 6th, 7th, 8th and 10th levels. The "Old Phoenix" fissure was explored by a crosscut northwards to hanging wall of the Ashbed lode and found not mineralized, excepting where it cuts the lode.

Equipment: at power plant at No. 1 shaft includes 3 boilers, 2 air compressors, hoisting engine and pumps. The mill contains 7 Wilfley tables. Company plans to make tests with the Mineral Separation process, 1917.

QUINCY MINING CO.

MICHIGAN

Office: 32 Broadway, New York. **Mine and works office:** Hancock, Houghton Co., Mich.

Officers: Wm. Rogers Todd, pres.; W. Parsons Todd, v. p.; Jas. L. Bishop, Chas. J. Devereaux, Isaac H. Meserve, Wm. M. Belcher, John M. Longyear, Walter P. Bliss and Otto Kirchner, directors; W. A. O. Paul, sec.-treas.; F. J. McLain, asst. sec.-treas.; Chas. L. Lawton, gen. mgr.; Alex. Laist, smelter supt.

Inc. March 30, 1848, under special charter from the state of Michigan. **Cap.**, \$3,750,000; shares \$25 par; issued, \$2,750,000. Original cap., \$500,000; reincorporated March 6, 1878, for 30 years more with cap. \$1,000,000, increased, 1889, to \$1,250,000, again increased, 1896, to \$2,500,000, and once more increased, 1906, to \$3,750,000. Reincorporated 1908 for a third term of 30 years. Old Colony Trust Co., Boston, transfer agent. Shares are listed on the Boston Stock Exchange. Annual meeting, first Wednesday in June.

Comparative Statement: Assets and Liabilities exclusive of real estate, mine plant and supplies in use.

	Cash, Cu, Invest's	Accounts Rec.	Total	Accounts Pay.	Add. Supplies At Mine	At Smelt.	Total
1916..	\$1,824,784	\$624,799	\$2,449,584	\$246,417	\$404,283	\$56,164	\$2,663,615
1915..	1,018,381	626,283	1,644,664	282,861	271,035	32,118	1,664,956
1914..	736,617	152,795	889,412	255,620	229,912	33,827	897,531
1913..	406,633	53,110	459,733	110,179	352,998	44,386	746,938

	Metal Sales	Total Income	Expenses	Net Income	Divid's	Balance Dec. 31
1916. . . .	\$5,400,874	\$5,421,835	\$2,663,176	\$2,758,659	\$1,760,000	\$2,663,615
1915. . . .	3,983,958	3,999,745	2,126,071	1,873,674	880,000	1,664,956(a)
1914. . . .	2,054,622	2,063,650	1,858,057	205,593	55,000	897,532
1913. . . .	1,921,198	1,940,128	1,863,968	76,160	412,500	746,938(b)

(a) After deducting \$226,250 paid Hancock Cons. Mining Co. for mineral land purchased.

(b) Balance, Jan. 1, 1913, \$1,233,278; also, deduct \$150,000 paid note given St. Mary's Canal Mineral Land Co.

Dividends: Quincy paid its first dividend in 1862, and profits have been disbursed to shareholders in every succeeding year except 1866 and 1867, giving the company a continuous dividend record of 49 years, from 1868 to date, rendering it the oldest dividend-paying American copper mine, and second only to the Tharsis Sulphur & Copper Co., Ltd., which has a record of continuous dividends since 1867, or 1 year longer than the Quincy's record. Recent dividends, by years, have been as follows: 1900-1, 36%; 1902, 28%; 1903, 22%; 1904, 20%; 1905, 24%; 1906, 50%; 1907, 54%; 1908, 18%; 1909, 16%; 1910, 20%; 1911, 16%; 1912, 21%; 1913, 15%; 1914, 2%; 1915, 32%; 1916, 64%; 1917, 60% to September. Total dividends to Sept., 1917, \$25,187,500.

A table of statistics, production, costs, etc., 1864-1905, is given in Vol. X., Copper Handbook.

The year 1917 marked Quincy's 69th anniversary. During this period it has paid its stockholders \$25,187,500 in dividends and still had \$2,663,615 cash surplus, equivalent to a profit of 4½c on each of 571,452,080 lbs. copper produced, and sold at an average price for the entire 69 years of 15.3456c, equal to \$87,765,820.

Production in 1916 was 1,204,020 tons of rock, averaging 17½ lbs. copper. Outlook for 1918 is good for continued production and a new hoist suitable for 10,000' in depth will permit deep exploration. A noteworthy fact was the find of a great body of mass copper 40' long and 70% pure, on the 6,500' level of No. 2 shaft, early in 1917.

Property: is very extensive, the management having adopted the policy, many years ago, of expansion of territory as opportunities offered. Acquisitions include a purchase of the Arcadian Copper Co., 1907, at a price of \$750,000; the old Franklin mine, 1908, at a cost of \$170,000, and the acquisition, 1910, of Sec. 14 and the N. E. ¼ of Sec. 22, of 800 acres, from St. Mary's Mineral Land Co. bought for \$600,000; 80 acres under and to the S. of shaft No. 2 were bought from Hancock Mining Co., July, 1915, for \$226,250.

The holdings of the Quincy now include lands formerly held by the Pewabic, Franklin, Mesnard, Pontiac, Arcadian and St. Mary's, in order named, from south to north.

Geology and Development: property carries the Pewabic bed and a number of parallel copper-bearing amygdaloids, from the Hancock mine, on the northern shore of Portage lake, to the boundary of the Franklin Junior mine, or about half way from Hancock to Calumet. Through the acquisition of new territory, shafts Nos. 2, 6 and 8 can be sunk to practically unlimited depth.

The mine was opened 1848, on the Quincy amygdaloid, a bed lying some distance west of the Pewabic, but the Quincy bed was abandoned 1856, when the Pewabic amygdaloid was opened. There is a footwall branch, known as the Pewabic East lode, underlying and parallel with the main bed, which occasionally yields good returns. The so-called West branch, about 300' west of the Pewabic bed, has been opened by shafts Nos. 4 and 7 through crosscuts on the 30th, 39th, 40th, 44th and 49th levels, and considerable stamp rock has been stoped therefrom. About 1,000' west of the Pewabic bed is the Hancock amygdaloid, which is narrow but fairly mineralized, and which yielded an average of 21 lbs. fine copper per ton, after reasonable selection, when worked in the old Hancock mine, this figure being materially above the present average return from the Pewabic bed.

The Pewabic amygdaloidal bed, on which all shafts are sunk, has a strike of about N. 30° E., with an average dip of 52 to 54° at surface, flattening in the lowest workings at depth of more than a mile to approximately 37° 30', the shafts following the dip of the bed on catenary curves. The Pewabic averages about 20' in width in the upper workings, but is materially narrower at the bottom. The lower workings show decreased copper values with much less heavy copper than above, but the ore is more uniform in value. Part of the decrease in copper returns is due to mining rock that formerly would have been left as worthless and practically the entire Pewabic bed is now mined. There are copper courses, or shoots, that rake to the north with depth.

The Pewabic bed has good walls and the mine requires comparatively little timbering. Dry-walls are built of waste rock, in wide stopes, saving the expense of hoisting waste and also the cost of timber. Shafts are sunk mainly in the footwall. The Pewabic rock now runs 17 lbs. fine cop-

per per ton, with some silver values. Previous to about 1890, about 40% of the copper was secured in masses. In 1912 the proportion of mass copper was about 15%. The southernmost drifts of the Quincy are about 3,000' below mean water datum of Portage lake, while the northernmost workings at No. 8 shaft are fully 2 miles from the southern breasts.

New work totaled 27,340' in 1915, and average about 6 miles yearly, the mine having over 100 miles of workings. Fire doors have been installed and every precaution is taken against fire. Miners are carried to and from work in man cars holding 30 men each, and hoisting cables are inspected frequently, with every care taken to prevent accidents.

The electric underground traction plant was installed by the General Electric Co., tram lines averaging about 1,800' each in length with gradients of 1.5% towards the shafts. The equipment includes 20 electric locomotives, each hauling 4 or 5 three-ton rock cars at a speed of 6 to 8 miles per hour, 1 man caring for each train. Tram cars are unloaded into 500-ton storage bins, built on the hanging-wall side of the shafts. This system of storage obviates the loss of time by either the tram lines or skips, and adds about 25% to the hoisting capacity of the mine, the property being equipped with hoisting and rockhouse capacity for a production of over 4,000 tons daily. About 200 rock drills are used in sinking, drifting and stoping, and extensive use is made of the diamond drill for exploratory and preliminary development work.

The Quincy has been much troubled by air blasts, violent disturbances brought about by the settling of superincumbent rock in the scores of miles of worked-out openings, causing violent compression of the air elsewhere throughout the mine. The most serious disturbances from air blasts, which are practically artificial earthquakes, felt for only a few miles distance upon surface, were experienced in Feb., 1906, and March, 1914, and there seems reason to fear that these troubles will prove intermittently continuous for the balance of the mine's life. The air blasts, while unpleasant, have caused more alarm than damage.

Owing to the absorption of adjoining mines, the Quincy shafts are numbered irregularly and are described hereinafter in order of occurrence, from south to north, rather than in order by number.

No. 7 shaft: the southernmost, planned and sunk by John L. Harris, leaves surface at an angle of 53° and is bottomed at an angle of 37° 30'. The shaft was sunk 4,000', in 18 months, through very refractory rock, this speed being rendered possible by sinking and raising in 5 sections simultaneously. The shaft is bottomed at the 71st level, at a depth of about 6,500'.

No. 7 shaft has a steel shaft rock house, with 750-ton bins, a steam hammer and two 24x36" crushers.

No. 7 shaft has an 8,000-h. p. Allis-Chalmers Corliss hoist, with 52x84" cylinders and winding drums 28' in diameter by 11' 9" face, carrying 8,000' of 1½" steel cable, the main shaft weighing 120,000 lbs. This hoist can raise 6-ton skips from a depth of 1½ miles at a speed of 3,000' per minute, hoisting being limited to this rate by an automatic cutoff which also prevents overwinding. Starting a load of 6 tons from a depth of more than a mile, the hoist, if untouched, will check without damage after raising the skip only a few feet higher than the appointed place in the shaft house. There is a 1,300-gal. bailer in addition to skips.

No. 4 shaft is closed down.

No. 2 shaft: 585' next north of No. 4, is below the 75th level. Equipment includes a 1,300-gal. bailer for raising water and 30 to 40 power drills are operated normally.

No. 2 shaft has a shaft rock house, built 1908, by the American Bridge

Co. Stamp rock from the shaft is dumped onto grizzlies, with wide bars, smaller material falling into circular bins, whence it passes by gravity to the crushers and thence into the main rock house bin. The smaller mass copper passes through the grizzly bars, is picked out by workmen and dropped into a chute carrying it to a steam hammer, there also being a chute for waste rock. The grizzlies allow large pieces of rock to fall into a bin of reinforced concrete in front of the steam hammer, where broken and sent to the main rock house bin through a chute, while mass copper is dropped into a steel tube leading to a circular steel bin, which loads into railroad cars through chutes with pneumatic gates.

No. 2 shaft has a special crushing plant for waste rock, between the collar of the shaft and the rock house. Poor rock is dumped into a circular bin and drawn by gravity to a crusher, going thence to circular storage bins, from which it is drawn off into wagons or railroad cars for use in railroad ballasting, road building and concrete work. There are similar crushing plants at the other main shafts, except No. 7.

The surface equipment of No. 2 shaft is very heavy, being practically a duplicate of that at No. 7, including a powerful hoist and two 60-drill cross-compound 2-stage Corliss air compressors.

No. 6 shaft 1,928' north of No. 2, is below the 73rd level. Equipment includes an Allis-Chalmers duplex hoist, with a 22' 6" straight-face drum, raising 8-ton skips; a 1,300-gal. bailer, a centrifugal feed-water heater being attached to one cylinder of the hoist, and a 100-drill 2-stage compound air compressor. The boiler house has four 250-h. p. Wickes water-tube vertical boilers, nine 100-h. p. locomotive firebox boilers, and a powerful fire pump.

The Franklin mine lies next north of No. 6. The Quincy bought the old Franklin mine, 160 acres, for \$170,000, taking possession Dec., 1908, and closing the mine immediately. It is doubtful if the old shafts ever will be used by the Quincy.

No. 8 shaft: the Mesnard, 4,168' north of No. 6, is at the 64th level. Levels in this shaft were opened at 135' intervals and former numbering made the 24th level of No. 8 correspond with the 42d level of No. 6. This lode was poor in the upper levels, but the lower workings, while by no means up to the Quincy average of some years ago in quality of ore developed, show a bed wider and better mineralized than above, and the ground is of very satisfactory and profitable average, the improvement that began on the 10th level being very marked below the 20th level. The present average of the lode at the Mesnard shaft is nearly up to the present average of the older workings. This shaft is connected with the workings to the south, which at this depth are at 200' intervals, from the 41st, which was the first to pass under the old Franklin mine, to the 63rd inclusive. Production, begun 1907 from this shaft, was 1,600 tons daily. The power house at No. 8 has a Nordberg 32x72" duplex-cylinder engine with double conical drum, of 12' 6" minimum and 18' 6" maximum diam., good for 6,000' depth, and a 65-drill Nordberg 2-stage cross-compound air compressor. The boiler room has ten, 250-h. p. Parker and Burt boilers. There is a large changing house of reinforced concrete at this shaft, and many well-built houses for employees.

No. 9 shaft: 2,600' north of No. 8 is the old 100' Pontiac shaft, given a concrete collar and cut down to 3-compartment size. The shaft is 2,900' deep, and at 2,600' cuts a drift from No. 8, giving ventilation; it is not in operation.

To the north of the Pontiac shaft there is a long stretch of ground, bought of the Arcadian Copper Co. and St. Mary's Mineral Land Co., carrying the extension of the Pewabic bed and available for later development.

The surface plant of the Quincy is very complete. Miscellaneous buildings at the mine include a large warehouse, general office, several hundred dwellings at the mine location and a considerable number of houses at the mills.

Water for boilers and potable use at the mine location is taken from Portage lake, the pumps forcing water for a mile against a static head of 640'.

The company's private rail line, the Quincy & Torch Lake, built 1890, is 6 miles long, touching at all shafts and shops at the mine and at the boiler house, wharves and coal sheds at the mill. This line is connected with the Mineral Range, Hancock & Calumet and Copper Range railways. Equipment includes several locomotives, freight cars and nearly 150 hopper cars for rock, the latter having automatic couplers and air brakes.

Stamp mills: at Mason, on Torch lake, 6 miles from the mine, have 8 stamps, with combined capacity of about 5,500 tons daily, the stamps giving an average duty of about 700 tons. Two 36"x8' Hardinge ball mills were added in 1916. In 1917 steel balls were substituted for pebbles in these mills. The results secured at the Quincy mills reflect great credit upon Superintendent Shields.

No. 1 mill, of wood, has 5 Allis-Chalmers 2-way stamps, taking steam at 100 lbs. pressure. There is an Allis-Chalmers Huntington mill for re-grinding raggings, and the dressing machinery includes 92 Hodge jigs, and 32 Wilfley tables.

No. 2 mill, 630' north of No. 1, has 3 Allis-Chalmers heads, each set on foundations of heavy timbers and concrete, surmounted by a bottom plate of 22 tons, a middle plate of 18 tons and a top plate of 18 tons, all of solid iron castings, above which are the mortar boxes of the stamps. The stamps have 1" revolving screens for the mortar boxes, with hydraulic discharges, as have the launders leading from the mortars, these yielding about 60% of the copper secured. Finishing jigs and slime tables have been replaced by 24 Wilfley tables, 8 for each stamp, assisted by 3 Standard concentrators. Each stamp has 12 rough jigs; 6 Wilfleys for finishing and 2 Wilfleys and 1 Standard table for slimes. There is a settler from which slimes are taken to the Wilfley tables. Re-grinding is done by a Trent Chilean mill, with 3 jigs and 3 Wilfleys as auxiliaries. By the adoption of hydraulic discharges and other improvements the capacity of the stamp-heads has been increased about 25%, while changes in the wash have given an increased capacity of 30%, with labor costs reduced 25% and loss in tailings cut down 40 to 50%. About 35% of the present product of the mill is No. 3 grade mineral, carrying very fine copper.

The mill power house at No. 2 mill, has four 250-h. p. Wickes vertical water-tube boilers. There is an electric light plant.

The mill and pump house has a 20,000,000-gal. centrifugal pump, and a 20,000,000-gal. Allis-Chalmers vertical triple-expansion pump, and the old pump house has 3 pumps with combined capacity of 21,000,000 gal. daily. Water is taken from a 7x7' 6" tunnel, driven 100' under the bed of the lake. A 6x6' 6" tunnel 440' long, connecting mills, boiler houses and pump houses, carries both water and steam pipes.

The tailings at the mills are very extensive, including millions of tons of stamp sand, and various experiments on reconcentration have been conducted by different interests at intervals since 1902. The companies that have attacked this proposition have bankrupted themselves with monotonous regularity, notwithstanding which, the successful results being secured at the re-grinding mills of the Calumet & Hecla offer promise that the Quincy sands also may be retreated profitably at some future time.

Smelter: blown in Dec. 1, 1898, is at Ripley, on the shore of Portage lake, opposite Houghton, just east of Hancock and only a half mile from the mine.

One building has four 40-ton reverberatory furnaces, and a second building has 60-ton and 120-ton reverberatories, the latter having an automatic casting machine. On arriving at the reverberatory building the trucks carrying mineral are lifted by electric cranes and contents dumped into the furnaces, which are top-charged. An overhead trolley in the main building permits handling large bars and cakes, and a trolley dipping system is used for casting. Slags are trammed, in 3,000-lb. pots, to a 30' hydraulic elevator which raises the ladles and dumps their contents over the end of a trestle. The cupola building has 1 blast furnace only, for reverberatory slags. A briquetting plant has 2 boiler-iron retorts for briquetting low-grade mineral before smelting. Miscellaneous buildings at the smelter include an engine house, casting house, cooper shop, office, laboratory, machine shop, 50x100' warehouse, and a coal shed.

Production has remained nearly constant for several years but was seriously lessened by the labor strike of 1913. Silver production averages about 100,000 oz. yearly.

Recent Production:

	Tons R'k	Lbs. Mineral Produced	Ref. Copper Lbs.	Lbs. Cu. per(a) Ton R'k	Cost per Lb.	Sell. Price
1916.....	1,204,026	33,864,280	21,065,612	17.5	12.4c	25.5c
1915.....	1,269,000	34,251,765	22,054,813	17.38	9.42c	18.01c
1914.....	.....	22,612,460	15,356,380	....	11.51c	13.29c
1913.....	804,645	18,161,575	12,184,128	15.11	13.65c	15.59c
1912.....	1,309,258	30,040,360	20,634,800	15.76	11.09c	16.24c
1911.....	1,382,524	32,550,440	22,252,943	16.1	10.17c	12.72c

(a) Includes mining expense, smelting transportation, etc., and taxes paid in Michigan.

Management is entitled to credit for following unswervingly a policy of expansion. Finlay in 1911 estimated a life of 7 years and a further production of but 200,000,000 lbs. of copper. Additional acreage purchased since that year makes the probable production 1,000,000,000 lbs. of copper and a life of 50 years. The company has the longest record of continuous annual dividend payments of any American copper mine and bids fair to continue disbursing large profits for at least another generation or two.

RHODE ISLAND COPPER CO.

MICHIGAN

Subsidiary of the Franklin Mining Co.

Office: 60 Congress St., Boston, Mass. **Mine office:** Demmon, Houghton Co., Mich.

Officers: R. M. Edwards, pres.; Henry Tolman, treas.; Albert L. Wyman, sec.; preceding, with S. J. Jennings, H. M. Howard, Carlos W. Van Law and C. A. Hight, directors.

Inc. Dec. 9, 1898, in Michigan. **Cap.,** \$2,500,000; shares \$25 par; paid in, \$10.50. Assessment No. 2, of \$1, was payable Jan. 14, 1907, and assessment No. 3, of 50c, was payable June 15, 1910. The Franklin Mining Co. owns 99,030 shares, or 99%, acquired by exchange of 3 shares Rhode Island for one of Franklin. Annual meeting, second Wednesday in April. No bonded debt. American Transfer Co., Boston, transfer agent.

Annual report for 1914 shows rents and cash on hand, \$320; borrowed

from Franklin Mining Co., \$8,980; insurance, total receipts, \$10,322. Expenses amounted to \$127 at mine, \$1,436 taxes, balance being interest and incidentals.

Property: 800 acres, immediately north of the Franklin Junior mine. The ground has been explored by extensive diamond-drill work, showing cores from the Mesnard epidote, Allouez conglomerate, Pewabic amygdaloid, Kearsarge amygdaloid, and other copper-bearing beds. All the formations lying between the Kearsarge amygdaloid and the Calumet conglomerate were drilled by a series of holes, the Calumet bed showing traces of copper. The first cores from the Kearsarge bed showed copper in somewhat encouraging quantities from a bed of about 19' width.

No. 1 shaft, 500' deep, is sunk on the Pewabic amygdaloid. This lode is 8 to 10' thick, of which 2 to 3' near the hanging wall is well mineralized but spotty in the 4 levels opened.

No. 2 shaft, 1,227' deep, has 10 levels, with a 125' winze below the 10th. The workings are north of the shaft, except on the 8th, 9th and 10th levels, the latter 2,400' long. The 8th level south develops a fair stretch of copper ground toward the Franklin Junior, and a 1,400' drift on the 8th level north showed 25 to 75' stretches of payable ground. The Rhode Island property is being developed by the Franklin Mining Co., at a depth of about 2,000', where the Pewabic bed averages 8 to 10' width.

The Albany & Boston, or Allouez conglomerate, has been opened by crosscuts on the 500' and 1,000' levels, but the showing secured was discouraging. A crosscut of about 250' length on the 10th level, about 1,100' south of No. 2 shaft, has disclosed an amygdaloidal bed of some promise. The east crosscut on the 8th level, at depth of 1,000' cut 2 apparently valueless beds, one being the Mesnard epidote. The East lode, about 5' wide, carries a little copper, but nothing of promise. The West lode, 96' from the Pewabic, is 7 to 9' wide, carrying occasional bunchy copper. The 4 amygdaloidal beds lying between the West lode and the Allouez conglomerate have been tested by N.-S. drifts, 3 proving barren.

Equipment: includes a frame shaft house at No. 2, with an engine house having a Nordberg hoist capable of raising 2-ton skips from a quarter mile depth, and a 12-drill Rand air compressor. Buildings include a machine shop and smithy, warehouse and 15 dwellings.

The Rhode Island is idle and the plan of developing at greater depth through the north drifts of the Franklin is a good one, since the Pewabic bed to the south of the Rhode Island has shown great improvement below a depth of 2,000' in both the Mesnard shaft of the Quincy and the main shaft of the Franklin.

ST. LOUIS COPPER CO.

MICHIGAN

Out of business. Assets transferred to Calumet & Hecla Mining Co. For description, see Vol. XII.

ST. MARY'S MINERAL LAND CO.

MICHIGAN

Office: 705 Sears Bldg., Boston, Mass. **Mine office:** Houghton, Houghton Co., Mich.

Officers: Geo. Peabody Gardner, pres.; Walter Hunnewell, v. p.; Chas. J. Paine, Jr., sec.-treas.; preceding, with E. V. R. Thayer, W. Cameron Forbes, Albert S. Bigelow, Thos. N. Perkins, Charles E. Perkins, Richard Olney, N. S. Stone and Chas. N. King, directors; A. E. Coe, asst. treas.; Fredric W. Nichols, resident agent; Dr. Lucius L. Hubbard, cons. geologist.

Inc. March 4, 1901, in New Jersey. **Cap.**, \$5,000,000; shares \$25 par; issued, \$4,000,000. Controls, through ownership of entire stock issue, except founders' shares, the St. Mary's Canal Mineral Land Co., a corporation inc. 1863, in New York, to acquire 180,000 acres of land given by the

state of Michigan for the construction of the first ship canal at Sault Ste. Marie. These lands in Houghton, Ontonogan and Keweenaw counties, Mich., formerly included the tracts on which the Calumet & Hecla, Baltic, Trimountain, Champion, Ojibway and other mines have been developed. Company has about 400 shareholders. Shares are listed on the Boston Stock Exchange. Old Colony Trust Co., Boston, registrar. Annual meeting, first Wednesday in March, in Jersey City, N. J.

Income of the company consists mainly of dividends from the Champion Copper Co., with a small but steady income from sales of lands, timber and wood, and occasional but irregular large receipts from sales of mineral lands. The balance sheet of Dec. 31, 1909, gave quick assets of \$4,489,273, and on Dec. 31, 1916, the company had \$56,104 cash on hand, with notes receivable, \$24,381, and was without liabilities.

Receipts for the year ending Dec. 31, 1916, were \$572,963.

Share assets of the company Dec. 31, 1916, were: 50,000 shares Champion Copper Co.; 25,000 shares Mayflower M. Co.; 20,165 shares La Salle Copper Co.; 79 shares Hancock Cons. Mng. Co.; 20,000 shares Pacific Copper Co.; 37,222 shares Houghton Copper Co.; 1,571 shares Franklin Mng. Co.; 2,000 shares Ojibway Mng. Co.; 56,778 shares Winona Copper Co.; 208 shares Copper Range Cons. Copper Co.; 640 shares St. Mary's Mineral Land Co.; 80 shares Old Colony Copper Co.; 8,340 shares Naumkeag Copper Co.; 17,902 shares Douglass Copper Co.; 10 shares Amphridrome Co.; 100 shares D. A. Stratton Co.

From 1863 to 1900 the old company paid cash dividends of \$2,200,000, and also paid stock dividends of 1 share of Tamarack, 1884; 1 share of Iroquois, 1890; 1/4 shares of Baltic and one-half share of Winona, 1898; 1 share of Old Colony and 1 1/2 shares of Trimountain in 1899.

Dividends: (of the present company)

1903.....	\$1	1911.....	\$3
1904.....	1	1912.....	3
1905.....	2	1913.....	3
1906.....	4	1914.....	0
1907.....	5	1915.....	8(b)
1908.....	0	1916.....	19
1909.....	1	1917.....	14(a)
1910.....	1(c)		

(a) Including dividend declared Aug. 30, 1917. (b) Not including North Lake and Hancock stock distributions equivalent in cash to \$2.59 a share. (c) Not including Franklin stock distribution equivalent to \$4.

Property: Jan. 1, 1917, consisted of 93,011.69 acres freehold, with mineral rights to 14,133.69 acres additional, property being scattered along the Lake Superior copper belt, with principal holdings on the South Range, S. W. of Houghton, in Houghton and Ontonagon counties.

The company, since its reconstruction, in 1900, has refused to sell its mineral lands outright, preferring to join with other land holders in the formation of new companies, taking pay for its lands in shares, on a pro rata basis, or partly in shares and partly in cash. This policy involves heavy outlays for exploratory and development work, but has resulted in giving the company a half interest in a new mine, the Champion, which is capable, alone, of furnishing funds to St. Mary's company for both dividends and development work elsewhere, and a continuance of this policy must result in time in making St. Mary's Mineral Land Co. the part or sole owner of a number of fine mines. Owing to the great extent of its lands, located mainly on the Keweenawan copper belt, stretching along the mineral range

for scores of miles, the landed holdings of the company are of great potential value. The management is vigorous and far-seeing.

In August, 1917, it was reported that W. E. Hopper, of the Michigan College of Mines, was making a geological examination of the St. Mary's lands.

SENECA COPPER CORPORATION

MICHIGAN

Offices: 11 Broadway, New York; and W. J. Uren, 3 Calumet State Bank Bldg., Calumet, Mich.

Officers: Frederick Lewisohn, pres.; Walter Lewisohn, v. p.-treas.; E. J. Macnamara, sec.; with Hamilton Fish, Jr., T. F. Cole, F. deC. Sullivan, P. A. Clarke and W. F. Bartholomew, directors.

Inc. Dec. 26, 1916, in New York. Cap., 200,000 shares. Company owns 11,960 shares of the 20,000 in the Seneca Mining Co.

Balance sheet of Jan. 4, 1917, shows assets totaling \$2,420,000, including 13,926 Seneca M. Co. shares at \$60 each, or \$835,560; cash at banks, \$1,564,440; and debit balance, \$20,000. Liabilities include 200,000 shares without par value, \$1,400,000 capital surplus and \$20,000 accounts payable.

SENECA MINING CO.

MICHIGAN

Subsidiary of the Calumet & Hecla Mng. Co.

Office: 11 Broadway, New York. Operating office: Calumet, Mich. Mine near Mohawk, Mich.

Officers: Frederick Lewisohn, pres.; Walter Lewisohn, treas.; E. C. Westervelt, sec.; E. J. Macnamara, asst. treas.; W. J. Uren, gen mgr.

Inc. March 23, 1860, in Michigan. Cap., \$500,000; shares \$25 par; fully issued, \$10 paid. Is controlled, through ownership of 11,960 shares, by the Seneca Copper Corporation (which see), a concern organized to take over shares owned by the Calumet & Hecla. The company had a debit balance, Jan. 1, 1917, of \$179,703. American Trust Co., Boston, registrar; State Street Trust Co., Boston, transfer agt. Annual meeting, fourth Monday in March.

Property: 1,880 acres, just north of the Mohawk and Ahmeek mines, is a swampy tract, somewhat irregular in outline and heavily covered with drift. The property carries the Calumet, Keweenaw and Allouez conglomerates and the Osceola, Kearsarge and other amygdaloidal beds, this statement being based mainly upon the outcrop of the Kearsarge lode seen in the N. E. corner and extending for 1¼ miles across the property. The mine is on the Keweenaw Central railway.

Development: The property was diamond drilled, 1907-08, giving some good cores from the Kearsarge amygdaloidal bed. This was followed by the sinking of a single 3-compartment shaft, located about 3,000' north of No. 1 shaft of the Gratiot mine. The shaft is sunk in the footwall, being 60' from the Kearsarge bed on the 1st level, 250' on the 3rd level, and 220' on the 5th level. The shaft is 957' deep, with 5 levels. Development shows little or no copper values above the 4th level, but the bed has been opened by crosscuts and drifts on several levels, with about 2,000' of laterals. On the 5th level the Kearsarge bed is about 15' wide and for a distance of 150' carries a 4' pay-streak having fair copper values. No. 1 shaft has a temporary frame shaft rock house, with crusher.

There is room for a second shaft on the outcrop of the Kearsarge bed, but this lode must be reached by vertical or sharply inclined shafts on the balance of the property as the lode outcrops outside the holdings, though the underlay extends under the entire tract.

In June, 1917, sinking No. 2 shaft with 3 compartments was started near Mohawk No. 2. A hoist of 4,000' capacity has been erected.

Equipment: includes a small power house, Lake Shore duplex hoist, good for 2,000', a 15-drill air compressor and 2 locomotives firebox boilers.

Buildings include a boarding house and bunk house. Operations were suspended April, 1911.

Property is considered promising.

SHELDEN & COLUMBIAN COPPER CO.

MICHIGAN

Idle. Address: care J. H. Rice, Houghton, Mich.

Property: lies next north of the Isle Royale mine and includes mineral rights under many private residences, near Portage Lake. An important discovery of sheet copper was made Sept., 1915, in an unidentified lode opened in excavating a cellar in this tract. Described in Vols. I and II of Copper Handbook.

SOUTH LAKE MINING CO.

MICHIGAN

Office: 60 Congress St., Boston, Mass. Mine office: Houghton, Mich.

Officers: R. M. Edwards, pres.-gen. mgr.; Arthur C. Paine, sec.-treas.; preceding, with Thos. S. Woods, E. C. Robinson and Geo. E. Davis, directors.

Inc. Feb. 25, 1880, in Michigan, as the Aztec Copper Co.; reincorporated Aug. 12, 1909, under present title and corporate existence extended for 30 years from Feb. 25, 1910. Cap., \$1,000,000; shares \$25 par, increased to \$5,000,000, Dec., 1917; assessable; all issued; \$6.60 paid in. Last assessment, \$2, payable June 3, 1912. Of the issued stock 40,000 shares were given to the old stockholders share for share, 20,000 were offered the same stockholders at \$2 per share and nearly all taken by them; 10,000 shares were offered to holders of record May, 1913, at \$6.60, but were largely taken by the underwriters; 10,000 shares were offered in March, 1915, and 10,000 more in Oct., 1915, at \$5. The last two offerings were practically all taken by the shareholders. In April, 1916, the last installment of 10,000 shares was offered to the stockholders, at the rate of \$7.75 per share.

Balance of assets Dec. 31, 1916, was 2,212, including \$1,774 cash on hand. Expenses at mine were \$157,646, including \$88,334 for underground work and \$37,125 for construction. American Trust Co., Boston, registrar; Federal Trust Co., Boston, transfer agt. Annual meeting, 1st Tuesday in March.

In Nov., 1917, company announced it had secured an option on S. W. ¼ of Sec. 30 immediately north of its property. A special stockholders' meeting to be held Dec. 11, 1917, for purpose of voting on an increase of capital stock to provide funds for above purchase.

Property: 334 acres of mineral lands, being the W. ½ of Sec. 31, T. 51 N., R. 37 W., adjoining the Lake mine on the east, and the Adventure on the west. In Dec., 1917, 160 acres, with dip of the North Lodes were acquired.

History: work was begun on the property in 1862, though the name Aztec was originally taken because the remains of extensive workings by a prehistoric race were thought, in those days, to have been the work of the Aztecs. A 16-lb. stone hammer was taken from the old workings.

The mine had a stamp mill in early days, and produced 756,853 lbs. fine copper, of which 100 tons was secured in a single mass. Exploratory work was done, 1905-06, on the Knowlton bed, of the Evergreen series, by the Aztec-Algomah Development Co., and diamond-drill borings were begun Sept., 1909, continuing until March, 1911, when suspended by reason of adverse financial conditions. Borings were begun at the base of Evergreen bluff, near the foot of the Evergreen belt, thence working southward toward the eastern sandstone. Eight drill holes were put down at various points on the property.

Exploratory drilling having shown copper rock in five holes, four of them at the corners of a 200' square, actual mine development work was determined upon. The holes showed that the beds run N. 70° W. and dip at about 56°. The drill cores and recent underground work were carefully

studied by A. C. Lane in 1916, who reports that of the four lodes cut by this work, No. 2 lode, or possibly, a combination of No. 1 and No. 2 lodes, is the Lake lode, mined by the Lake Copper Co., and that the lodes dipping north in the 300' crosscut, north of the South Lake shaft, are identical with, and the same as those dipping south on the 600' crosscut south of the shaft. This means that the veins fold over, dipping both N. W. and S. E., and that a vertical shaft can reach both limbs of the A shaped fold.

The vertical shaft, begun May, 1912, and now 600' deep, has opened up lodes Nos. 1 and 3, and the Butler lode, north of the shaft, in all of which ore is being mined, 1917. For 400' along the Butler lode, the rock is said to be spectacular in character. The South lodes will not be stoped until November, when a connection with the Lake mine by a drift on No. 3 lode on the sixth level will be completed, giving good ventilation. Drifting on an amygdaloid in the 600' South crosscut at 1958' to 1965' from the shaft is said to carry heavy copper. A north crosscut on this same level shows 51' of ore in No. 3 lode, 64' from the shaft.

New work in 1916 amounted to 3,702'. Total openings are 10,626'. drifts on lodes being 5,119'. In Sept., 1917, No. 6 level was connected with that of the Lake mine on South lode No. 3 by a 1,650' drift ending in a 75' raise; this improves ventilation and also makes available the 4 South lodes.

The South Lake installed all machinery, including a 15-drill air compressor in 1915, and completed its new steel shaft and rockhouse.

Production: commenced May, 1916, and to end of 1916, 20,057 tons was sent to the Franklin mill, yielding 285,600 tons of refined copper. By Sept., 1917, production was at the rate of 10,000 tons of ore per month. Company has a decidedly promising property upon which to work.

SOUTH RANGE MINING CO.

Out of business. Property sold, 1917, to Copper Range Cons., which see.

SOUTH SIDE MINING CO.

MICHIGAN

Office: 68 Devonshire St., Boston, Mass.

Officers: Ashley Watson, pres.; Frederick Hoitt, sec.-treas.; preceding with Harry F. Fay, John C. Watson and D. C. Forbes, directors.

Inc. 1859 in Michigan, and reincorporated Nov. 2, 1898; charter expires by limitation in April 11, 1919. **Cap.**, \$1,000,000; shares \$25 par; fully issued; \$9.70 paid in. The company levied assessments of about \$90,000, to 1872, and April, 1912, paid a cash dividend of 25 cts. per share and 1,935/10,000 of a share of stock of the Naumkeag Copper Co., received in payment for lands sold to that company. A final liquidation dividend of 7c. per share was declared Nov. 6, 1916. Annual meeting first Monday in March.

Lands: were about 200 acres, lying west of the Dacotah and north of the old Naumkeag properties, immediately west of Houghton, sold, with the exception of about 31 acres of surface rights surrounding the water supply of the village of Houghton, for \$22,515 cash and 7,740 shares of the remaining stock of the Naumkeag Copper Co. Surface rights to the village of Houghton were sold in July, 1916.

SUPERIOR COPPER CO.

MICHIGAN

Controlled through ownership of 50,100 shares, bought 1906, by the Calumet & Hecla Mining Co.

Office: 12 Ashburton Place, Boston, Mass. Operating office: Calumet, Mich. Mine address: Houghton, Mich.

Officers: Rodolphe L. Agassiz, pres.; James MacNaughton, v. p. and gen. mgr.; with C. F. Ayer, F. L. Higginson, Benj. Joy, directors; G. G. Endicott, sec.-treas.; H. L. Bennett, asst. sec.-treas.; Ocha Potter, supt

Inc. July 23, 1904, in Michigan. Cap., \$2,500,000; shares \$25 par; fully issued and \$1 paid.

Report for 1916 showed a net profit from mining operations of \$331,933, and balance of assets of \$434,313. In 1915 the company acquired 18,836 shares of the Lake Milling, Sm. & Ref. Co.'s stock for \$240,000. Shares are listed on the Boston Stock Exchange. Old Colony Trust Co., Boston, registrar; American Trust Co., Boston, transfer agent. Annual meeting, second Tuesday in April.

Dividend No. 1 of \$1 per share, amounting to \$100,000, was paid in Oct., 1916. A like amount was paid in April, 1917.

Property: 400 acres, carries about 6,000' of the strike of the Baltic amygdaloidal bed, between the Isle Royale and Atlantic mines. It embraces Sec. 15, of T. 54 N., and R. 34 W. The tract has room for 3 or 4 shafts, and has a light overburden, the bed being proven by trenches at intervals of 1,000', showing an amygdaloid of 35 to 40' average width, with extensive carbonate stains, due to weathering, and a little fine copper near surface. The property has been trenched to the eastern sandstone.

The mine has 2 workable copper lodes, the Baltic, locally known as the Superior, and the West lode, discovered in 1911, a formation independent of the Superior, 14 to 30' thick, which, however, cannot be stoped until the Superior lode is mined. On the Superior lode all ground above No. 15 level has been stoped out. Reserves in the west lode at end of 1916 were estimated at 250,000 tons.

Development: by 2 shafts, sunk in the footwall of the lode, insuring solid ground, but necessitating crosscuts at each level. Owing to the great width of the copper-bearing stratum, it is necessary to crosscut along the bed at 100' intervals. The Superior mine is opened on the northern extension of the Baltic amygdaloid bed, though some call this the Superior lode, not being satisfied that the correlation is correct. The Baltic bed, in the Superior mine, carries copper impregnations in the footwall, always an evidence of strong mineralization, and there is a conglomerate bed under the foot that carries a small amount of copper. The stamp rock is remarkably deceptive in appearance, as the copper oxidizes readily, and when it has been broken a few weeks, appears lean, unless a fresh fracture shows its true nature. As a triangular tract of land intervening between shafts Nos. 1 and 2 is owned by others, they cannot be connected above the 12th level. The mine had about 10 miles of workings at the end of 1916. Underground work for 1916 totaled 5,136', compared with 4,199' in 1915, and 2,654' in 1914.

No. 1 shaft, about 1,200' south of the northern boundary of the property, is 2,906' deep and develops the Superior and West lodes, the first opened on all levels, and the second lode from the 12th to 26th inclusive. Both lodes carry copper in exceptional quantity. Improved values have been encountered with depth, and the workings of No. 1 shaft give a good showing. The ground, especially in the upper levels, is very treacherous, and requires careful attention and close timbering.

This shaft was sunk 437' during 1916. Bad ground retarded progress. Further sinking, from No. 29 to 33rd level is contemplated.

No. 1 shaft has a frame shaft rock house, of the Calumet & Hecla type, equipped with Westinghouse engine and two 23x36" crushers. The hoist is good for 4,000'.

The equipment at No. 1 shaft includes a combination boiler and engine house, with 90" Belpaire boilers, a hoist, and 10-drill and 18-drill air compressors. No. 1 shaft is connected with the main line of the Atlantic railway by a 7,000' spur, and also with the Isle Royale railway.

No. 2 shaft, 2,540' S. W. of No. 1 and 2,400' from the southern boundary, sunk 40' in the footwall, at an angle of 53°, is 1,628' deep. Equipment at No. 2 includes a steam hoist, formerly used at No. 1, and a shaft rock house having 2 crushers and a Westinghouse engine, with rated capacity of 1,000 tons daily.

Exploration on the West lode in 1916 totaled 4,377', from No. 19 to No. 25 level. Only about 20% of the ground opened is profitable to mine.

Buildings include an office, warehouse, smithy, change house, and a number of dwellings for employees at a small town site lying between the shafts.

Production: (began Jan., 1909)

	Tons R'k Stpd.	Lbs. Cu. per Ton	Cost p. Ton(b)	Lbs. Cu. Produced	Cost per Lb.	Rec'd per Lb.
1916.....	185,315	16.38	\$2.07	3,034,656	14.61c	24.67c
1915.....	212,051	18.23	1.88	3,866,484	12.29c	18.125c
1914.....	191,628	16.79	1.75	3,217,635	12.43c	12.645c
1913.....	130,826	22.87(a)	2.36	2,992,765	12.86c	15.387c
1912.....	172,322	22.76(a)	2.33	3,921,974	12.75c	16.45c
1911.....	162,599	19.90	2.39	3,236,233	15.31c	12.70c
1910.....	140,514	22.64	2.60	3,181,041	14.29c	12.63c
1908-09.....	16,835	22.22	....	374,077	.....	.....

(a) An excellent return, and materially above the average secured from the good amygdaloidal mines of the Lake Superior district. (b) The high cost of mining is largely accounted for by the comparative newness of the mine; costs include mining, transportation, stamping and taxes.

Production was lessened in 1913 and 1914 by the strike of the Western Federation of Miners, lasting from July 23, 1913, to April 12, 1914, and from Sept. 1, 1914, to Feb. 1, 1915, the mine operated on a three-quarter time basis on account of the condition of the copper market following the outbreak of the European war. Superior has thus far been a disappointment; the copper yield per ton rock is lower than originally calculated, and production remains below the 4,000,000-lb. mark. It cannot reasonably be expected to do much better.

Copper production in the first 4 months of 1917 averaged 214,000 lbs. per month, ranging from 143,614 in April to 318,798 lbs. in January. The financial position of the company is improving satisfactorily.

TAMARACK MINING CO.

MICHIGAN

Out of business. Property sold for \$3,600,000, equal to \$60 per share, to Calumet & Hecla Mining Co., on April 1, 1917. For history and description of property see Vol. XII. No report published for 1916.

TOLTEC MINE

MICHIGAN

Idle many years. **Office:** care J. M. Longyear, Marquette, Mich. Owners, Gogebic & Ontonagon Land Co. and Galen L. Stone.

Mine at Greenland, Ontonagon Co., Mich., 960 acres, carries the underlay of the Evergreen belt and the Calico and adjacent beds of the Michigan.

Production: 1851-1860, was 413,443 lbs. fine copper. Some diamond drilling was done, 1908.

TORCH LAKE MINING CO.

MICHIGAN

Idle. **Office:** 4-24 Exchange Place, Boston, Mass. **Mine office:** Leopold Bldg., Houghton Co., Mich.

Officers: Thacher Loring, pres.; Chilton Cabot, sec.; F. W. Nichols, agt.

Inc. in Michigan. Cap., \$500,000; shares \$25 par; assessable.

Property: 1,280 acres, Secs. 35 and 36, T. 56 N., R. 33 W., lying east

of the Tecumseh mine of the La Salle, and about midway between Calumet and Lake Linden. The property was slightly prospected, 1899-1900, by diamond-drill borings. Reported that exploration work will soon be resumed.

TREMONT & DEVON MINING CO., LTD.**MICHIGAN**

Office: First National Bank Bldg., Hancock, Mich. Mine at Victoria, Ontonagon Co., Mich.

Officers: H. L. Baer, pres.; W. M. Gibson, v. p.; Chas. D. Hanchette, sec.-treas., with Claude Cooper, W. M. Gibson and Robt. T. Dunstan, directors.

Inc. Dec., 1908, in Michigan. **Cap.**, \$250,000; shares \$25 par; 6,000 issued; two 10c assessments levied to date.

Property: 680 acres, freehold, including the old Tremont and Devon mines, adjoining and directly W. of the Victoria, carrying about 1¼ miles of the strike of the Keweenaw copper formation, and apparently in the horizon of the western extension of the Lake bed. The Victoria has a vein of some promise, outcropping about one-half mile from the Tremont & Devon line. A little work was done, in olden days, on shallow shafts near the center of the property, from which rock was taken, said to have yielded 500 lbs. fine copper per fathom of ground broken, which was better than 25 lbs. of finished copper per ton.

In Feb., 1916, the E. J. Longyear Co. began diamond drilling. Three holes were put down; the first cut an unidentified lode lying above the Forrest lode; the third is said to have shown good values in the Victoria lode.

UNION COPPER LAND & MINING CO.**MICHIGAN**

Office: 70 State St., Boston, Mass.

Officers: Harry F. Fay, pres.; Harold H. Anthony, Ezra H. Baker, Samuel Carr and Albert B. Merrill, all of Boston, and John G. Stone, of Houghton, Mich., directors; C. J. Morrissey, sec.-treas.

Inc. 1863 in Michigan; charter extended in 1893. **Cap.**, \$2,500,000; issued, \$2,000,000; shares \$25 par, \$2.06—2/3 share, paid in. Old Colony Trust Co., Boston, registrar; American Trust Co., Boston, transfer agent. Stock listed on Boston Stock Exchange. Annual meeting, fourth Thursday in March. Books close 20 days before, and reopen day following.

Dividends: in 1899 company paid 50c per share and ¼ share of stock of Old Colony Copper Co. and in 1907 and 1908 dividends of \$2 and of 50c per share respectively were paid; none since.

Property: 5,323 acres of land, carrying both surface and mineral rights, and 1,043 acres additional of mineral rights only, divided into 200 or more tracts in Keweenaw, Ontonagon and Gogebic counties, Mich. Company is primarily a land-holding corporation, although its charter empowers it to carry on mining operations as well, and it has from time to time investigated various tracts to determine their mineral value. Greater part of the land is heavily timbered and is valued at \$125,000.

In 1910-11, exploratory work was done by diamond drill on 320 acres of land, lying W. of the Allouez and North Kearsarge mines, with satisfactory results, especially on the Quincy-Pewabic amygdaloid, which showed well in copper. The Allouez conglomerate was cut; also several other beds carrying copper.

VICTORIA COPPER MINING CO.**MICHIGAN**

Office: 60 Congress St., Boston, Mass. **Mine office:** Victoria, Ontonagon Co., Mich.

Officers: Fred H. Williams, pres.; Chas. D. Hanchette, v. p.; Jas. P. Graves, treas.; preceding, with Willard S. Martin and A. W. Chesterton,

directors; Sydney S. Millet, sec. and transfer agent; George Hooper, supt.; Chas. D. Hooper, mill and power supt.; G. A. Braun, Jr., engr.; A. R. Penberthy, clerk and purch. agt.

Inc. Jan 16, 1899, in Michigan. Cap., \$2,500,000; shares \$25 par; all issued; paid in, \$15. Last assessment \$1, April 15, 1914. Shares listed on the Boston Stock Exchange. First National Bank, Boston, registrar. Annual meeting, fourth Monday in February.

Statement for 1916 shows receipts totaling \$470,229, and expenditures, \$384,898. Including previous balance the surplus was \$197,611. Since organization, the revenue totaled \$3,979,129, of which, \$2,311,963 was from copper sales. Mining expenses were \$1,769,484; equipment, \$584,156; real estate, \$387,862; surface, \$240,085; general, \$137,414; crushing, \$200,372; and smelting, etc., \$234,961.

Property: 2,389 acres mining lands, in Secs. 19, 20, 29, 30 and 31, T. 50 N., R. 39 W., and Secs. 24, 25 and 36, T. 50 N., R. 40 W. This tract has an extreme E.-W. width of 2 miles, and a N.-S. length of $2\frac{3}{4}$ miles, lying just W. of the Ontonagon river. It is practically all on the mineral belt, only about 100 acres lying on the eastern sandstone. The tract may carry the western extension of the amygdaloidal bed under development by the Lake Copper Co. Neighboring mines, all idle for many years, are the West Minnesota on the N., National on the E., and Tremont-Devon on the W. The lands are well timbered, with an inexhaustible supply of good sandstone for building purposes. Nearest railroad is the C. M. & S. P., at Rockland, 3 miles distant.

The first known attempt at Lake Superior copper mining was made in the winter of 1770-71, on what is now Victoria property. In 1849, the property, known then as the Cushin, was opened on a line of prehistoric pits containing masses of native copper, one weighing upwards of a ton. The name was changed, 1850, to Forrest, and property reorganized, 1858 as the Victoria Mining Co. Under these titles the property made 373,279 lbs. fine copper at a loss of about \$180,000. The mine was operated regularly, on a small scale, 1849-55, and thereafter spasmodically. It was unwatered 1883, but remained idle until work was begun March 1, 1899, by the present company.

Geology: the mine is located on a high and steep hill, notwithstanding which the solid rock is covered with heavy sand and clay drift. The Forrest amygdaloid bed, on which the mine is opened, is 5 to 80' wide, averaging about 12', but of very irregular width and dip, and very buncy in contents. The average strike is N. 66° E., and dip 61° N. W., the lode having about 2 miles of outcrop on Victoria lands. The formation is much disturbed at surface, the bed being irregular in dip, but widening at depth, with more regular walls. The lode is low in average grade, but fairly regular in copper contents, carrying low-grade stamp rock, with best values near the hanging wall.

Development: the old mine was opened by 5 shafts, deepest, 300', located at irregular intervals, with levels spaced at 55 to 65'.

The Victoria, or, No. 2 shaft, which was chosen for new operations, was enlarged to 2 compartments, and a third compartment was added, 1916, 16' E. of the skipway. The two skips will work in balance. The shaft is 2,716' deep, bottomed below the 27th level. Levels between the 4th and 24th have been opened at regular intervals of 100', below the 23rd at intervals of 150', with drifting on all levels. The total driftings on the Forrest bed, tributary to No. 2 shaft, was 45,270' at the end of 1915, and in addition there are 8,068' of crosscuts.

Short drifts have been opened from these crosscuts on various beds, but

without much encouragement. The total openings tributary to No. 2 shaft are 60,647'.

The productive part of the mine tributary to Victoria or No. 2 shaft is on the Forrest bed, an epidotal amygdaloid having an average width of 4' to 12', widening to 80', at one point. Walls are quite regular, but where crush zones occur, the mineralization extends into the walls, giving an occasional maximum of 50' width of ore. The footwall bed underlying the Forrest, at a depth of 2 to 12', is well mineralized in places, carrying occasional masses from 100 lbs. to 3 or 4 tons in weight, but is very bunched, copper occurring mainly on the foot, with considerable epidote on the hanging. Underlying this epidotal bed, at a distance of 60', is a 6' amygdaloid showing much epidote and allied minerals, with a little stamp rock. Stopes opened on all levels from the 4th to the 22nd inclusive, give fairly uniform results.

The copper shoot developed by this shaft is 1,000 to 1,500' wide, with a slight rake to the S. W. The ore stoped is low in average grade, but fairly regular in contents, with main values in stamp copper. All levels down to the 17th are connected by winzes, giving ventilation and safety.

Development: 1916, included 1,350' of drifts, with a total of 3,806' of new work and 10,755 cubic fathoms stoped. The mine uses 35 power drills.

No. 6 shaft, 3,455' E. of No. 2, was started Dec., 1909, to develop the eastern end of the property, previously explored by diamond-drill borings. This shaft has three compartments with 2 skipways, designed for 6-ton skips and is 1,172' deep. There are 1,490' of drifts and crosscuts, showing broken and faulted ground, barren of copper, excepting for about 100', a short distance W. of the shaft.

The mine also has 419', 150' and 724' crosscut tunnels, the latter showing the contact between the Keweenawan trap beds and the eastern sandstone with several amygdaloidal beds exposed on which 176' of drifting gave a little encouragement.

Considerable diamond drilling has been done N. of the Forrest bed, a total of 15,292' of holes having been drilled, in 2 cross-sections, disclosing several beds that may warrant future attention.

No. 2 shaft has a new shaft house, equipped with a duplex 32x72" cylinders, with conical drum, Nordberg hoist, good for 5,000', and a 5-ton traveling crane for handling skips, man cage and timber.

Equipment is now sufficient to take care of exploration to a depth of 5,000', the present depth being 2,716'.

The rock house has storage bins for stamp rock and waste, with chutes, loading gates and air lifts, and there is a pneumatic hammer for mass copper.

The boiler house is for heating purposes only. A steam power plant is being added to use as a reserve when water supplying the hydraulic plant is low.

Buildings at No. 2 shaft include machine and carpenter shops, smithy, changing house, hospital, warehouse, general store, mine office, boarding house, 76 dwellings, sawmill, lathe, shingle and planing mill. Water for domestic use and fire protection is pumped from a well having a storage tank about one-half mile from the mine.

Hydraulic Plant: a large water power has been developed from Glenn Falls, on the W. branch of the Ontonagon river, about 1 mile from the mine. at a cost of \$250,065, to Dec. 31, 1916. This is the best natural water power of the Lake Superior copper district, the stream dropping about 110' on the company's property, by a series of small falls, between which are numerous rapids, with sandstone bottoms. The company utilizes 72'

of this drop. Power is developed by means of a dam, canal and hydraulic air compressor.

The dam is 225' between abutments, has an extreme height of 24', is 14' wide at the bottom and 8' at the top, and has a 320' main section with wings of 100' and 160', giving a total length of 580', built with an arch upstream. It is provided with two 44" flush gates, for drainage and flushing out silt, a log chute, waste weir and sand fence.

The canal diverting water from the dam is 4,800' long, 10' deep at the head gates, with a bottom slope of 1" in 100'. At the end the canal opens out in a forebay, at the extreme end of which the compressor shafts are located. The canal is equipped with drainage gates, slush gates, overflow weirs and submerged measurement gates.

The 3 intake shafts of the compressor are 5' in diameter, spaced 19' from center to center. The shafts were sunk through solid sandstone, by means of 5" preliminary holes, bored to the required depth of 343', then enlarged from 5" to 5' in diameter.

The shafts, lined throughout with concrete, formerly drew air through 5,000 special $\frac{3}{8}$ " tubes. This proved unnecessary as the water falling down each shaft sucks air with it and this air is carried through 280' of air chamber cut in the rock at the bottom of the shaft. A water seal at the intake end is formed by $\frac{3}{8}$ " steel shells, firmly concreted into the bottom of the shafts. The air chamber is 281' 6" long, and 18' wide, with minimum of 21' and maximum of 26' height, having a maximum capacity for 80,264 cu. ft. of compressed air. The water seal at the upflow end is formed by an arch of rock, 40' long, below which a tunnel 10' high leads to the upflow shaft, which is 16x18' in section, sunk at 72°, with a vertical depth of 271', leading to surface, where the water is again discharged into the river. The power head developed is 72', and the pressure head 271', giving a maximum air compression of 117 lbs. per sq. inch. Imprisoned air, carried down the shafts by suction and swept along the tunnel in bubbles, by the rushing water, is released in the chamber where the constant accession of bubbles causes compression, escape backwards being prevented by the $\frac{3}{8}$ " steel shells connected in the shafts. The chamber, known as the compressor, is connected with a 12" pipe line to mine and mill. Extra pressure is relieved by a safety or blow-off pipe.

The Taylor hydraulic-pneumatic plant was completed, March 1906, furnishes 4,000 to 5,000 h. p. under a full head of water, and has shown an efficiency of 82% under test. It is the largest single-unit air compressor in existence and the fifth installation of the sort in the world. It is possible to operate 1, 2 or 3 of the inlet shafts if so desired, with corresponding variation of energy developed, but only 1 unit is in regular use. The compression is automatic, practically isothermal, and the air as delivered is unusually dry.

An extensive topographical and hydraulic survey of the company's lands and the watershed made 1909, by the J. G. White Co., of New York, shows that an average of 15,000 h. p. can be developed on the western branch of the Ontonagon river, but the expense of development necessarily will be large. During the drought of 1910, the water supply fell far below normal and additional storage for water was secured on the western branch of the Ontonagon river, near the outlet of Lake Gogebic.

The mine and mill are connected by a 4,800' tram line, in 2 sections, the upper with 6%, and the lower with a 12% grade. A stationary double-sheave hoist, at the top of the incline, serves to pull the empty cars up the steeper grades, but otherwise trains are operated by gravity, in counter-balance.

Mill: the stamp mill, on the bank of the river, near the hydraulic works, has a single 24x24" Allis-Cuyahoga stamp. The stamp of 650 tons daily capacity, has 5/8" mortar screens, and all oversize above 3/16" is run to a set of 16x36" Traylor rolls. The washing floor contains 22 Hodge jigs, 5 Wilfley tables, 6 Card tables, 1 Standard table, hydraulic separators and settling tanks. Machinery is driven by a 12x12" piston-valve engine. The mill went into commission June, 1906, tailing losses running only 0.1 to 0.15% copper. Extraction is about 81%. Mineral (concentrate) formerly smelted by the Calumet & Hecla Co. is now smelted by the Quincy smelter at Ripley, thereby effecting an appreciable saving in transportation.

Production:

Year	Ton R'k Stamped	Lbs. Cu. per Ton	Cost per Ton(a)	Copper Produced Lbs.	Cost per Lb. Cts.
1916.....	146,690	11.3	\$2.16	1,661,832	18.40
1915.....	133,984	11.1	1.46	1,499,695	15.66
1914.....	139,862	10.6	1.41	1,486,242	16.0
1913.....	137,163	10.4	1.42(b)	1,428,693	16.5
1912.....	131,955	9.3	1.32	1,224,911	17.41
1911.....	126,894	10.2	1.20	1,303,331	13.01
1910.....	122,497	9.0	1.17	1,164,564	13.04
1909.....	118,605	9.0	1.48	1,062,218	17.09
1908.....	109,015	11.8	1.56	1,290,040	14.34
1907.....	95,035	12.7	1.71	1,207,237	15.8
1906.....	39,185	13.9	.....	546,334	18.7

(a) Mining and Milling. (b) High cost due to the labor strike and high footage, 7,428', of development.

Tonnage costs are low, but finished copper costs are high, owing to the exceedingly low average tenor of the rock stamped which is only about 0.65%, and returns would be absolutely ruinous, and the mine hopeless, were it not for the great advantage that the property enjoys through the cheapest power that is had by any copper mine in this or any other district. It is obvious that the Victoria needs 15 cent copper to break even on its present basis of production. With the larger ore supply procurable through the new skipway in No. 2 shaft, even the present phenomenally low average cost will be bettered, and the Victoria placed in a position to handle rock of lower average grade than perhaps any other mine in the Lake Superior district. The company's holdings are extensive, exploratory work is being conducted with vigor, and the management has displayed both courage and good judgment in its operations.

WASHINGTON COPPER MINING CO.**MICHIGAN**

Office: Calumet, Mich. Mine near Delaware, Keweenaw Co., Mich.

Officers: Chas. A. Wright, Jr., sec.-treas.; Thos. F. Cole, Spencer R. Hill, G. G. Hartley and Thos. Hoatson, directors.

Inc. in Michigan. Cap., \$2,500,000; shares \$25 par; issued \$1,500,000. Is controlled, through ownership of a majority of issued stock, by the Keweenaw Copper Co. Annual meeting, fourth Tuesday in March.

Property: 1,050 acres, on the western shore of Mosquito lake, on which desultory work has been done at intervals in the past. Idle since 1901.

WEST MINNESOTA MINING CO.**MICHIGAN**

Defunct. John Coughlan, receiver, 68 Devonshire St. Boston, Mass. **Inc.** about 1854 in Michigan. **Cap., \$500,000;** shares \$25 par. Was an old and long inactive company owning 550 acres lying mainly W. of the Ontonagon river. Property sold May, 1916, to F. W. Nichols of Houghton, presumably for T. W. Cole. Sale ordered because company's charter had expired.

WETTERHORN LAND CO.**MICHIGAN**

Idle. W. H. Garlick, agt., 990 W. Kensington Road, Los Angeles, Cal., agent.

Lands: 760 acres, in Secs. 21 and 22, T. 51 N., R. 42 W., Ontonagon county shows 14 copper-bearing beds of 4 to 9' average widths, the most important being an 8' bed of cupriferous sandstone, carrying native copper and silver said to have given assays of 2.6 to 6% copper and 1 to 6 oz. silver per ton. An amygdaloid opened by 84' shaft shows a small amount of copper.

WHEALKATE MINING CO.**MICHIGAN**

Address: R. C. Pryor, mgr., Houghton, Mich.

Officers: N. F. Leopold, prés.; R. R. Goodell, v. p.; R. C. Pryor, sec.; A. F. Leopold, treas., with J. H. Rice, directors.

Inc. 1902 in Michigan. **Cap.**, \$50,000; \$25 par; all issued and paid.

Property: 240 acres in and adjoining village of South Range, Mich. Company only conducts a real estate business. Part of its mineral rights were sold to the South Range Copper Co.

WHITE PINE COPPER CO.**MICHIGAN**

(Subsidiary of Calumet & Hecla Mng. Co.)

Office: 12 Ashburton Place, Boston, Mass. **Mine address:** Ontonagon, Ontonagon Co., Mich.

Officers: R. L. Agassiz, pres.; Jas. McNaughton, v. p.-gen. mgr., preceding with D. S. Dean, Benj. Joy, F. L. Higginson, J. M. Longyear and E. V. R. Thayer, directors.; G. G. Endicott, sec.-treas.; H. L. Bennett, asst. sec.-treas.; Thos. H. Wilcox, supt.

Inc. 1909. **Cap.**, \$5,000,000; shares—\$25 par; in 150,000 common shares and 50,000 5% cumulative preferred shares; issued 85,320 common and 34,759 preferred. Is controlled by the Calumet & Hecla Mng. Co., through ownership of 34,259 shares of preferred stock and 42,602 shares of common stock.

Preferred stock, numbering 4,759 shares, was retired by purchase at \$25 a share on Jan. 2, 1917.

Annual report for 1916 gives balance of quick assets, \$613,908, compared with \$139,786 in 1915. Mine expenses were \$534,137 and receipts \$1,124,934.

A dividend on preferred shares, equal to \$116,676, was paid Jan. 2, 1917.

Property. the White Pine mine and surrounding lands, formerly owned by the Keweenaw Association and others. The White Pine mine, 80 acres, is in Sec. 5, T. 50 N., R. 42 W., 3 miles E. of the Nonésuch mine at the extreme south end of the Keweenaw mineral belt. The other property was paid for by stock. A 9 mile railroad line connecting the property with the Chicago, Milwaukee & St. Paul R. R., was completed in Dec., 1915.

Geology: property as a whole shows eruptive rocks with interbedded sandstone and conglomerates of the secondary Keweenaw series. It also holds what F. E. Wright called epidote veins which are epidotal melaphyrs crossing the face of the cliffs parallel to the sandstones, but showing evidence of faulting and crushing. There is also a second set of minor, nearly vertical epidote veins which, unlike the first, are barren of copper. The sandstone beneath the melaphyr is a fine-grained, dark red, almost quartzitic rock that is jointed and has numerous calcite veins and occasional threads of malachite which extend down a few feet from the contact. The rock is, however, usually concealed by talus from the cliffs. Native copper also occurs in a very fine-grained sandstone-conglomerate, which is said to run from 5 to 10%. The dip of the bedded formation is

towards the S. E., varying from 8 to 35°. The so-called Nonesuch formation consists of 2 parallel beds of sandstone running from 4 to 8' in thickness and separated by a 5' bed of slate. The entire copper-bearing ground has a width of about 40'. The beds carry considerable finely disseminated native copper which is as a rule very flaky. This formation is badly faulted and ground is said to have been thrown so that the payable lode abutted directly against the unpayable one. Besides the 2 veins described, there is a third which lies about 45' back in the footwall. *

Development: includes 4 shafts; No. 2 temporary shaft was 324' deep and had 3,501' of openings, Jan. 1, 1917. It connects with the old White Pine shaft. The main working shaft (called No. 3), located between the two temporary shafts (Nos. 1 & 2), is an incline 1,090' deep, with 6,744' of underground workings, Jan. 1, 1917. It is equipped with 5-ton skips.

The No. 4, an inclined shaft west of No. 1 shaft, is sunk in the hanging at a considerable distance above the lode. On Jan. 1, 1917, it was 977' deep and had 10,783' of underground workings. It is also equipped with 5-ton skips. New workings totaled 5,288' in 1916, 8,605' in 1915, and 4,721' in 1914. The rock is soft and can be mined and crushed cheaply. The property has been extensively diamond-drilled, more than 110 holes having been made since work was begun in 1907. Considerable drilling was done in 1916, showing that the lodes S. of the fault lie from 600' to 700' lower than those immediately N. of it. Generally, exploration in 1916 revealed only fair ground.

Equipment: includes a power plant and compressor at the mine. A 750-k. w. electric turbine on Iron River, 1½ miles from the mine and mill, supplies water for the mill.

In 1915 a 1,000-ton mill was completed and put in operation. Instead of the steam stamps common in the Lake Superior copper country, it is equipped with gyratory crushers, rolls and Hardinge mills. Concentration is effected on Wilfley tables and the tailing saved, as future regrinding and leaching will undoubtedly be used in reclaiming the copper content. The mill is near the working shafts and connects with them by means of trestles over which rock is transferred from the shaft rockhouses to the crushing plant at the mill. An extraction of but 67% is being made at present, the copper lost in the tailing consisting partly of sulphides, but mostly of fine flaky particles of native copper.

A 50-ton flotation plant, Minerals Separation type, was erected in 1917, to try and save fine copper.

Production:

	Tons R'k Treated	Lbs. Cu. p. T.	Mine Cost p. T.	Lbs. Cu. Prod.	Cost per Lb.	Rec'd per Lb.
1916.....	188,890	22.27	\$2.082	4,207,449	12.70c	25.26c
1915.....	114,039	24.76	2.182	2,824,145	16.64c	18.353c

1915 production is for 8 months only.

*Mine costs include mining, transportation, stamping and taxes per ton of rock treated.

Property is decidedly promising and a long life assured by discovery in diamond drill work of high-grade rock at 2,100' depth; at the same time, development in 1916 might only be termed fair.

Costs showed a drop of nearly 4 cts. during 1916. Copper output in 1917 is averaging 335,000 lbs. monthly.

WHITE PINE EXTENSION COPPER CO.

MICHIGAN

Offices: 15 William St., New York, and Pinex, Ontonagon Co., Mich.

Officers: J. R. Stanton, pres.; F. L. Smith, v. p.; G. W. Drucker, sec-treas.; foregoing with Angus Smith, Gerrit Smith, L. P. Yandell, Theo.

Dengler, and J. H. Hurley, directors. Theodore Dengler, mgr.; Wm. R. Bolly, supt.; John Jacka, mine capt.

Inc. June, 1915, in Mich. Cap., \$3,750,000; shares \$25 par; assessable; in treasury, 65,000 shares. American Trust Co., Boston, transfer agent; Boston Safe Deposit and Trust Co., registrar.

Annual meeting first Tuesday in March.

Financial: revenue from June, 1915, to Jan., 1917, amounted to \$851,073, from 85,000 shares sold at \$10 each, and interest. Property purchase absorbed \$600,000, development in 1915, \$71,603, and in 1916, \$113,834. Surplus at end of 1916 was \$48,233, and in March, 1917, further financing was being considered.

Property: 1,440 acres mineral land in the White Pine district, Ontonagon Co., 5 miles west of the White Pine property of the C. & H. Mng. Co. The company owns the leases and exclusive mining rights for 50 years, paying a sliding scale royalty. These leases were purchased from F. L. Smith of Detroit, and associates, who received 60,000 shares of stock in payment for their lands and the development work done prior to June 1, 1915.

The property is similar to that of the White Pine Copper Co. in that it shows sandstone and soft shales and slates. Considerable copper-glance was found during diamond drill exploration work the copper in the core of one hole showing glance only, no native copper being present.

Development: little underground work has been done, but thorough diamond drill development has been completed. It consists of one line of holes, spaced 1,000' apart, which cut the copper-bearing beds about 400' below the surface and on their dip; a second line of holes, similarly spaced, cut the beds about 600' in depth; the third line of holes, also 1,000' apart, cut the beds at a depth of 1,100'. The second line was located half way between the holes of the first; the third line holes were put down 250' from those of the second line. Drilling has disclosed very uniform values for a distance of 4,000' along the strike of the formation and at an average depth of 300'.

The first of the five shafts planned, 1,495' from the E. boundary, was sunk 242' in 1916. It has 4 compartments, 21' 14" x 11' outside timbers, with ultimate hoisting capacity of 1,500 tons per day. Driving and cross-cutting, 1916, totaled 900'. This work reveals that the ground carries a shale (No. 1), 5' on the foot-wall assaying 15 lb. copper per ton; then 6' of barren sandstone; followed by shale (No. 2) 4½' wide, containing 22 to 30 lb.; 9' below this is 18 to 24" of fine-grained sandstone, returning up to 60 lb. per ton. Work indicates that these veins will outcrop on the property for 2½ miles.

Concentration will undoubtedly be by means of the flotation system. experimental work showing possibilities of an 85% extraction. Plans for a 100-ton testing mill were being considered during early part of 1917. Slime tables and flotation are the main features.

In Feb., 1917, the N. drift was 532' long, and the S. drift 556'. Shaft-sinking continues.

Equipment: 60' head-frame, 329' trestle, shaft-house, hoist of 500-ton daily capacity to 1,000' depth, 12-drill compressor, 3 boilers, machine-shop, saw-mill, fire system, water-supply, 26½-mile telephone line, and dwellings, etc., for 67 men. A 9-mile railway is to be constructed.

Possibilities of this mine are good, and exploration is in capable hands.

WILMOT MINING CO.

MICHIGAN

Office: 990 W. Kensington Rd., Los Angeles, Cal. Mine near Ontonagon, Mich. W. H. Garlick, pres.; W. B. Goucher, sec.

Inc. in Michigan. Cap., \$500,000; shares \$25 par. Paid dividends of

\$17,000, from sale of timber lands, with mineral rights reserved, and has received \$1,500 from assessments. Owns mineral rights to 3,520 acres in Ontonagon county. No mining done.

WINONA COPPER CO.**MICHIGAN**

Office: 705 Sears Bldg., Boston, Mass. **Operating office:** Houghton, Mich. **Mine office:** Winona, Houghton Co., Mich.

Officers: Chas. J. Paine, Jr., pres.; Geo. P. Gardner, v. p., with W. A. Paine, Walter Hunnewell, Jas. H. Seager and W. Cameron Forbes, directors. A. E. Coe, sec.-treas.; Rex. R. Seeber, supt.

Inc. 1898, in Michigan. **Cap.**, \$2,500,000; shares \$25 par; increased 1911 to \$5,000,000; issued 166,667 shares, fully paid. Last assessment of \$1 was paid July 2, 1914. The company 1911 acquired the property of the King Philip Copper Co., issuing 166,667 shares of Winona stock therefor. Boston Safe Deposit & Trust Co., registrar; American Trust Co., Boston, transfer agent. Shares are listed on the Boston Stock Exchange. Annual meeting last Tuesday in March.

Report for 1916 shows receipts totaling \$712,407, including \$473,583 from copper and \$223,324 balance from 1915. Expenditures totaled \$545,202, including \$472,769 mine expenses. Balance of assets at end of 1916 was \$330,045.

Property, 2,608 acres, with timber rights to 1,768 acres additional, lying 3 to 5 miles S. of the mine.

Geology: the main tract carries the outcrop of the Winona amygdaloidal bed for about 2 miles. The mine was discovered 1864, by a line of old Indian pits along the outcrop, and a single shallow shaft was sunk, but owing to entire lack of transportation facilities little was accomplished. The property was leased in 1880 and worked for mass copper, but did not pay and was closed, until the present company began work April, 1898, when the old shaft was cut down, retimbered and deepened, and 3 new shafts sunk. The Winona bed is an amygdaloid of 12' minimum, 20' average and 46' maximum width, striking N. 59° E., and having an average dip of about 70°. The Winona amygdaloid greatly resembles both the Baltic bed and the Knowlton bed of the Evergreen belt, carrying considerable epidote, calcite and quartz, with a limited amount of both mass and barrel copper, though the bulk of the metal occurs in stamp rock. Diamond-drill borings have located several other cupriferous beds on the Winona tract, all lean where cut. The mine is on a spur of the Copper Range railway.

The older workings show mineral of the lighter grades, with somewhat heavier copper at depth.

Development: No. 1, the discovery shaft, has 3 compartments, is 400' deep, with 4 levels opened, which shows a little heavy copper and some stamp rock in the northern drifts, but is of little promise and has been idle since 1901.

No. 2 shaft is 1,000' deep, with 9 levels opened, showing good copper at depth of about 200', but with poor ground below, and has been idle since early 1906.

Old No. 3 shaft, 750' deep, has been idle for years.

New No. 3 shaft, 1,650' S. W. of No. 2, is bottomed at the 13th level. The 3d to 10th levels, inclusive, have been extended to No. 4 shaft at depth of 1,272' showing alternations of good and poor ground. The openings, as a whole, show rock carrying 12 to 15 lbs. fine copper per ton, allowing for judicious stoping and reasonable selection of ground broken.

Equipment at N. 3 shaft includes a steel shaft rock house, equipped with two 18"x24" crushers, pneumatic steel gates, and pneumatic trolley cranes.

No. 4 shaft, about 1,700' S. W. of No. 3 is down to the 15th level. The shaft is sunk in the footwall and was opened by sinking and raising simultaneously. Underground work has been confined to stoping for the past year. Connection is had with the King Philip workings on the 5th, 7th, 8th, 9th, 10th and 12th levels.

No. 4 shaft is equipped with a modern steel shaft rock house, having a cylindrical main bin of about 40' diam., built of heavy steel plate and a 24x36" Portage Lake-Farrell crusher.

The hoist at No. 4 shaft, about 1,700' from the central plant, and good for 1,500' depth, operates two 3-ton skips, working in counterbalance, at a speed of 1,200' per minute.

King Philip No. 1 shaft, about 1,400' S. of Winona No. 4 shaft, is 14x25' in size, sunk about 85' in the footwall, at an angle of 70°, and is temporarily bottomed at the 14th level. The lode shows a width of 20 to 25', and carries considerable epidote.

King Philip No. 2 shaft is 2,780' S. of No. 1, on the southern side of Sleeping river, and 3,400' from the southern boundary of the tract. This shaft, temporarily idle, also sunk in the footwall, is 1,108' deep, with crosscuts on the 6th, 8th and 10th levels, to the Winona bed, which gives a fair showing, about the same as in No. 1, with which it has underground connection on the 8th level.

Development in 1916 amounted to 879', openings showing about the usual run of ground, those at No. 1 King Philip being the best.

King Philip No. 1 has a wooden shaft and rock house completed in May, 1916, which allows a 35% increase in output. No. 2 shaft has an isolated steam hoisting plant. It contains a motor driven 18x24" Hodge crusher, and a mass hammer of drop type.

The power plant equipment at No. 3 shaft includes an Allis-Chalmers 250-kw. 3-phase 60-cycle 2,300-volt cross-compound a. c. generator. The equipment at No. 4 shaft includes a motor-generator set which has a 450 h. p. 3-phase 60-cycle 2,080 volt variable speed induction motor, at 600 r. p. m., connected on either side by flexible couplings, to two 20-ton fly-wheels, 10' in diam. The motor-generator set has 2 bearings of 11x33", and 2 bearings of 9x27" with oil pumped through them at the rate of 16 gals. per minute, automatically filtered and water-cooled, insuring perfect lubrication. A 150-kw. motor-generator operating the electric locomotives, transforms a 2,200-volt alternating current into a 500-volt direct current. There is a 25-drill Nordberg air compressor in the central power house, and steam is provided by three 270 h. p. water-tube boilers, operated at 175 lbs. initial steam pressure.

The King Philip boiler house has a battery of two 300 h. p. Parker tubular boilers. The 34x40' power house has a 50-drill Nordberg 3-stage air compressor.

Mine buildings include a carpenter shop, machine shop, smithy, warehouse, office buildings, 2 boarding houses and about 150 dwellings for employees. There also is a sawmill, with wing for boilers, and a wing containing a shingle mill, the plant having a daily capacity of 20,000' of sawed lumber.

The mill, built at a cost of about \$300,000, is near No. 4 shaft, thus saving about 13c per ton in transportation charges. The mill secures its water from the Sleeping river, across which a dam has been built, with a storage capacity of 150,000,000 gals. Careful hydrographic surveys for 3 years show that the watershed tributary to this river yields about 3,000,000 gals. per day, which, is enough for the mill. The item of 13c per ton transportation charges saved by the new mill may seem small, at first sight, but it actually means about 1c per lb. on the cost of finished

copper, and may mean the difference between success or failure, so closely are costs and income adjusted in a low-grade Lake Superior copper mine. The custom for many years past has been to put Lake Superior mills some miles away from the mines, on large bodies of water, but in the case of the Winona, the management has had to consider costs rather than the easier solution of its milling problem.

Rock, brought to the mill by electric locomotives, is crushed in 2 Allis-Chalmers stamps, 1 a simple head having a 24" cylinder, and 1 a steeple-compound head with 16" and 32" cylinders. Equipment includes 6 Hardinge conical tube-mills, 60 Wilfley tables and 12 settling tanks. Under the wash floor there are 6 large settling tanks for the wash water, which is reused after clarification. Tailings are carried by belt-conveyor for a distance of 321' from the mill, and delivered at a height of 123' above the ground, forming a great hill of waste at hand for retreatment at some future time. Slimes are delivered by a 1,200' steel launder to a ravine beyond the sand discharge. Company employs about 300 men.

In Aug., 1914, the mine was shut down on account of the low price of copper. In Oct. work was started by lessees, the rock being shipped to the Centennial-Allouez mill, until Jan. 1, 1915, and after this date to the Trimountain mill, and continued until the Spring of 1915. In June, the company started work, sending the mine output to its own mill.

The Winona has made various separate campaigns of production; on several occasions the percentage of copper extracted ran down to unpayable figures, returns averaging 18.95 lbs. fine copper per ton of rock stamped in 1904, 14.34 lbs. in 1906, and 12.59 lbs. in 1907. The average yield in 1914 was only 10.96 lbs. fine copper per ton of rock stamped.

Winona's rock averages 20 lbs. of copper per ton, but the copper is light and flaky and the mill has never been able to make adequate recovery. A great deal of experimental work has been done in an attempt to solve the problem. The method finally determined upon, and being tried out at present, is the Slater ferric-chloride process. Results indicate that when it is made continuous instead of treating the ore in batches it will be the solution of the problem. Flotation was also tried but nothing definite has been decided.

Development: underground is much better to the S. of the property than in the original workings to the N., and the mine has been extensively opened, with a large tonnage of rock available for stoping. Notwithstanding the unsatisfactory results secured thus far, the Winona is considered to have very fair chances of making a successful low-grade mine, with profits depending upon copper selling at 15 cts. or over. The management is efficient and resourceful.

Production: 1902, 101,188 lbs. copper; 1903, 1,036,944 lbs.; 1904, 646,024 lbs.; 1905, no production; 1906, 278,182 lbs.; 1907, 1,285,863 lbs.; 1908, 1909 and 1910, no production.

Recent production:

	Tons R'k Stmpd.	Mineral Lbs.	Lbs. Copper		Ref. Copper Produced Lbs.
			per Ton Rock	Rec. per Ton R'k	
1916.....	161,829	3,700,180	22.85	13.39	2,167,255
1915.....	102,594	3,032,045	29.55	16.79(a)	1,722,638
1914.....	123,339	2,239,170	18.15	10.96	1,352,085
1913.....	120,806	2,467,460	20.42	11.99	1,448,737
1912.....	181,148	3,586,520	19.79	12.738	2,307,237
1911.....	97,445	2,533,870	26.00	13.091	1,275,675

(a) Higher recovery due to closer selection of rock stamped. Copper was sold at 17.4c per lb. in 1915, and 28.08c in 1916.

During the first 9 months of 1917 the mine yielded an average of 166,000 lbs. copper monthly at a cost of 27c per lb. With copper selling at 23½c fixed price a loss would be made, so the mine was let on tribute to the superintendent and others on a royalty basis in October, 1917. The daily production is now 450 tons.

WOLVERINE COPPER MINING CO.

MICHIGAN

Office: 15 William St., New York. **Mine office:** Kearsarge, Houghton Co., Mich.

Officers: R. Stanton, pres.; Geo. W. Drucker, sec.-treas.; preceding with Jas. S. Dunstan, L. P. Yandell, and Theo. Dengler, directors. Theo. Dengler, supt.; F. W. Hartmann, asst. supt.; Chas. L. Noetzel, clerk; David L. Vivian, mill supt.; Arthur Williams, mine capt.; A. Floetter, engr.; A. B. Holtenhoff, master mechanic.

Inc. 1890 in Michigan. **Cap.**, \$1,500,000; shares \$25 par. The company owns \$80,000 stock in the Michigan Smelting Co. Old Colony Trust Co., Boston, registrar; American Trust Co., Boston, transfer agent. Annual meeting, first Monday in August.

Financial statement for fiscal year ending June 30:

	Receipts	Tot. Exp.	Profit	Div.	Tot. Sur.
1917.....	\$1,707,441	\$681,036	\$1,026,405	\$780,000	\$1,108,933
1916.....	1,369,286	634,068	735,218	660,000	862,529
1915.....	929,193	610,991	318,201	360,000	787,311
1914.....	484,061	402,936	81,075	.....	829,109
1913.....	1,326,501	724,987	601,514	600,000	748,034
1912.....	1,327,030	713,840	613,180	540,000	746,520

Surplus at end of last financial year was \$1,108,933, including cash \$913,000, Liberty bonds, \$355,000; copper \$360,000; equal to \$18.48 per share.

Dividends: the first dividend was paid Oct. 1, 1898 and 38 dividend disbursements, to Oct. 1, 1917, aggregated \$9,930,000.

Property: 320 acres, 280 acres freehold, and 40 acres mineral rights, carries 3,100' of the strike of the Kearsarge amygdaloidal bed, on which the mine is opened. Neighboring properties are the North Kearsarge on the N., Mayflower on the E., Mayflower and South Kearsarge on the S., and Centennial on the W.

The Kearsarge bed averages about 16' in width on the Wolverine property, and this mine was for many years the richest amygdaloidal mine in the Lake Superior district, second in richness only to the Calumet & Hecla among all Lake Superior copper mines. All shafts are sunk at an angle of 41°, and skip tracks have been given crossies, in place of longitudinal stringers, following the plan introduced in the Calumet & Hecla, which permits the use of a cheaper grade of timber and allows quicker repairs. All levels, except some of the very upper ones, are opened at 100' intervals. Owing to the uniformity of the cupriferous bed, all levels from the 1st to the 23d, inclusive, are opened through the entire property, connecting all 4 shafts to the bottoms of No. 1 and 2 and connecting Nos. 3 and 4 only below the 17th level. With production at the rate of 6,500,000 lbs. fine copper yearly, the life of the mine is estimated at about 12 years. The new lease on life is due to the reworking of the footwall rock of supposedly worked out stopes, throughout the mine. The total width of the lode is 15' to 20'; in the original work only 12' was mined, so there remains 3' to 5' of rock which contains about 18 lbs. copper per ton.

Development: several parallel lodes have been prospected, an exploratory crosscut being driven for 2,000' across the formation on the 14th level, reaching the Kearsarge conglomerate on the W., where it was barren.

Another exploratory crosscut, 1,600' long, driven E. on the 28th level, intersects the Old Colony lode 1,489' E. of the Kearsarge amygdaloid and cuts other cupriferous beds. A little drifting on the Old Colony lode failed to disclose payable ground. The West lode lying 80' W. of the Kearsarge has been opened by several levels, with some payable ore on the 13th and 14th.

The Wolverine lands also carry the Osceola amygdaloid, but it proved non-commercial in a 631' shaft with drifts on 5 levels.

No. 1 shaft near the Kearsarge line, was abandoned years ago. No. 2 shaft, next S., is bottomed at 1,700' and is used for handling men and supplies.

No. 3 shaft sunk in the footwall, is bottomed at the 39th level, total depth 4,005'. Sinking was stopped at the 39th level as the hoist had reached the limit of its rope capacity. It is proposed to open and mine the remaining 100' below the 39th level by means of a winze 600' S. of the shaft. This inclined winze will eventually attain a depth of 700' in order to reach the boundary of the property. It will take 5 years to reach this point and 15 years to exhaust the ground. Shafts No. 3 and 4 are connected by drifts down to and including the 33rd level.

No. 4 shaft sunk 45' in the foot, to guard against drawing, has reached the 43rd level, total depth 4,500', the bottom of the mine.

Development in 1916-1917 amounted to 1,924'. New openings exposed good ore, and indications for No. 41, 42 and 43 levels are also good.

Equipment: at No. 3 shaft duplicates that of the Mohawk mines. That at No. 4 includes a 14"x60" Nordberg duplex-cylinder hoist with double conical drum having a maximum diam. of 18', capable of raising 4-ton skips from 1 mile depth, with a 1¼" steel cable. There are 20-drill and 22-drill compressors, and 3 Stirling water-tube boilers, with American automatic stokers and a Green fuel economizer.

Mine has Knowles electric pumps, 3 at No. 2 shaft, and one at shafts Nos. 3 and 4, three pumps having an average lift of more than 1,000' each.

The principal mine buildings are at No. 4 shaft, but there is a model changing house at No. 3 shaft. A telephone system connects underground pump stations and all buildings. The company maintains a 6-ward hospital and staff, and owns a large number of substantial dwellings, the location being exceptionally prosperous in appearance.

Rock is transported between the mine and mill by the Mohawk & Traverse Bay railroad, with a down-grade haul of 13 miles.

Mill is near the mouth of Tobacco river, on Traverse bay, Lake Superior, and adjoins the Mohawk mill, both being served by a single pump and managed by a joint superintendent. The mill has 2 Nordberg heads and uses Wilfley tables. Mineral from the heads and wash is sluiced to the basement through iron pipes, going to the works of the Michigan Smelting Co. at Houghton. A Jackson tailings plant provides for settling out the water and stacking the tailings 800' from the mill by belt conveyor.

The boiler house houses a battery of 200 h. p. Stirling water-tube boilers, equipped with American automatic stokers.

The pump house, owned jointly by the Wolverine and Mohawk, has a 20,000,000-gal. Snow horizontal triple-expansion pump, with 18", 33" and 54" steam cylinders and 22" water plungers, with 36" stroke, besides an auxiliary 8,000,000-gal. Nordberg triple expansion water-end pump, with 3 plungers. The pump house is located on the river, near its mouth, the intake being protected by timber cribs running 300' into the lake to prevent clogging from floating bark and anchor ice.

Average number of men employed at mine and mill is 370.

Recent Production: (fiscal year ending June 30).

	Tons R't Hoisted	Cost per Ton	Tons R't Stamped	Cost per Ton	Lbs. Cu. per Ton	Mineral Lbs.	Ref. Cu. Lbs.	Cost per Lb.(b)
1917.....	354,899	\$1.54	352,645	\$1.63	16.59	8,753,945	5,856,889	11.62(c)
1916.....	391,898	1.31	388,898	1.39	17.07	9,127,790	6,541,492	9.43
1915.....	403,219	1.28	397,614	1.30	18.23	9,734,850	7,250,866	8.43
1914.....	188,147(a)	1.85	182,127	1.92	18.86	4,606,015	3,435,459	11.72
1913.....	403,514	1.53	385,502	1.62	21.49	10,782,405	8,350,312	8.665
1912.....	414,544	1.53	401,308	1.58	23.45	12,164,780	9,408,960	7.586
1911.....	400,296	1.59	386,476	1.64	24.75	12,227,500	9,617,168	7.542
1910.....	405,790	1.55	390,837	1.61	24.96	12,859,000	9,757,191	7.413

(a) Mine was closed from July, 1913, to April, 1914, on account of the Western Federation of Miners' strike.

(b) Cost per pound includes construction.

In July, 1917, the output was 363,888 lbs. from 27,557 tons of ore. or 14.12 lb. per ton, a decided decrease on a few months ago.

With a 12-year life, as estimated by the directors, and an annual yield of 6,500,000 lbs. of copper figured at a total of 78,000,000 lbs., the profit with 15c copper and 9.4c cost would be \$4,368,000, equivalent to \$72 per share, or \$6 per year.

WYANDOT COPPER CO.

MICHIGAN

Office: 68 Devonshire St., Boston, Mass. **Operating office:** Houghton, Mich. **Mine office:** Winona, Houghton Co., Mich.

Directors: Ashley Watson, pres.; Jos. Dorr, v. p.; Chas. E. Adams, sec.-treas. and Frank L. Van Orden, mgr. Louis La Rochelle, mg. capt.

Inc. Feb. 3, 1899, in Michigan. **Cap.**, \$2,500,000; shares \$25 par; paid in, \$13. Has levied assessments of \$700,000 since organization. Shares are listed on the Boston Stock Exchange. State Street Trust Co., Boston, registrar; Federal Trust Co., Boston, transfer agent. Annual meeting, second Monday in May.

Property: 1,065 acres, adjoins the Winona, in Secs. 16, 20 and 21, T. 52 N., R. 36 W. Exploratory work, begun Feb., 1899, was done in search of the Winona bed; later to locate the southern extension of the Baltic amygdaloid, after which attention was turned again to the Winona bed, and latterly to development of an amygdaloidal bed, the No. 8 lode, lying about 2,300' E. of the Winona lode. The average strike of the Keweenawan formation on this land is N. 53° E., with an average dip of 65°, and the Wyandot lands carry the strike of the Keweenawan bedded series for about 1½ miles.

Development: by several shafts, No. 1, 1,000' deep, located in the S. E. ¼ of Sec. 21, T. 52 N., R. 36 W., is sunk in the footwall of the Winona bed.

No. 11 exploratory shaft is sunk 710' on a stratum paralleling the Winona bed, at a distance of 1,200'. This bed looked good when first opened, and diamond-drill cores were rich, but the bed proved poor under development. A crosscut driven S. E. from the bottom of No. 11 shaft for 2,640', intersects 13 distinct amygdaloidal beds, Nos. 3 and 8 showing copper. Drifting done on No. 3 bed disclosed considerable mass and barrel copper, but No. 8 is the more promising.

Miscellaneous work of the past includes a 102' vertical shaft, sunk on a lean amygdaloidal bed, known as the Misery river bed, in Sec. 16, T. 52 N., R. 36 W., but nothing of value was developed. Some years ago a vertical shaft was sunk on lands held under option, near the W. quarter post of Sec. 28, T. 52 N., R. 36 W., to depth of 250', and crosscuts driven both E. and W. with about one-half mile of workings. This work crossed the horizon of the Baltic bed, but what was deemed the Baltic amygdaloid was found highly altered, and worthless, as was the whole country in the neighborhood.

Extensive diamond drilling has been done on the property and a core, taken 1904, from the horizon of the Lake bed, showed a little copper, but was not considered important at that time. The ground has been carefully prospected again by diamond drill, in Secs. 16 and 21. Holes Nos. 21 and 22 showed beds offering encouragement, and some trenching was done

on 1 bed, 48' wide, carrying a little copper from foot to hanging. Another trench, 1,500' N. E. disclosed the bed under only 16' of overburden, and a shaft known as the Sec. 16 shaft, was sunk to a depth of 65'. A crosscut at this depth shows the bed to be 38' wide, carrying finely-disseminated copper for about 10', with small masses along the footwall.

Recent activity has been centered in development work in the No. 8 lode, 1,100' S. E. of the No. 11 shaft. This lode is opened by the long crosscut on the 700' level, and below this depth by a 115' winze, with about 800' of drifts on the 815' level, 400' of drifts on the 900' level and drifts have been started on the 1,000' level, the bottom of the winze. The showing on these levels has been varied and sufficient work has not been done to fully demonstrate the value of the lode.

Equipment: includes a steam plant with Lidgerwood hoist, good for 1,000' and compressors of 12 drills aggregate capacity.

Work at present is confined to drift-stopping, preparatory to regular stoping, both N. and S. of the winze on the 800' level. Gratifying results have been obtained and if present developments are indicative of the general mineralization of the lode, the future of the property looks good. About 25 men are employed. Two drills were working on No. 10 level in August, 1917.

The Wyandot company has worked faithfully and with skill for more than a decade to make a profitable mine, and, though not yet successful, has not exhausted the possibilities of its holdings.

Two mill tests have been made, the second of 654 tons being completed in Sept., 1917. This averaged 21.62 lbs. copper per ton. Another lot of 500 tons is to be milled. Operations are kept going by assessments, one of \$1 per share being called for Sept. and March (50c each).

IRON MINES OF MICHIGAN

Arranged alphabetically and embracing the important mining companies operating in Gogebic, Menominee and Marquette ranges.

BREITUNG IRON CO.

MICHIGAN

Office: 11 Pine St., New York.

Officers: E. N. Breitung, pres. and gen. mgr.; Wm. A. Hamilton, sec.-treas.; the preceding, and H. H. Seaman, Norman Merriman and R. M. DeVoe, directors; C. B. Dunster, mgr.

Inc. May 4, 1917, in Delaware. **Cap.,** common stock, \$15,000,000; par value, \$100; authorized and outstanding; pfd. 7% cumulative; convertible, \$3,000,000. Redeemable at option of corporation at \$110 per share and accrued dividends. Convertible share for share into common stock at the option of the holders. Quarterly dividend payable on the first day of Jan., April, July and October. Privilege of conversion up to thirty days, prior to date fixed for redemption. No bonds.

The various subsidiary companies and their locations are given below, together with the percentage of capital stock of each one held by the B. I. Co., other than directors' qualifying shares.

Names of Subsidiary Operating Companies	Location	Iron Ore Range	% Capital Stock Owned
Mary Charlotte Mng. Co.	Negaunee, Mich.	Marquette Range	95
Breitung Hemetite Mng. Co.	"	"	95
Juliet Iron Co.	"	"	100
Washington Iron Co.	Humbolt,	"	70
Hopkins Mng. Co.	Ironton, Minn.	Cuyuna Range	51
Clifford Ext. Iron Co.	Iron Mtn., Mich.	Menominee Range	100
Loon Lake Mng. Property	Wilde, Ont., Can.	Algoma Range	80

Under date of April 1, 1917, the American Appraisal Co., of 120 Broadway, appraises the properties of the subsidiaries at \$8,631,073, including in permanent equipment and development, \$1,227,563; mineral lands and leases, \$7,078,250; investments in ships, \$325,260; current assets, \$3,620,648, and the liabilities as, \$1,622,978. The Appraisal company notes that these values are very conservative. The B. I. Co. estimates that net earnings for 1917 will be \$800,000 and in next 3 years about, \$1,750,000 annually.

A Surplus Fund is to be created from earnings remaining after payment of preferred dividends in each year, up to Jan. 1, 1920, to be maintained at an amount equal to that existing on that date, either in property or otherwise, so long as any of the preferred stock is outstanding. No dividends can be paid on the common stock until Jan. 1, 1920, and after that, 25% of all surplus earnings remaining after payment of preferred dividends in each year shall be applied to the redemption of preferred stock at \$110 and accrued dividends.

Property: over 1,300 acres in one solid group in the Negaunee district of the Marquette Iron Range in the Lake Superior region, and properties in other districts. The company operates a boat line from Superior ports to lower Lake ports.

Subsidiary Properties

Mary Charlotte Mining Co. holds leases on 120 acres of iron ore lands estimated to contain over 4,000,000 tons of high-grade Bessemer and Mary ores, disclosed by development work and drilling; and large tonnage of lower grade ores. Mine has operated since 1903.

Breitung Hematite Mining Co., Ltd. has 50-year leases on more than 175 acres of iron ore lands estimated by development and drilling to contain 4,000,000 tons of high grade Bessemer and non-Bessemer ores. Company has recently spent \$400,000 for new shaft and development to permit steady production. Has produced since 1906.

Juliet Iron Co. holds fifty-year lease on 960 acres in the Negaunee Basin iron formation and adjoins and almost surrounds the Breitung Hematite No. 1 mine; practically undeveloped except by shallow workings that show promising prospects. From one tract of 80 acres, known as the Milwaukee-Davis, 700,000 tons were produced.

Lucky Star Mining Co. owns 150 acres northeast of Breitung Hematite; property is crossed by a very rich orebody. Drill holes show more than 4,000,000 tons. A shaft has been sunk to within 200' of the ore, and company reports that it should be producing within two years.

Washington Iron Co. owns in fee and operates the Barron mine in the Humboldt district of the Marquette range. Since 1908 property has produced 350,000 tons. There are 1,120 acres situated in the iron formation with known ore developed to present time of 400,000 tons.

Hopkins Mining Co. holds 46-year lease on 80 acres in Cuyuna range near Ironton, Minn. Drilling in 1914 showed 468,566 tons of Bessemer and manganese ore. Later work in that section indicated a larger tonnage. At present time shaft has been sunk 145'.

Clifford Extension Iron Co. holds a 24-year lease on 80 acres in the Menominee range where ore bodies ~~are estimated with large reserves~~ ^{are estimated with large reserves} to go to great depth. Above the 135' level 2,500,000 tons are estimated with large reserves below that level. Property is being opened up by a small ~~and ore will be mined~~ ^{and ore will be mined} by open pit milling method. Ore is Bessemer grade of specular hematite.

Loon Lake Mining Property is held in fee by a subsidiary company. There are about 1,000 acres in the Algoma Iron Range, 20 miles north of Sault Ste. Marie, Ontario. Property is being prospected

BRISTOL MINING CO.

MICHIGAN

Office: E. W. Hopkins, mgr., Wade Bldg., Cleveland, Ohio.

Property: on the Menominee range, Mich. Ore: hard, brown, non-Bessemer hematite, containing 49.48% iron, 3.96% manganese, 0.6% phosphorus and 7.25% silica.

Mining method: by stoping to 1,060'.

Production: 462,559 tons in 1916 and 4,606,922 tons to date.

CASCADE MINING CO.

MICHIGAN

Address: 728 Security Bldg., Minneapolis, Minn.

Officers: Fred B. Snyder, pres.; J. F. VanDerlip, v. p.; R. M. Bennett, treas.; O. B. Warren, gen. mgr. T. J. Nicholas, supt., Palmer, Mich. Pickands, Mather & Co., Cleveland, Ohio, sales agents. Operated as a close corporation.

Property: Isabella mine, Marquette county, developed by shafts and tunnels to vertical depth of 940', showing an iron ore deposit in Jasper-diorite and quartzite. The ore is mined by the square set and stoping systems.

Production in 1916: 134,998 tons, the product being a Bessemer and non-Bessemer hematite.

CLEVELAND-CLIFFS IRON CO., THE MINNESOTA-MICHIGAN

Office: Cleveland, Ohio. M. M. Duncan, mgr.

Officers: W. G. Mather, pres.; M. M. Duncan, v. p.; R. C. Mann, treas.; S. L. Mather, sec., with T. H. Newberry, C. W. Bingham, Samuel Mather, J. H. Wade and B. F. Bourne, directors; C. G. Heer, asst. treas.; E. H. Jaynes, asst. sec.; and C. D. Mason, aud.

Inc. in W. Virginia. Cap., \$10,000,000; shares \$100 par; 995,740 issued. Funded debt outstanding, \$1,575,000 1st collateral trust gold 6s.

Statement for 1916 shows an income from all sources of \$5,827,787, of which \$1,645,374 was profit. Cash assets at end of year were \$6,624,320 and current liabilities, \$3,387,715.

Dividends: 2% per quarter.

Property: iron mines in Michigan and Minnesota that yielded 2,275,796 tons in 1916. The principal ones are:

Mine	Range	Mining System	Ore	Iron Content, Per Cent	Shipments, 1916, Tons	Total Tons
Crosby...	Mesabi	Open pit and side-slicing	Bessemer	56.89	110,652	1,374,286
Fowler...	Mesabi	Caving	.....	52.07	29,711	764,309
Meadow...	"	Top and side slicing	Non-Bessemer	49.90	50,763	170,932
Angeline..	Marquette	Underground	Bessemer	60.02	1,959	9,022,881
Austin....	"	Caving	B. and non-B.	.....	64,521	1,031,643
Cliff Shaft	"	Open stope, room and pillar	non-B.	59.20	1,036,775	27,067,196
Gwinn....	"	Caving	B. and non-B.	.....	143,708	221,963
Lake.....	"	"	"	51.33	463,374	9,084,663
Lloyd....	"	Open pit, caving, shrinkage stoping	B. and non-B.	52.28 to 46.14	281,502	808,904
Maas.....	"	Caving	B. and non-B.	53.14	267,946	1,261,634
Negaunee.	"	"	"	53.59	523,736	6,176,287
Republic..	"	Open and shrinkage stoping	"	62.25	209,060	7,227,946
Salisbury..	"	Caving	"	52.20	107,212	1,255,873
Stephenson	"	"	"	51.88	355,166	1,480,615

The Maas is worked to a depth of 1,290'.

The above figures represent the season's shipments, May 1 to December 1, or the season of Lake navigation. Actual production goes on all the year, and the ore is stocked at the mines. It frequently happens that in one year production figures are considerably larger than shipments; and in other years the reverse.

DAVIDSON ORE MINING CO.**MICHIGAN**

Office: 403 White Bldg., Buffalo, N. Y. Mine office: Iron River, Mich.

Officers: F. N. Beagle, pres.; Geo. Davidson, v. p.; T. F. Hildreth, sec.-mgr.; L. R. Davidson, treas. Rudolph Ericson, supt.

Inc. 1910 in Michigan. Cap., \$500,000; shares \$25 par; \$400,000 shares outstanding.

Property: 120 acres, includes the Davidson No. 1 and No. 2 mines, near Iron River. Ore is a non-Bessemer hematite.

Development: by 550' vertical and 252' incline shafts.

Equipment: includes 3 hoists, 2 compressors and a Marion steam shovel.

HANNA & CO., M. A.**MICHIGAN-MINNESOTA**

Office: Leader-News Bldg., Cleveland, Ohio.

Officers: L. C. Hanna, R. L. Ireland, M. Andrews, H. M. Hanna, Jr., F. B. Richards, Wm. Collins, R. F. Grant. Operated as a close corporation and does not furnish reports for publication.

Controls the following operating companies: Virginia Ore Mining Co., Virginia, Minn.; Consumers Ore Co., Mountain Iron, Minn.; La Rue Mining Co., Nashwank, Minn.; American-Boston Mining Co., Diorite, Mich.; Richmond Iron Co., Palmer, Mich.; Hollister Mining Co., Crystal Falls, Mich.; Wakefield Iron Co., Wakefield, Mich. Also operates 32 vessels of 8,915 average tonnage on the Great Lakes.

Company is sales agents for the following:

Company	Mine	Tons in 1916	Tons to Date
.....	Bessemer.....	.....	1,238,546
Pittsburgh Iron Ore.....	Brunt.....	162,290	1,108,794
Consumers' Ore.....	Hanna A.....	124,201	1,274,630
" ".....	" B.....	.....	.....
Swallow & Hopkins.....	Helmer.....	395,615	674,858
Republic Iron and Steel.....	Kinney.....	466,576	3,859,132
La Rue Mining.....	La Rue.....	253,402	2,067,440
Pitt Iron Mining.....	Miller.....	252,404	3,075,419
Republic Iron and Steel.....	Pettit.....	178,917	1,436,316
Newport Mining.....	Keweenaw.....	121,014	169,152
" ".....	Newport.....	1,315,980	12,570,580
Wakefield Iron.....	Wakefield.....	1,061,730	2,041,343
Loretto Iron.....	Loretto.....	174,173	1,912,453
Penn Iron Mining.....	Penn Group.....	427,266	11,109,692
American-Boston Mining.....	American.....	245,969	1,312,743
Republic Iron and Steel.....	Cambria.....	195,612	2,905,732

INDIANA MINE**MICHIGAN**

John M. Thomas, owner, Milwaukee, Wis.; G. A. Richards, supt., Iron Mountain, Mich.

Is an iron property producing ore carrying 40.4% iron and .007% phosphorus. Uses electric hoist, pump, tram and steam driven compressor.

JUDSON MINING CO.**MICHIGAN**

Alpha, Mich. M. E. Richards, gen. mgr.; T. D. Held, pres., Chicago; Carom Hartly, v. p., Duluth, Minn.; A. H. Anderson, sec.

Inc. 1912 in Mich. Cap., \$750,000; shares \$10 par; all issued.

Property: Judson mine with 80 acres iron ore land having 2,000,000 tons hematite ore with 50% iron and 0.5% phosphorus content, blocked out.

Development: by 450' incline shaft and 5,000' of workings.

Equipment: includes Lake Shore hoist, 2,200 cu. ft. Ingersoll compressor, 1,000 gal. pump and motor tramway. Also a Bucyrus steam shovel.

Production: from 100,000 to 500,000 tons annually.

LAKE SUPERIOR IRON & CHEMICAL CO. MICHIGAN

Address: W. H. Matthews, mgr., Bessemer, Mich., -E. W. McRandle, supt.

Property: the Yale mine on Gogebic range, Michigan. **Ore:** 3 grades, all soft red, one a Bessemer, the second non-Bessemer and the third silicious hematite. The best ore contains 52.6% iron, 0.043% phosphorus and 5.43% silica. Ore is mined by caving to depth of 1,780'.

Production: 149,155 tons in 1916 and 1,013,486 tons to date.

LORETTO IRON CO. MICHIGAN

Office: 1400 Fulton St., Chicago, Ill.

Officers: Wm. A. Amberg, pres.; D. F. Bremner, v. p.; T. J. Amberg, sec.; J. W. Amberg, treas.; C. H. Baxter, supt., directors.

Inc. in Ills. Cap., \$400,000; shares \$10 par; all issued. Is a close corporation and makes no figures public.

Property: 280 acres leasehold on Menominee range at Loretto, Dickinson Co., Mich., opened up in 1892. Main orebody averages 10-40' in width and is about 1,000' long with an overburden of above 25'. Ore varies greatly in iron content.

Development: to vertical depth of 800'.

Production: 174,173 tons in 1917. Total output to date, 1,912,453 tons.

MINERAL MINING CO. MICHIGAN

Office: 910 Wells Bldg., Milwaukee, Wis. **Mine office:** Iron River, Mich.

Officers: G. D. Van Dyke, pres.; W. D. Van Dyke, v. p. and treas.; E. F. Brown, mgr. and sec.; above are directors.

Inc. May 7, 1904, in Wisconsin. Cap., \$100,000; shares \$100 par; 90,000 issued. Annual meeting, first Tuesday in May. Company is a close corporation.

Property: the Osana, Wauseca, Nanaimo and Breen iron mines near Iron River, Mich., first two being worked at present.

Production: capacity 500,000 tons yearly. Output of "James" ore averages 55.3% iron and 0.45% phosphorus.

NEGAUNEE MINE. MICHIGAN

Address: M. M. Duncan, mgr.; G. R. Jackson, supt., Ishpeming, Mich.

Sales agents: Cleveland-Cliffs Iron Co., and Pickands, Mather & Co., Cleveland, Ohio.

Property: in Marquette Co., Mich., has been worked since 1887.

Development: ore mined by caving system to vertical depth of 1,180'.

Ore: two grades: Negaunee, a soft, red, Bessemer hematite, containing 52.04% iron, 0.083% phos., and 6.72% silica; and Negaunee Bessemer, assaying 53.59% iron, 0.053% phos., and 6.72% silica. Moisture is 12% in both. Cargo analyses in 1916 averaged 59.20 to 60.90% iron, 0.094 to 0.060% phos., 7.65 to 7.12% silica, and 0.31 to 0.27% manganese.

Production: 523,736 tons in 1916, and total of 6,176,287 tons to date.

NEVADA MINING CO. MICHIGAN

Address: M. E. Richards, gen. mgr., Alpha, Mich.

Inc. 1916 in Michigan. Same directorate as Judson Mining Co.

Property: about 80 acres, in Iron county, Michigan, includes the Amasa Porte mine, carries a typical replacement deposit in slate, that is reported to average 55% iron.

Developed by shaft to 550' vertical depth with 3,000' of underground workings, said to contain 700,000 tons of ore, with 200,000 tons blocked out.
Equipment: includes Sullivan hoist, compressor, Prescott steam pump and 600-ton mill.

Production: to date amounts to 150,000 tons.

NORRIE-AURORA MINE.

MICHIGAN

Address: Oliver Iron Mining Co., Ironwood, Mich. J. H. McLean, mgr.; O. C. Davidson, gen. supt.

Property: in Gogebic county, Mich., was first opened in 1885, and developed to 2,034' vertical depth.

Production: 1,885,863 tons in 1916, making 33,522,636 tons to date. Ore is of 5 grades, all soft, reddish brown, Bessemer hematites, and one grade of non-Bessemer hematite. Average in mine is 54.31% iron, 0.036% phosphorus, 6.21% silica, and 10.86% moisture.

PENN IRON MINING CO...

MICHIGAN

Address: Vulcan, Mich.

Officers: A. C. Dinkey, pres.; H. F. Black, v.-p.; D. H. Gehly, sec.-treas., with Wm. Kelly, directors. Wm. Kelly, mgr.

Inc. in Michigan. Cap., \$1,000,000; shares \$100 par, all issued.

Property: in Menominee range, Dickinson county, includes the Cyclops, Norway, West Vulcan, Brier Hill and Curry mines. Developed to depth of 1,600' by vertical shafts. **Ore:** Bessemer and non-Bessemer hematite, 56.77% iron. Reserves estimated at 1,200,000 tons, August, 1917.

Production: the rate of 425,000 tons iron ore per year, a total to date of 11,109,692 tons.

PEWABIC CO.

MICHIGAN

Office: 910 Wells Bldg., Milwaukee, Wis.

Officers: G. D. Van Dyke, pres.; W. D. Van Dyke, sec.-treas., with N. P. Hulst, J. H. McLean and D. G. Kerr, directors. E. F. Brown, mgr.; W. G. Monroe, supt.

Inc. Jan. 1, 1887, in Wis. Cap., 8,000 shares; \$25 par, all issued. Is a close corporation.

Owns the Pewabic, Walpole and Millie iron mines at Iron Mountain, Dickinson Co., Mich. Ore carries from 38% to 63% iron and from .007 to .012% phos. Ore reserves: estimated at 50,000 tons in the Walpole and 500,000 tons in the Genoa.

REPUBLIC IRON & STEEL CO.

MICHIGAN

See same title under U. S. section of this book at beginning of Chapter VI.

SPRING VALLEY IRON CO.

MICHIGAN

Address: E. H. Willis, mgr., Wellston, Ohio. J. E. Looney, supt.

Property: on the Menominee range, Iron Co., Mich., opened in 1907. **Ore:** a soft, red, non-Bessemer hematite, assaying 51.75% iron, 0.461% phosphorus, and 6.3% silica. Ore is mined by top slicing system to depth of 350'.

Production: 145,716 tons in 1916, and 916,661 tons to date.

VERONA MINING CO.

MICHIGAN

Office: C. H. Munger, mgr., Cleveland, Ohio.

Property: 3 mines on the Menominee range, Mich. **Ore:** hard, red, non-Bessemer hematite.

Mine	Depth, ft.	Tons in 1916	Tons to date
Baltic.....	553	110,965	1,788,651
Bengal.....	280	140,960	208,923
Caspian.....	292	443,631	2,674,814

WAKEFIELD IRON CO.**MICHIGAN****Address:** J. D. Ireland, Wakefield, Mich. W. C. Hart, supt.**Property:** Andrews and Duane mines on Gogebic range, Gogebic Co., Mich.; first opened in 1913. **Ore:** a soft, red, non-Bessemer hematite and soft dark brown non-Bessemer hematite, carrying, respectively, 52.06 and 47.93% iron, 0.08 and 0.09% phosphorus and 4.25 and 5.31 silica.

Mining is by open pit and by underground work to depth of 400'.

Production: 1,061,730 tons in 1916 and 2,041,343 to date.**WASHINGTON IRON CO.****MICHIGAN****Address:** W. B. Pattison, supt., Negaunee, Mich.**Property:** the Washington mine, opened in 1860, on Marquette range, Mich. Has 4 grades of hard, gray non-Bessemer specular and magnetite ores, which are concentrated before shipment. No. 2 ore assays 56.83% iron, 0.136% phosphorus and 15.47% silica. Ore is mined by stoping to 730' depth.**Production:** 6,631 tons in 1916 and 360,322 tons since 1908.**WICKWIRE MINING CO.****MICHIGAN****Address:** E. C. Bowers, Buffalo, N. Y. H. Duff, supt.**Property:** the Virgil and Wickwire iron mines on the Menominee range, Iron Co., Mich. **Ore:** yellow-brown and red-brown non-Bessemer hematite, the former containing 51.04% iron, 0.396% phosphorus and 6.32% silica. Ore mined by sub-stoping, to 273' in the Virgil and slicing and caving to 313' in the Wickwire.**Production:** (tons)

	Virgil	Wickwire
1916.....	36,307	13,265
Total to date.....	42,220	128,627

MINNESOTA COPPER MINES**GREAT NORTHERN COPPER CO.****MINNESOTA**Idle since 1911. **Office:** 504 Globe Bldg., Minneapolis, Minn. Mine at Hinckley, Pine Co., Minn. Fully described Vol. XI, Copper Handbook.**J. BENNETT SMITH MINING CO.****MINNESOTA**

Company now entirely in hands of R. D. Lacoë of Oceanside, San Diego Co., Cal., who advanced most of the money for development. Former office Kingston, Pa. Mine address: Pine City, Pine Co., Minn.

Property: 500 acres of copper-bearing ground, along Snake river, a mile below Cross lake, in Pine county, Minn. The lands show the western extension of the Keweenaw copper-bearing beds of Lake Superior, the bedded formation having a strike of about N. 20° E., with dip of about 72° S.-E., showing the beds to be on the northern fold of the syncline.**Development:** includes 560' shaft; also several shallow pits and shafts. Several of the amygdaloidal and conglomerate strata, showing native copper, have been proven by test pitting and diamond-drill borings. Company reports having expended about \$50,000 on exploratory and development work since 1879.**LYCOMING CO.****MINNESOTA****Office:** 708 Lonsdale Bldg., Duluth, Minn. Was a securities-holding company. Inactive and no assets.**IRON-MANGANESE MINES OF THE CUYUNA RANGE****ALGOMA MANGANESE CO.****MINNESOTA****Address:** Ferguson Bldg., Duluth, Minn. W. A. McClaren, mgr.; A. A. MacKay, supt.

Property: Algoma mine, in Sec. 33, T. 47, R. 29, Crow Wing county, is developed to vertical depth of 100', the ore averaging 29.13% iron, 19.50% mang. and 0.81% phos. Shipments begun in 1916 amounted to 24,035 tons.
AMERICAN MANGANESE MFG. CO. MINNESOTA

Address: W. H. Locker, mgr., Bullitt Bldg., Philadelphia, Pa.

Property: the Mille Lacs mine, Cuyuna range, Minn. **Ore:** is a hard, manganiferous, non-Bessemer hematite carrying 37.31 to 40.02% iron, 8.96 to 21.22% manganese, 11.46 to 22% silica and 0.051 to 0.096% phosphorus. Ore is mined by underground methods to 205' vertical depth.

Production: 90,564 tons in 1916 and 203,137 tons to date.

CUYUNA DULUTH IRON CO. MINNESOTA

Address: Duluth, Minn. **Officers:** W. H. Socker, pres.; O. J. Windlandt, v. p.-sec.; W. H. Socker, treas.

Inc. 1911 in Minnesota. **Cap.**, \$1,000,000; shares, \$1 par, 756,000 outstanding.

Property: iron-ore leases in Crow Wing Co., Minn. Producing 52% iron ore in 1917.

GORHAM-GARBETT CO. MINNESOTA

Office: 627 First Ave., Minneapolis, Minn.

Officers: J. Pye, pres.; S. H. Wood, v. p.; C. F. W. Carlson, sec.-treas.; above with F. Bailey, W. F. Fruen, J. C. Heritage and R. W. McGarry, directors.

Inc. Jan., 1908 in Minn. **Cap.**, \$1,000,000; shares \$1 par; 925,000 issued.

Dividends: 2% paid Aug. 1, 1917.

Gross earnings, 1916, \$16,870 from royalties; expenses \$4,500. **Cash** on hand Feb. 1, 1917, \$8,973.

Property: 360 acres of iron and manganese ore land on Cuyuna range, Crow Wing Co., Minn., all leased on royalty plan. Lessees are the Iron Mtn. Mng. Co., Onahman Iron Co., Chas. W. Potts and associates.

Development: by 149' and 109' vertical shafts.

HELMER IRON MINE. MINNESOTA

Address: Swallow & Hopkins, owners, Duluth, Minn. **Mine address:** Kinney, St. Louis Co., Minn. J. S. Rayburn, mgr.; F. N. Gleason, supt.

Mine produced 375,000 tons of iron ore in 1916; total production to 1917, 675,000 tons. **Claims** 500,000 tons ore reserves.

HILL MINES CO. MINNESOTA

Office: Hill Bldg., Saginaw, Mich. **Mine address:** W. Van Evera, supt., Ironton, Minn.

Officers: Roger R. Hill, pres.-treas.; E. L. Beach, v. p.; Peter Drummond, sec.

Inc. Jan. 14, 1914, in Maine. **Cap.**, \$500,000, increased 1917 to \$5,000,000; shares \$10 par; non-assessable; \$1,100,000 issued. **Nine** dividends paid to date.

Property: 7 iron mines, 670 acres, at Ironton, Minn., on Cuyuna Iron Range, also near Aurora, on the Eastern Mesabi Iron Range. Ore is hematite in schist, in a deposit reported to be 200' wide. Average assays, 58% dry, 50.58% natural.

Development: by 1,000'x400' open pit, mining with steam shovels. Pit to be extended 700' east. Also one shaft mine. In 1916, 193,272 cu. yd. of overburden was removed.

Equipment: includes 2 Ingersoll-Rand compressors, Layne & Bowler pump, 2 steam shovels, electric power and 2 Baldwin locomotives.

Production: total to 1917, 19,430 long tons. **Approximate production** for 1917, 250,000 tons.

HOCH MINING CO.**MINNESOTA**

Office: 227 Fergusson Bldg., Duluth, Minn. C. A. Lanigan, asst. sec.
Initial dividend of \$10 per share paid Feb., 1917.

Operates the Hoch mine, known as Iron Mountain mine, formerly worked by the Iron Mountain Co., in Cuyuna range, Minn. Developed by 2 shafts, one 160' deep.

Ten cars of ore shipped reported to average 20% manganese.

JOAN MINING CO.**MINNESOTA**

General office: 106 Providence Bldg., Duluth, Minn. Mine office: Iron-ton, Minn.

Officers: G. M. Fay, pres.-supt. S. J. Fay, v. p.; Marcus Fay, sec.-treas., directors.

Inc. 1916 in Minnesota. Cap., \$50,000; shares, \$100 par.

Property: 2 mines in the Cuyuna range, Crow Wing Co., Minn.

Development: by shafts and tunnels. Ore contains from 20 to 35% manganese. During 1917, management expects to ship 60,000 tons of ore, and probably 200,000 tons in 1918, as two additional mines will be producing.

ONAHMAN IRON CO.**MINNESOTA**

Office: 208 Fergusson Bldg., Duluth, Minn.

Officers: W. P. Mars, pres.; W. A. McClaren, v. p.; C. A. Lanigan, sec.; M. A. Dunning, treas.; A. A. MacKay, supt.; above with O. P. McDonald, W. H. Squier, O. M. Moore, and G. H. Lyons, directors.

Inc. 1913 in Nev. Cap., \$1,000,000; shares \$1 par; non-assessable; 530,000 issued.

Gross earnings, 1916, were about \$75,000, all from ore sales. Earnings to April, 1917, about \$28,000.

Property: 160 acres of manganiferous iron ore land in Crow Wing Co., Minn. Ore said to carry an average of 29% iron and 20% manganese.

Development: by 150' shaft in the total underground workings of 3,000', estimated to block out 500,000 tons of ore.

Equipment: includes electric hoist, 700 cu. ft. compressor and centrifugal pump.

Production: total to 1917, 14,000 tons.

PROVIDENT IRON CO.**MINNESOTA**

Office: Duluth, Minn.

Officers: W. D. Edson, pres.; Herbert Warren, v. p.; T. A. Gall, sec.-treas.; with W. B. Dunlop and D. J. Curry, directors.

Inc. 1913 in Maine. Cap., \$150,000; shares \$10 par; non-assessable; 11,700 outstanding.

Property: company holds a lease on 280 acres of iron lands on the Cuyuna range, Minn. The deposit of 58% ore, estimated to contain 1,500,000 tons, lies in slate and schist. Examined by Dwight E. Woodbridge, who is consulting engineer for the Big Ledge Co.

ROGERS, BROWN IRON CO.**MINNESOTA**

Address: W. C. Agnew, mgr., Buffalo, N. Y.

Property: the Kennedy, Meacham and Susquehanna iron mines; first on the Mesabi and others on Cuyuna range, Minn. Opened in 1906, 1907 and 1909 respectively.

Mine	Mining System	Ore	Iron Con- tent, %	Prod., 1916, Tons	Total Tons
Kennedy....	Slicing and caving	Non-B.	50.32	166,915	907,539
Meachem....	" " "	"	50.60	25,207	25,207
Susquehanna.	Stripping	B. and non-B.	48.78 to 50.08	764,249	4,685,741

SULTANA MINES CO.**MINNESOTA**

Address: H. H. Bradt, mgr., Sellwood Bldg., Duluth, Minn. A. R. McGuire, supt.

Property: an iron mine on Cuyuna range, Crow Wing Co., Minn., opened up in 1915.

Ore: hard and soft, dark brown non-Bessemer, manganiferous hematite, limonite, etc. Average analysis in natural state is 33.8% iron, 0.146% phos., and 7.34% silica. Dried samples of cargo shipments assay 39.3% iron, 0.17% phos., 8.54% silica and 13.43% manganese. Mining by sub-level slicing method to 190' depth.

Production: 35,169 tons in 1916.

*IRON MINES OF THE GOGEBIC RANGE***BROTHERTON IRON MINING CO.****MINNESOTA**

Office: C. H. Munger, mgr., Cleveland, Ohio.

Property: the Brotherton on the Gogebic range, Minn.

Ore: Bessemer and non-Bessemer hematite, carrying 51.65 to 53.26% iron, 0.023 to 0.091% phosphorus and 11.65 to 12.73% silica.

Mining by underground method to depth of 1,342'.

Production: 107,813 tons in 1916 and 2,401,926 tons to date.

COLBY MINE**MINNESOTA**

Address: Corrigan, McKinney & Co., Cleveland, Ohio.

Ore: soft, blue, Bessemer and non-Bessemer hematites, assaying 53.70 to 53.98% iron, 0.039 to 0.047% phosphorus and 5.89 to 6.05% silica. Mined by underground method.

Production: 423,553 tons in 1916 and 4,269,083 tons to date.

MONTREAL MINING CO.**MINNESOTA**

Office: E. W. Hopkins, mgr., Wade Bldg., Cleveland, Ohio.

Ore: soft, red Bessemer and non-Bessemer hematites, assaying 55.36% iron, 0.041% phosphorus and 6.48% silica. Mined by slicing and caving method to 2,300'.

Production: 530,813 tons in 1916 and 4,662,938 tons to date.

NEWPORT MINING CO.**MINNESOTA**

Office: E. L. Cullen, mgr., First Natl. Bank Bldg., Milwaukee, Wis.

Property: on the Gogebic range, Minn. Ore: soft, red, Bessemer and non-Bessemer hematites, carrying up to 55.45% iron, 0.08% phosphorus and 10.58% silica. Ore is mined by sub-slicing method to 2,274' depth.

Production: 1,315,980 tons in 1916 and 12,570,584 tons to date.

PLYMOUTH MINE**MINNESOTA**

Address: Coates & Tweed, Duluth, Minn. C. A. Myers, supt.

Property: iron mine on the Gogebic range, Gogebic Co., Minn., carries soft, non-Bessemer hematite, containing 53% iron, 0.069% phosphorus, and 4.34% silica.

Development: by open pit system.

Production: started in 1916, and totaled 330,427 tons.

*IRON MINES OF THE MESABI RANGE***ADRIATIC MINING CO.****MINNESOTA**

Office: R. M. Sellwood, mgr., Cleveland, Ohio.

Property: on Mesabi range, St. Louis Co., Minn.; opened in 1906.

Ore: soft, red, non-Bessemer hematite, containing 49.31% iron, 0.067% phosphorus and 10.48% silica. Ore is mined by underground slicing to depth of 180'.

Production: 220,818 tons in 1916 and 1,041,268 to date.

ARTHUR IRON MINING CO.**MINNESOTA**

Office: E. E. Hunter, supt., St. Paul, Minn.

Property: the Leonard mine on the Mesabi range. Ore is a non-Bessemer averaging 51.61% iron, 0.057% phosphorus and 5.51% silica. Mined by open pit and underground methods to 253' depth.

Production: 316,468 tons in 1916 and 9,598,827 tons to date.

BALKAN MINING CO.**MINNESOTA**

Office: C. H. Munger, mgr., Cleveland, Ohio.

Property: Belgrade mine on Mesabi range, opened in 1908. Ore: soft, red, Bessemer and non-Bessemer hematite, containing 47.54 to 52.27% iron, 0.062 to 0.037% phosphorus, and 7.01 to 8.04% silica. Ore is mined by underground slicing system to 260' vertical.

Production: 180,532 tons in 1916, and 1,157,214 tons to date.

BANGOR MINING CO.**MINNESOTA**

Office: C. H. Munger, Cleveland, Ohio.

Property: Bangor mine on Mesabi range, opened in 1910.

Ore: soft, red, non-Bessemer hematite, assaying 49.39% iron, 0.059% phosphorus, and 9.10% silica. Ore is mined by underground slicing to 307' vertical.

Production: 223,576 tons in 1916, and 998,057 tons to date.

BENNETT MINING CO.**MINNESOTA**

Is controlled by Pickands, Mather & Co., Cleveland, Ohio.

Property: the Bennett mine, formerly owned by the Keewatin Mining Co., in Sec. 24, T. 57, R. 22, Itasca county, Minnesota, developed to 137' depth. The mine was opened in 1912. Product is a Bessemer hematite, non-Bessemer hematite, and a manganiferous non-Bessemer hematite.

Production: 88,931 tons in 1913; 25,868 tons in 1914; 50,475 tons in 1915; 672,672 tons in 1916.

CLEVELAND-CLIFFS IRON CO., THE**MINNESOTA**

See same title under Michigan Iron mines.

COMMODORE MINE**MINNESOTA**

Address: Corrigan, McKinney & Co., Cleveland, Ohio.

Property: on Mesabi range, Minn., opened in 1893. Ore: soft, blue Bessemer and non-Bessemer hematite, carrying 51.83 to 57.32% iron, 0.048 to 0.032% phosphorus, and 7.67 to 6.01% silica. Ore mined by open pit system.

Production: 579,285 tons in 1916, and 2,860,349 tons to date.

CORSICA IRON CO.**MINNESOTA**

Office: C. H. Munger, Cleveland, Ohio.

Property: on Mesabi range, Minn., opened in 1901.

Ore: soft, red, Bessemer and non-Bessemer hematite, assaying 52.74 to 47.47% iron, 0.048 to 0.056% phosphorus, and 7.76 to 7.27% silica. Mined by underground slicing system to 248' vertical.

Production: 292,228 tons in 1916, and 1,951,477 tons to date.

CRETE MINING CO.**MINNESOTA**

Office: C. H. Munger, mgr., Cleveland, Ohio.

Property: Albany mine on Mesabi range, opened in 1903.

Ore: soft, yellow, non-Bessemer, soft, red Bessemer, and soft, blue, non-Bessemer hematite, assaying from 46.81 to 53.52% iron, 0.015 to 0.047% phosphorus, and 6.65 to 3.71% silica. Mined by milling and underground slicing systems to 260' vertical.

Production: 468,291 tons in 1916, and 3,734,109 tons to date.

GREAT NORTHERN IRON ORE PROPERTIES.**MINNESOTA**

Offices: 1st Nat'l Bank Bldg., St. Paul, Minn., and 32 Nassau St., New York.

Inc. Dec. 7, 1906. Is a trust created by directors of and approved by shareholders in the Great Northern Railway Co.

Trustees: Louis W. Hill, James N. Hill, Walter J. Hill and E. T. Nichols.

The Lake Superior Co., Ltd., which held securities and properties in the interest of the Great Northern Ry. Co. shareholders, turned over to the trustees of the Great Northern Iron Ore Properties, stocks in 10 iron ore mining companies, worth \$1,738,400. Any dividends declared by the Allouez Bay Dock Co., or by Duluth, Superior & Western Terminal Co., up to Dec. 31, 1912, were to be paid to the trustees, to be applied by them to the uses of the trust.

When the trust was created, the trustees issued certificates of beneficial interest, amounting to 1,500,000 shares to holders of the Great Northern Ry. The trustees' income has come from dividends from stocks held and from interest earned. From this revenue, organization expenses are deducted, the balance being available for distribution on certificates of beneficial interest.

Income: in 1916, from Proprietary companies (the West Missabe, Arthur, Fillmore, Harrison, Jackson, Polk, Tyler, Van Buren, North Star, and Leonard iron mining companies), totaled \$2,100,000. Other revenue made a total of \$2,178,548. Total income to 1917, \$17,472,901. Administration of the Trust cost \$89,663.

Dividends: to holders of certificates of beneficial interest were 50 and 75c per share, or \$1,875,000 in 1916; total to 1917, \$12,375,000. The surplus at end of 1916 was \$4,340,183.

Assets: \$20,413,233, including \$8,124,380 cash (trustees and Proprietary companies); lands and leases, \$1,513,545; mine expenditures, \$4,065,170; and securities, \$2,301,483. Liabilities include total surplus of Proprietary companies and trustees, \$17,566,957; current expenses, \$929,912; and capital stock, \$1,738,400.

Property: 65,091 acres of iron-ore land in the Mesabi district, Minn. In June, 1917, the trustees leased 3 mines to Jones & Laughlin of Pittsburgh, the yearly output for 20 years being reported as worth \$6,000,000.

Production: shipments in 1916 were 3,207,091 tons, of which 2,202,359 tons were from the Mahoning mine. The average royalty was 17.5c per ton, giving a total of \$562,706.

General: the trustees contemplate the coming year with hopefulness for the metal trade. Prices of ore increased in 1916 to \$4.20 per ton at Lake Erie ports for Bessemer, \$3.55, for non-Bessemer, against \$3.45 and \$2.80 per ton, respectively, in 1915. Prices in 1917 were \$5.70 and \$5.05 for the two grades. On the other hand, production costs have risen considerably.

M. A. HANNA CO.

See same title under Michigan iron mines.

HANNA ORE MINING CO.

MINNESOTA

Office: Duluth, Minn. J. D. Ireland, gen. mgr.; E. E. Hunter, asst. mgr.; F. H. Cohoe, supt. Company is a newly organized subsidiary of the M. A. Hanna Co., to operate a lease on Great Northern ore lands at Buhl, Virginia, Hibbing and Crosby, Minn.

HOBART IRON MINING CO.

MINNESOTA

Office: C. H. Munger, mgr., Cleveland, Ohio.

Property: Elba mine on Mesabi range, Minn., opened in 1898. **Ore:** soft, red, Bessemer hematite, containing 53.79% iron, 0.04% phosphorus, and 6.24% silica.

Mined by underground slicing to 316' vertical.

Production: 130,384 tons in 1916, and 2,819,760 tons to date.

INLAND STEEL CO.

MINNESOTA

Office: Room 1105, First Natl. Bank Bldg., Chicago, Ill.

Officers: A. W. Thompson, pres.; E. M. Adams, sec.

Inc. Feb. 6, 1917, in Delaware, as successor of an Illinois corporation of same name. Cap., \$30,000,000; \$100 par; \$25,000,000 issued. Bonded debt: \$1,650,000—6% gold bonds of old company being balance of 3,000,000 issue, due 1928. Also 4,380,000, due July 1, 1942. The 1916 report shows, total assets, \$36,352,599; surplus, \$16,359,410; current assets, \$10,861,080; net working capital, \$9,113,800. Earnings for 1916 were \$11,365,477, compared with \$4,493,024 in previous year.

Property: valuable ore leases on 5 producing mines in Minnesota, two on the Mesabi range near Hibbing, three on the Cuyuna, at Crosby, Minn., with 30 years' ore reserves at each mine. Furnaces are at Indiana Harbor, Ind., and Chicago Heights, Ill.

In 1917, company purchased 2,000 acres of coal land near Dorseyville, Pa., and a lease on further ore lands from the Great Northern Iron Ore Co.

INTER-STATE IRON CO.

MINNESOTA

Office: Mark Elliott, supt., Jones & Laughlin Bldg., Pittsburgh, Pa.

Property: the Lincoln mine on the Mesabi range. Ore, both Bessemer and non-Bessemer containing 45.75 to 56.60% iron, 0.025 to 0.053% phosphorus and 6.94 to 9.20% silica. Ore mined by top slicing and caving to 237' depth.

Production: 286,128 tons in 1916 and 3,894,178 tons to date.

LEETONIA MINING CO.

MINNESOTA

Office: Mark Elliott, supt., Jones & Laughlin Bldg., Pittsburgh, Pa.

Property: the Leetonia mine, opened in 1902 on the Mesabi range. Ore: soft, red, non-Bessemer hematite assaying 50.3% iron. Ore mined by top slicing and caving and steam shovels to 182' depth.

Production: 656,876 tons in 1916 and 5,905,849 tons to date.

MACE IRON MINING CO.

MINNESOTA

Address: O. B. Warren, mgr., 710 Security Bank Bldg., Minneapolis, Minn. J. A. MacKillican, supt., Hibbing, Minn. Pickands, Mather & Co., Cleveland, O., sales agents. Operated as a close corporation.

Property: Mace No. 1 and No. 2 mines in St. Louis county, Minnesota, carry a chamber shaped deposit of iron ore in taconite. Developed by shaft and open pits to 120' depth. Underground workings total 6,000'.

Equipment: includes steam hoist and Cameron pump.

Production: Mace No. 1, 1914, 160,815 tons; 1915, 120,906 tons; 1916, 163,353 tons. Mace No. 2, 1916, 307,496 tons.

MAHONING ORE AND STEEL CO.

MINNESOTA

Office: W. C. Agnew, Hibbing, Minn.

Property: Mahoning mine on Mesabi range, Minn.

Ore: soft, blue Bessemer, and soft, brown, non-Bessemer hematite, containing 57.18% iron, 0.037% phosphorus, and 2.39% silica. Mined by open pit system to 200' vertical.

Production: 2,215,788 tons in 1916 and 23,832,886 to date.

NORTH HARRISON MINE.

MINNESOTA

Address: Butler Bros., St. Paul, Minn. Cooley Butler, mgr.

Property: an iron mine on Mesabi range, Itasca county, Minn., developed by open pit system. Total shipments since 1914 amount to 592,773, of which 422,825 tons were produced in 1916. Both soft Bessemer and non-Bessemer hematite is mined, assaying from 51 to 54% iron, 0.075 to 0.036% phosphorus, and 8.6 to 9.01% silica.

Same concern operates the Harrison mine, which yields similar ore. Production: in 1916 was 82,876 tons; total since 1914 is 426,683 tons.

OLIVER IRON MINING CO.**MINNESOTA**

Office: Eveleth; Minn. J. H. McLean, gen. mgr.

One sixth interest in stock owned by U. S. Steel Corporation; remainder owned by Carnegie Steel Co. Is a close corporation, owning, controlling and operating mines in Michigan, Minnesota and Wisconsin. Has interests in the following mining companies: Lake Superior, Regent, Great Western, Braddock, Homestead, Duquesne, Alleghany, Hope, Neville, Monongahela, Lorain, Agawain, Ambridge, Morewood, Pencoyd, Munhall, Monessen, Somerset and Lebanon.

Production: in season of 1916 was 647,132 tons from Marquette range, Mich.; 996,983 tons from Menominee in Mich.; 2,869,460 tons from Gogebic in Mich.; 1,314,002 tons from Vermilion in Minn., and 24,928,039 tons from Mesabi range in Minn.; a total of 33,355,169 tons. In 1915 the quantity was 23,669,676 tons, 17,34,981 tons in 1914 and 28,738,451 tons in 1913.

Some of the mines are as follows:

Mine	Range	Mining System	Ore	Iron Production		
				Content, %	1916, Tons	Total Tons
Pioneer.....	Vermilion	Underground	Bessemer and non-Bessemer	58.05	507,086	10,328,756
Savoy.....	"	"	Non-Bessemer	56.80	38,067	1,862,223
Sibley.....	"	"	B. and non-B.	58.69	237,258	2,486,014
Soudan.....	"	"	non-B.	64.29	142,688	8,907,807
Zenith.....	"	"	B.	56.80	492,783	4,868,319
Mining in this district is done to a depth of 1466 feet.						
Lake Superior....	Marquette	Underground	B. and non-B.	52.87 to 48.35	422,525	16,641,006
Queen.....	"	"	Non-B.	47.62	283,775	8,106,945
Stegmiller.....	"	"	"	52.28	65,420	376,867
Mining in this district is done to a depth of 1100 feet.						
Adams.....	Mesabi	Open pit	B. and non-B	54.08 to 45.91	961,500	18,979,504
Burt.....	"	"	"	54.08 to 46.54	1,060,487	14,224,501
Canisteo.....	"	"	"	54.08 to 46.54	1,943,745	10,445,686
Chisholm.....	"	Underground	"	54.08 to 46.54	283,820	5,772,660
Clark.....	"	"	"	54.08 to 46.54	251,226	5,959,474
Fayal.....	"	"	"	52.51 to 45.91	2,288,799	25,514,000
Genoa.....	"	"	"	52.51 to 45.91	274,172	7,827,049
Glen.....	"	"	"	54.08 to 46.54	284,889	2,855,275
Hill.....	"	Open pit	"	54.08 to 46.54	552,104	6,539,872
Hohman.....	"	Underground and Open pit	"	54.08 to 46.54	610,281	5,219,173
Hull-Rust.....	"	Open pit	"	54.08 to 46.54	7,665,611	30,352,554
Kerr.....	"	"	"	54.08 to 46.54	539,675	539,675

Mine	Range	Mining System	Ore	Iron Production		
				Content. %	1916, Tons	Total Tons
Leonidas.....	"	Underground	"	54.08 to 45.91	1,147,105	1,879,882
Missabe Mountain	"	Open pit	"	54.08 to 46.54	539,913	2,873,407
Morris.....	"	"	"	54.08 to 46.54	1,069,971	11,499,715
Norman.....	"	Underground	"	54.08 to 45.91	320,937	6,260,191
Ordean.....	"	Open pit	"	54.08 to 46.54	395,591	395,591
Sauntry-Alpena...	"	"	"	54.08 to 46.54	933,937	8,251,681
Sellers.....	"	"	"	54.08 to 46.54	1,344,121	6,246,306
Spruce.....	"	Underground	"	54.08 to 45.91	463,179	9,192,607

The deepest of the above mines, the Leonidas, is 448 feet, the others being about 200'.

Norrie-Aurora....	Gogebic	Underground B. and non-B.	"	54.31 to 50.89	1,855,863	32,522,636
Puritan.....	"	"	"	54.36	308,534	762,048
Tilden.....	"	"	"	50.96 to 53.27	110,733	5,907,699

The Puritan is worked to a depth of 2095'.

Aragon.....	Menominee	Underground B. and non-B.	"	49 to 54.59	224,478	7,489,782
Chapin.....	"	"	"	54.06	557,485	19,978,718
Riverton.....	"	"	"	51.30	174,992	3,345,656

The Chapin is worked to a depth of 1150 feet.

ORIENTAL GRANITE & IRON CO.

MINNESOTA

Office: 30 N. La Salle St., Chicago, Ill.

Officers: Edw. Romberg, pres.-treas.-mgr.; S. Romberg, v. p.; G. A. Hail, sec.; above with G. Silverman, L. B. Lehman and H. J. Grannis, directors.

Inc. April, 1887, in Minn. Cap., \$80,000; shares \$2 par, 38,000 issued.

Owns the Spring iron mine, in St. Louis Co., Minn., and other unexplored iron lands. Ore of the Spring mine reported to assay 50% iron, .084% phosphorus and 22% silica.

PITT IRON MINING CO.

MINNESOTA

Address: G. B. Levan, mgr., Steubenville, Ohio.

Property: Miller and Wacootah mines on Mesabi range, St. Louis county, Minn. Ore: soft, brown, non-Bessemer hematites, containing 48.73 and 48.43% iron, 0.065 and 0.071% phosphorus, 6.05 and 5.45% silica. Ore is mined by shafts to 212' at Miller and stripping to 200' at the Wacootah.

Production: in 1916, 354,374 tons; total to date, 3,712,222 tons.

QUINN MINING CO.

MINNESOTA

Office: New York Life Bldg., St. Paul, Minn.

Property: the Quinn mine in Sec. 31, T. 57, R. 22, Itasca county, is worked by steam shovel and open pit systems. The product is Bessemer and non-Bessemer hematite.

Recent production: 49,251 tons in 1914; 91,007 tons in 1915; 226,360 tons in 1916.

REPUBLIC IRON & STEEL CO.

See same title in U. S. section.

SHADA MINING CO.**MINNESOTA****Address:** 1107 Alworth Bldg., Duluth, Minn. C. K. Quinn, mgr.**Property:** iron mine on Mesabi range, Itasca Co., Minn., carries a soft, red Bessemer hematite, containing 54.01% iron, 0.036% phosphorous and 7.28% silica. The washed product from concentrators assays 59.35% iron, 0.04% phos., and 8% silica.**Development:** by steam shovel methods. Will produce in 1918.**SHENANGO FURNACE CO.****MINNESOTA****Address:** E. J. Maney, Pittsburgh, Pa.**Property:** Shenango, Tioga and Webb iron mines on Mesabi range, St. Louis Co., Minn., opened in 1904, 1916 and 1905, respectively.**Ore:** all three produce soft, brown Bessemer and non-Bessemer hematites, containing 53.23, 50, and 53.52% iron; 0.041, 0.039, and 0.051% phosphorus and 4.75, 10.97, and 6.13% silica, respectively. Ore is mined by underground and open pit methods to 300' in the Shenango, underground to 200' in the Tioga, and underground and stripping to 250' in the Webb mine.

	Production in tons:		
	Shenango Mine	Tioga Mine	Webb Mine
1916.....	979,658	4,275	140,279
Total.....	8,102,906	4,275	980,049

TOD-STAMBAUGH CO., THE**MINNESOTA****Address:** C. A. Thompson, mgr., Cleveland, Ohio. Sales agents for the following iron mines:

Property	Range	Mining System	Ore	Iron Con- tent, %	Production,* Tons
Biwabik.....	Mesabi	.....	Bessemer and non-Bessemer	55.09 to 50.75	428,944
Dean-Itasca....	"	Open pit	Bessemer and non-Bessemer	51.51 to 50.10	687,878
Dunwoody.....	"	"	non-Bessemer	.....	New mine
Morton.....	"	Underground	.....	50.46	44,940
North Eddy....	"	"	non-Bessemer	.....	104,710
Pennington....	Cuyuna	Open pit	"	51.11	206,085
Warren.....	Mesabi	"	"	.....	New mine

*In 1916.

The Biwabik, opened in 1893, has produced 11,559,883 tons; the Dean-Itasca in 1915, 1,048,250 tons; the Morton in 1912, 139,430 tons; and the North Eddy in 1915, 107,369 tons.

WISCONSIN STEEL CO.**MINNESOTA****Office:** B. W. Batchelder, supt., Nashwauk, Minn.**Property:** Agnew mine on Mesabi range, Minn., opened in 1902.**Ore:** soft, red Bessemer hematite, containing 53.19% iron, 0.03% phosphorous, and 5.76% silica, which is concentrated to 61.44% iron. Mined by open pit system to 230' vertical.**Production:** 102,150 tons in 1916 and 1,643,894 to date.**IRON MINES OF THE VERMILLION RANGE, MINNESOTA
CONSOLIDATED VERMILLION AND EXTENSION CO.****MINNESOTA****Office:** 609 Sellwood Bldg., Duluth, Minn.

Officers: T. J. Wash, pres.-treas.; J. M. Christie, v. p.; A. M. Oullette, sec.; the president, M. C. Williams and Angus Cameron, directors.

Inc. Sept. 1911, in Minnesota. **Cap.**, \$900,000; \$2 par; \$620,000 outstanding, no bonds. Stock transferred at company's office. No dividend.

Property: consolidation of the Vermillion Steel and Iron Co. and the Extension of the Vermillion Steel and Iron Co. Operates under 50 year leases.

Company estimated, June, 1917, 20,000 tons of iron ore in stockpile with production of about 200 tons a day. Developed tonnage is claimed to be 600,000 tons at a depth of 440'. A sample from stockpile is said to assay 69.85% iron and 0.76% manganese.

SECTION THIRTY MINING CO.

MINNESOTA

Address: Sellwood Bldg., Duluth, Minn.

Officers: G. A. St. Clair, mgr.; H. G. St. Clair, supt.

Property: iron mine in the Vermillion range, Lake Co., Minn. Ore is a hard, blue Bessemer and non-Bessemer hematite, containing 59.85 and 55.67% iron, 0.044 and 0.080% phosphorous and 7.13 and 11.14% silica, respectively. Ore is crushed, and cargo analyses show 63% iron in Bessemer and 58.6% in non-Bessemer.

Development: by open pit and sub stoping methods to 650' vertical.

Production: 868,826 tons since 1909, including 226,089 tons in 1916.

SOUTH CHANDLER MINE

MINNESOTA

Address: B. M. Pattison, lessee, Sellwood Bldg., Duluth, Minn. W. J. Nicholls, supt.

Property: iron mine on Vermillion range, St. Louis Co., Minn. Worked in 1888, abandoned 1905 and reopened 1913, mainly re-using ground already worked.

Ore: hard, red Bessemer hematite, containing 54.08% iron, 0.042% phos., and 8.3% silica. This is crushed and shipped, assaying 58.78% iron.

Mining by slicing system, to 800' vertical.

MISSOURI

The State contains two distinct metalliferous districts, viz., the Joplin and the Southeastern regions. These are described independently in two sections.

JOPLIN DISTRICT

Joplin, in southwestern Missouri, is the center of a district, covering 3,000 sq. miles, partly in Oklahoma and Kansas. The ore deposits are found at comparatively shallow depths in chert and limestone, the ore carrying both zinc and lead. Over 4,000,000 tons of 2.25% ore treated yearly, mostly by small companies, the metal output for 1916 having a value of over \$35,000,000. The geology of this region is described by H. A. Buehler, and ore treatment by C. A. Wright, in Bull. 130 of the A. I. M. E., 1917. The average mine's total costs for 1917, are \$1.32 per ton, a rise of 28c in two years.

ADIRONDACK MINING AND MILLING CO.

MISSOURI

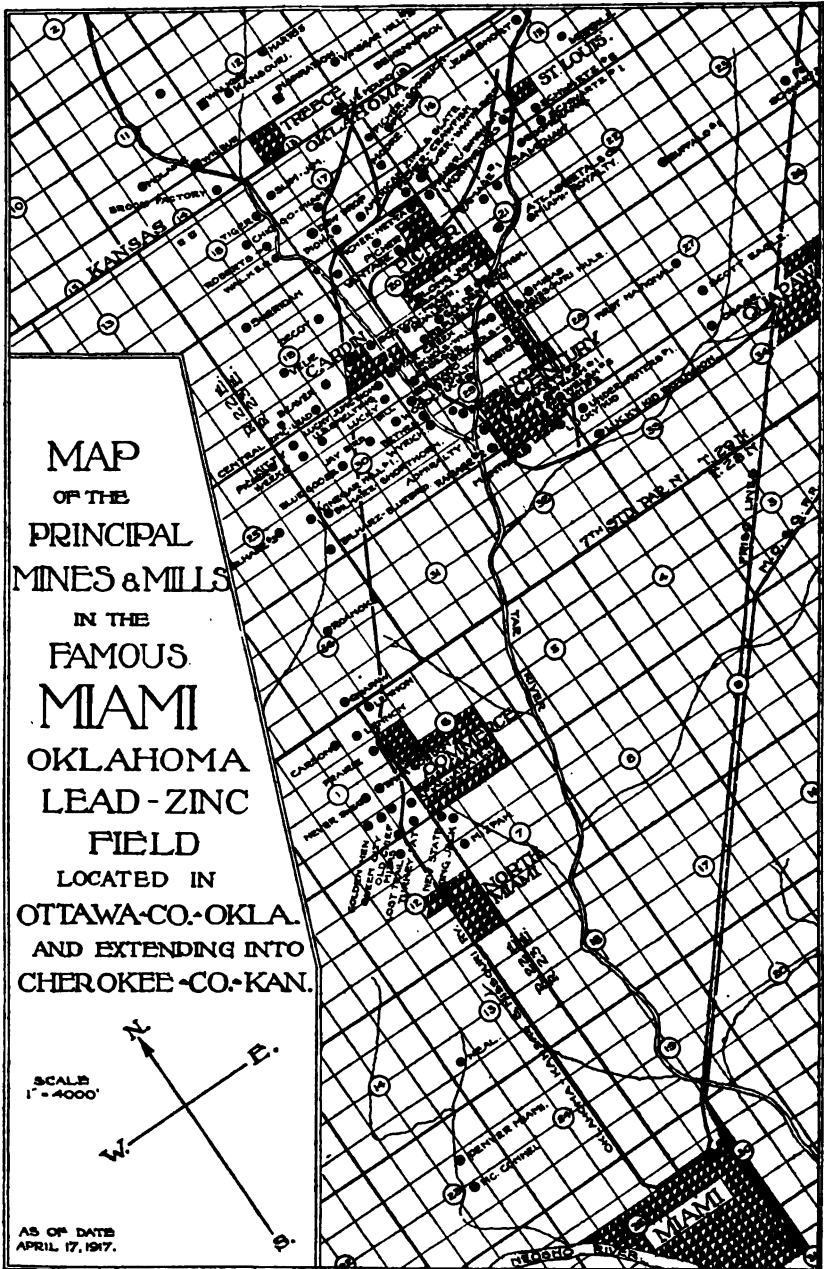
Address: W. 11th St., Joplin, Mo. W. H. Roberts, mgr.

Inc. 1916, to operate a lease on 20 acres of mineral land owned by the City of Joplin. Developed by 200' shaft, and equipped with 300-ton mill.

AMALGAMATED ZINC & LEAD CO.

MISSOURI

Inc. in New Jersey. **Cap.**, \$200,000. Operates on land of the Granby



NOTE: Above properties described under Oklahoma, page 1255.

Mining & Smelting Co., in Jasper County. Has 5 shafts, average depth 186', and a concentrator with daily capacity of 250 tons. Product is zinc concentrate.

ANDAYER MINING CO.**MISSOURI**

Office: Joplin, Mo. Harry L. Ayer, treas., 8 Hawley St., Boston, Mass. Is a close corporation, consisting of four stockholders, with mines at Joplin, Mo. Company has no stock for sale and refuses to furnish a report.

In Sept., 1917, company completed its fifth churn drill hole on a 40-acre lease, $3\frac{1}{2}$ miles S. W. of Galena. A new shaft has been sunk to open the 9' of lead and zinc ore disclosed.

The New Market mill was purchased, 1917, moved, and was in operation, November, 1917.

ANNA LEE MINING CO.**MISSOURI**

Inc. in Ariz. Cap., \$100,000. Operates on 120 acres of land of J. W. Allen in Newton Co., Mo. Has 7 shafts, average depth 100', and a 200-ton concentrator. Output is zinc concentrate.

ATHLETIC MINING & SMELTING CO.**MISSOURI**

Address: Webb City, Jasper Co., Mo. Charles T. Orr, pres. and gen. mgr.; James B. Millar, treas. Is under same control as Bertha A and Wingfield Companies. Property bought in 1915; purchase price said to be \$150,000. Formerly operated under name of Gopher M. & M. Co.

Property: 100 acres of the Jasper Co. Royalty Co.'s land at Duenweg. Lead-zinc ore occurs in "sheet ground" at depth of 240'.

Development: by seven 240' shafts.

Equipment: includes a 1,500-ton concentrating mill. Company plans to build a second mill. Smelter located at Fort Smith, Ark.

A. T. S. MINING CO. (Not Incorporated)**MISSOURI**

Formerly known as the A. B. C. mine. Owned by A. T. Swan, Joplin, Mo. Property is the A. B. C. zinc-lead mine at Joplin, Mo. Equipped with 90 h. p. gasoline engine, hoist, Ingersoll-Rand compressor and 175-ton mill.

A. W. C. MINING CO., INC.**MISSOURI**

Address: W. 7th St., Joplin, Mo.

Officers: W. O. Cragg, pres. and mgr.; Bert Lease, mine supt.; Jason Scott, mill supt.

Inc. in Maine. Cap., \$500,000.

Property: 160 acres at W. 7th St., Joplin, in center of sheet ground district. Ore carries $2\frac{1}{2}\%$ zinc and lead. The deposit is 12' thick. Five shafts are down 195'.

Equipment: includes three mills of 850 tons capacity per 24 hours; 2 on A. W. C. land and 1 on Expansion Co.'s land on the south end.

Production: in 1916, company is reported to have sold 2,435 tons of zinc concentrates, assaying 62% zinc for \$245,520 and 477 tons lead ore for \$40,914. The plant was closed down during 3 months. Lead concentrate assays 75% metal.

BEN B. MINING CO.**MISSOURI**

Address: Box 271, Joplin, Mo.

Officers: D. Longacre, pres. and mgr.; B. W. Brice, v. p. and supt.; P. B. Butler, sec.-treas.

Inc. Oct. 25, 1917, in Missouri. Cap., \$30,000.

Property: 80 acres, $2\frac{1}{2}$ miles W. of Joplin, on 7th Street.

Ore: deposit is 20' thick, opened to 145' depth and carries 8% zinc.

Equipment: 150-ton mill with crusher, rolls, 2 Cooley jigs, Arbutnot tables and Chicago Pneumatic Tool Co.'s gas engines.

BERTHA A MINING CO.**MISSOURI**

Address: Chas. T. Orr, pres. and gen. mgr., Webb City, Mo.; Jas. B. Millar, treas.

Inc. in Missouri. **Cap.**, \$10,000. Operates a lease on 160 acres of mineral land, owned by the Newell-Morse Royalty Co., in S. 12, T. 28, R. 33, Webb City, Jasper Co., Mo. Company is one of the largest producers of zinc and lead concentrates in the district.

Developed: by 8 shafts to a depth of 221' and equipped with 1,500-ton concentrator, electric hoist, pump, air compressor and drills. Company employs 125 men.

This company, together with the Athletic M. & S. Co., of Webb City, and the Wingfield Mining Company near Picher, Okla., are operated jointly by Mr. Orr and associates. The three mills vary from 1,000 to 1,200 ton capacity per 24 hours, and their joint production in 1916, was 32,000,000 lbs. zinc and lead of a value of \$1,250,000.

The zinc smelter is at Fort Smith, Arkansas.

B-G-M. MINING CO.**MISSOURI**

Address: J. B. Gibson, mgr., Carthage, Mo.

Officers: Z. A. Metzler, pres.; J. B. Gibson, v. p.; S. C. Boggess, sec.-treas.

Inc. in Missouri. **Cap.**, \$100,000.

Property: 60 acres N. of Webb City, Mo. Ore carries 2% zinc and lead and is opened to depth of 180'.

Equipment: 800 ton mill (24 hours), containing crusher, rolls, jigs and sludge tables. Concentrate assays 59 to 61% zinc. Cost of mining and milling is \$1.25 per ton.

BOSTON DUENWEG MINING CO.**MISSOURI**

Owens the property being operated by the Wilson Mines Co., and the O. F. & L. Mng. Co., Jasper Co., Mo.

BRADLEY LEAD & ZINC CO.**MISSOURI**

723 Frisco Bldg., Joplin, Mo. Owns a lease on the St. Louis-Joplin Lead & Zinc Co.'s land, comprising a part of the A. B. C. Mining Co. ground and the Martha Ball mine, in the Chitwood district, near Joplin, Jasper Co., Mo.

Ore: lead-zinc occurs in disseminated deposits in the A. B. C. and as sheet-ore, 20' thick at depth of 200', in the Martha Ball.

Development: by shafts.

Equipment: 250-ton mill on Martha Ball ground. Active operations began March, 1915. Company operating a second 250-ton mill in the West Joplin district, at last accounts.

BURTON MINING CO.**MISSOURI**

Inc. in Missouri. **Cap.**, \$10,000. Operating two 20-acre tracts of J. I. Walker land in Jasper Co., Mo. Has \$160,000 invested. Developed by 5 shafts, averaging depth 150' and equipped with one 150-ton concentrator. Output is zinc concentrate.

CACTUS HILLS MINING CO.**MISSOURI**

Address: Box 201, Joplin, Mo.

Officers: Herman Schmelzer, pres.; J. H. Estes, v. p.; H. F. Hoffman, sec.-treas.; J. H. Moreland, mgr.

Inc. 1913, in Missouri. **Cap.**, \$10,000.

Company operates the Lone Elm 150-ton custom mill. In 1916 its expenses were \$49,000, including about \$10,000 paid in dividends.

Ore treated contains 7% zinc and lead and is treated by one 16" crusher. 3 sets of 30" rolls, 3 Cooley jigs, and 2 Dunham tables. About 150 tons

treated in 10 hours. Monthly concentrate shipments are 200 tons, carrying 55 to 63% zinc and 77 to 83% lead. Costs are 55c per ton.

CARMEAN & SQUIRES MINING CO. MISSOURI

Office: Room 14-16, Wagner Bldg., Webb City, Mo.

Inc. in Missouri. Cap., \$2,000.

Operates 5 properties in S. W. Missouri, including Gwinn land, 2 tracts, one 20, the other 40 acres of Kelly Land, all located in Jasper Co. Is reported to have bought the old John L. mine, 20 acres, in the north Webb City sheet ground district, for \$30,000, in Nov., 1915, and the Old Virginia mine, near Carterville in 1916. A new concentrator was built and is now in operation. The Gwinn tract has 2 shafts, depth 186', and a 250-ton concentrator. The 20-acre Kelly tract is opened by 200' shaft, and has a 150-ton concentrator; the 40-acre tract is opened by 180' shaft and has a 200-ton concentrator.

Production: lead-zinc concentrates, not reported.

CAVE SPRINGS LEAD & ZINC CO. MISSOURI

M. Grundler, supt. Operates a lease on 50 acres of land owned by the Kansas-Missouri L. & Z. Co., including the Grass Roots and Cave Springs mines, both old-time producers, at Cave Springs, west of Joplin, Jasper Co., Mo.

Ore: contains zinc and lead as sulphides. Developed by several shafts, deepest 260', with levels at 130' and 240'. This shaft was unwatered to the 240' level in 1915. Ore in Grass Roots mine is taken out by open-pit work.

Equipment: 100-ton concentrating mill, centrifugal pumps, hoist, electric power and surface buildings.

CENTER CREEK MINING CO. MISSOURI

Office: O'Neill Bldg., E. Daugherty St., Webb City, Mo. Robt. F. Stewart, sec.-treas.

Inc. 1889. Cap., \$1,000,000; shares \$10 par. Dividends to 1917, amounted to \$625,000. Company does not carry on active mining operations, but leases its land to operators among whom are S. Y. Ramage, C. D. & R. Mng. Co., Incline Mng. Co., J. R. Wisby, Twin Cities Mng. Co., Nearby Mng. Co., Rogey Mng. Co., Jewel Mng. Co., Carlatt Mng. Co., and the Good Shepherd Mng. Co., receiving royalty on all ore produced.

Property: 200 acres and mill site between Webb City and Carterville, Jasper Co., Mo., developed by 13 shafts from 110' to 165' deep, producing both lead and zinc ore. Five mines are operated.

Production:

Year	Zinc, Pounds	Lead, Pounds	Value
1916.....	10,529,930	920,480	\$454,111
1915.....	15,250,870	1,107,547	.....
1914.....	6,823,320	1,993,180	.....
1913.....	11,223,690	4,438,410	.....

Total output from start of operations is valued at \$13,000,000.

CENTRAL LEAD CO. MISSOURI

Entire capital stock owned by American Smelters Securities Co.

Property: 1,603 acres in Flat River mining district, Saint Francois Co., Mo.

CHICAGO MINES CO. MISSOURI

Address: 301 Miners Bank Bldg., Joplin, Mo.

Operates 10 acres land owned by the Conner Investment Co. Property in Sec. 28, T. 28, R. 32, Webb City, Jasper Co., is opened by two 200' shafts. Equipped with a 200-ton mill.

C. M. & H. MINING CO.**MISSOURI****Address:** 4th and Gray Ave., Joplin, Mo.**Property:** leases on the Jones and Weymann tracts, at Joplin. Drilling showed good disseminated ore at 86 to 165' depth. A 150-ton mill is to be erected.**COAHUILA LEAD & ZINC CO.****MISSOURI****Mill office:** Carthage, Mo.**Officers:** C. F. Jennings, pres.; S. B. Cohn, v. p.; W. E. Parker, sec.-treas.; C. D. Smith, supt.**Cap.,** \$100,000.

Company operates 120 acres land owned by Horton & Horton, in the Duenweg-Porto Rico district, Jasper Co., Mo. Ore occurs in "sheet-ground."

Development: by 3 shafts, 240' deep.**Equipment:** includes 3 mills; No. 1 and No. 3 at Duenweg; No. 2 at Carthage.**CONNECTICUT ZINC CORPORATION****MISSOURI****Office:** 500 Fifth Ave., New York.**Officers:** Ross M. Turner, pres.; Geo. Tracy, v. p.; preceding, with P. W. Brooke, A. R. Turner, J. J. Coyle, A. H. Lippincott, W. S. Hallowell, W. H. Lyon, A. S. Raymond, D. L. Robertson and G. P. Smith, directors; E. H. Van Wyck, treas.**Inc.** June, 1914, in N. Y., to hold securities of Oronogo Circle Mining Co., of which it owns the entire capital stock, and to operate zinc properties. **Cap.,** authorized and outstanding, \$1,000,000; \$25 par. Fidelity Title & Trust Co., transfer agt., Stamford, Conn. Annual meeting, second Monday in July.**Bonded debt:** \$350,000 sinking fund gold 6% bonds, dated July 1, 1914, due July 1, 1924; int. Jan. and July 1, at Logan Trust Co., Philadelphia, Trustee. Coupon \$500, principal may be registered. At least \$35,000 of the bonds are callable on July 1 each year, commencing in 1915. Sinking fund equal to 40% of net earnings is provided. Secured by pledge of the entire stock and leases of the Oronogo Circle Mining Co. Authorized and issued \$350,000, of which \$175,000 has been paid off to June 30, 1916. Interest paid without deduction for normal Income Tax.**Dividends:** paid quarterly, Jan., at rate of 6% per annum.**Property:** the Oronogo Circle mine near Joplin, Mo., that has been a producer for 60 years. Mill has a daily capacity of 1,000 tons, and yields up to 9,000 tons of blende (60% zinc) per annum.**CONQUEROR ZINC CO.****MISSOURI****F. H. Houk, sec.,** Joplin, Mo.

In liquidation at last reports.

CONSUMERS MINING CO.**MISSOURI****Address:** W. 7th Street, Joplin, Mo.**Cap.,** \$10,000.

Has lease on 15 acres of mineral bearing land near Joplin, formerly worked by Otis Mng. Co.

Development: by 2 shafts to 185' level.**Equipment:** includes 300-ton concentrating mill, crusher, 8 tables, 11 air drills, 2 hoists and pump. Employs 80 men. Producing since 1914.**CONTINENTAL ZINC CO.****MISSOURI****Office:** 87 Milk St., Boston, Mass. **Mine office:** 7th and Harlem St., Joplin, Mo.**Officers:** Jere A. Downs, pres.; J. B. Hardon, v. p.; F. H. Baird,

sec.-treas., Boston; preceding, with F. T. Rubidge, Chas. Hayden, Galen L. Stone and R. F. Hoyt, directors.

Inc. April 4, 1902, in Maine, as successor to Continental Zinc Mng. & Sm. Co. Cap., \$550,000; shares \$25 par; all outstanding. Reduced, 1916, to \$110,000; shares \$5 par. No bonded debt. Hayden, Stone & Co., Boston, transfer agent; Old Colony Trust Co., Boston, registrar. Annual meeting, first Tuesday in April. Listed on Boston Stock Exchange.

Dividends: formerly 8% per annum, quarterly, reduced to 2% in 1908; 1909 and 1910 none; since 1910 to 1916 at the rate of 4% payments semi-annually, J. and J. 1; Dec. 31, 1915, \$10 per share, in part liquidation. Further dividends in liquidation of about \$2 per share may be expected, with further small cash distributions as the real estate is gradually sold.

Balance sheet as of Dec. 31, 1916, showed assets: \$523,402, which included real estate and property, \$350,000; Litteral tract, \$63,900; Litteral mining and milling plant, \$63,899; notes receivable, \$1,500; cash, \$43,991; accounts receivable, \$111. Liabilities: included depreciation reserve, \$143,000; Empire & Cont. First Addition, \$19,627; depletion, \$59,760; surplus was, \$190,967. The year's profit from the Kohinoor tract amounted to \$13,205; from the Litteral tract, \$30,824. Temagam had a loss of \$1,047.

Property: 2 tracts of land, 200 acres, at Joplin, Mo., the orebodies of which are fast becoming exhausted; the old Kohinoor tract upon which there are no mining operations at present and upon which the company is gradually selling house lots, and the Litteral tract which is leased on a royalty basis. Royalties for 1916, from the Kohinoor and from the Litteral properties, were \$50,246. Life of Litteral property figured in 1915 as 2 years.

Continental Zinc must be considered a liquidating proposition.

•CYGNI MINING CO.

MISSOURI

A. J. Burnham, mgr., Joplin, Mo.

Operates a lead-zinc property near Prosperity, that is a veteran sheet ground producer, yielding 1,000 tons per day of 2% blende ore. Mine has 3 shafts, operating one shift daily.

DALLAS MINING CO.

MISSOURI

H. Wells, Joplin, Mo., mgr. of Little Bess mine.

Property: Little Bess mine, on the Knight land at Carl Junction, Jasper Co., Mo.; also 20 acres of the Nilson land.

Development: on the Knight land, 2 shafts, deepest 170'. The Nilson land has a 195' shaft.

Equipment: 300-ton concentrating mill and sludge mill for treatment of sand and slimes from large mill.

DELTA LEAD & ZINC CO.

MISSOURI

Inc. in Missouri. Cap., \$3,000. Has a lease on 40 acres of land belonging to the McCown estate, in the Spring City-Beef Branch district, Mo.

Development: 3 shafts with average depth of 200'. Has 2 concentrators with a daily capacity of 250 tons. Output consists of galena concentrates and mixed blende and silicate concentrates, averaging 48-50% zinc.

No report for 1917.

DUENWEG LEAD & ZINC CO.

MISSOURI

Webb City, Jasper Co., Mo.

Inc. in Missouri. Cap., \$3,000. Has \$12,000 invested in land and plant. Operates a lease on 20 acres of J. I. Walker land; has one 180' shaft and a 200-ton concentrator. Output is lead and zinc concentrates.

EAGLE-PICHER LEAD CO.

MISSOURI-OKLAHOMA

Mine address: Edward M. Johnson, supt., Picher, Mo. Office: Continental & Commercial Nat'l Bank Bldg., Chicago, Ill.

Officers: O. S. Picher, pres., Joplin, Mo.; R. W. Evans, v. p.; S. M.

Evans, v. p.; Jos. Hummel, Jr., sec.; T. S. Brown, Jr., treas.; above, with J. B. Swift, chairman, F. L. Porin, J. E. Webb and Fred Hertenstein, directors.

Inc. June, 1916, in Ohio. Cap., \$9,000,000 com., and \$1,000,000 6% non-cumulative pfd.; \$100 par; \$7,000,000 com., and \$1,000,000 pfd. outstanding. Pfd. dividends payable, quarterly; initial dividend of 1½% paid July 12, 1916. Central Trust & Safe Deposit Co., Cincinnati, transfer agent. Annual meeting in January.

Company is a consolidation of the Eagle White Lead Co., of Cincinnati, Ohio, and the Picher Lead Co.

The Eagle Picher Lead Co. is the third oldest corroder of white lead by the old Dutch process in the United States, having been established in 1843 as the Eagle White Lead Co. and in continuous operation ever since.

The Picher Lead Co. is one of the oldest concerns in the Joplin district, having been chartered in 1867. To-day it is one of the largest lead producing companies in the State. For many years the product was white lead and oxides of lead. During last 3 years company has entered the mining field, taking over extensive leases in Oklahoma.

In 1917 erected "G" plant at Picher, a 300-ton mill, having sand jigs with 6 cells, each 32x42', a 12-table sludge house, and two 50' Dorr thickeners.

EAST HAMPTON DEVELOPMENT CO.

MISSOURI

Office: Carthage, Mo. Mill office: Wentworth, Mo. S. B. Matlack, pres. and treas.

Company is developing 160 acres of land, ½ mile south of Wentworth, Mo., and has sunk 3 shafts. Ore is zinc and is said to occur at 70', 90' and 135' in depth.

Mill built by company can handle 350 tons and is counting on enough ore from the property to keep it busy several years.

EDGAR ZINC CO.

MISSOURI

Office: Boatmen's Bank Bldg., St. Louis, Mo. Company has large zinc smelting works at Cherryvale, Mo. O. F. Garrison, mgr.

From 1907 to 1917, one furnace with 600 retorts, was in continuous operation, producing 29,136 tons of spelter.

EIGHT FRIENDS MINING CO.

MISSOURI

Reported to have taken over the Denver-Miami mine, near Miami, Mo., in 1917.

Mine said to have a large body of zinc ore.

FLANNERY ZINC CO.

MISSOURI

Pittsburg, Pa., and Sarcoxie, Mo. Acquired the Boyd zinc properties at Sarcoxie, 1915, and spent \$40,000, rehabilitating the mine and mill.

Equipment: includes a 1,000-ton concentrator and a Diesel engine. The ore is blende, but some calamine is also mined.

FRANKLIN MINING CO.

MISSOURI

Webb City, Mo. Owns a tract of "sheet ground," carrying zinc ore at depth of 200'. Is equipped with 880' air-compressor and a 600-ton mill.

GEORGETTE MINING CO.

MISSOURI

Address: Wentworth, Mo.

Property: 400 acres in Newton Co., Mo. Thirty-five drill holes have been put down, showing ore 60' thick. Three shafts are in ore. A modern mill yields 63% zinc concentrate from 7 to 10% ore.

GILT EDGE MINING CO.

MISSOURI

Company held lease on ore lands, 2 miles E. of Tipton Ford, near Joplin, Mo. Lease was transferred, June, 1916, to Wade Mining & Milling Co. (which see), operating ½ mile from Gilt Edge mine.

GOLDEN RULE MINING & MILLING CO.**MISSOURI**

Fred Kincannon, mgr., Granby, Mo.

Inc. in Missouri. Cap., \$8,000.

Company leasing and operating 80 acres land at Granby, developed by 5 shafts, 100' deep.

Equipment: 100-ton concentrating mill, compressor and steam power.

Produces zinc-lead concentrates.

HARTFORD MINING CO.**MISSOURI****Address:** 305 Miners Bank Bldg., Joplin, Mo.**Officers:** L. A. Barbour, pres., Hartford, Conn.; H. H. White, sec-treas., Joplin, with S. B. Griswold, Carthage, Mo., and C. C. Spencer, Joplin, directors; H. H. White, gen. mgr., Joplin, Mo.; Geo. Elliott, supt., Galena, Kan.

Inc. 1906, in Missouri. Cap., \$100,000; shares \$100 par; all outstanding.

Output: zinc-lead concentrates; production not available.**HURRY-UP MINING CO.****MISSOURI**

Webb City, Jasper Co., Mo.

Property: in the North Webb City sheet-ground district, said to show lead-zinc ore occurring at depth of 200'. A 300-ton mill on the property, operating almost continuously for 10 years, is to be dismantled and replaced with one of 400 tons capacity in 10 hours. Company hoisting ore from the Florence shaft, 1,000' N. E. of the mill.**ICE PLANT MINING CO.****MISSOURI**

Webb City, Mo.

Inc. in Missouri. Cap., \$50,000. Has a lease on 40 acres of mineral land belonging to the Guinn Investment Co., in Sec. 7, T. 28, R. 32, Jasper Co., Mo.

Property: developed by 3 shafts to depth of 180'.**Equipment:** includes 300-ton concentrating plant, a 200-gal. per minute pump, 8 drills, hoist, crusher, compressor, boiler and steam power.**INCLINE MINING CO.****MISSOURI**

Controlled by Tom Walker & Co., Webb City, Mo. Has a lease on part of the lands belonging to the Center Creek Mining Co., in Sec. 17, T. 28, R. 32, between Webb City and Carterville. Developed by 5 shafts to depth of 150', showing lead and zinc ore.

Equipment: includes 2 concentrators of 500 tons capacity, pump, boiler and steam power.**JASPER COUNTY LAND & MINING CO.****MISSOURI**

Frank Danglede, supt., Webb City, Mo.

Property: the McKinley mine, near Carterville, Jasper Co., Mo., developed by 2 shafts, mining a large body of zinc blende and lead ore at depth of from 190-210'. A 350-ton concentrating mill, erected in 1914, started operations in April, 1915.**JOPLIN-KENTUCKY LEAD & ZINC CO.****MISSOURI**

Joplin, Mo.

Inc. in Kentucky. Cap., \$50,000. Operates a lease on 33 acres of mineral land owned by the St. Louis-Joplin L. & Z. Co., in Sec. 32, T. 28, R. 33, at Joplin.

Development: by 3 shafts to depth of 150'.**Equipment:** includes 125-ton concentrating plant, 2 pumps, 3 drills, steam power, 3 hoists, Carterville crusher and 2 Wilfley tables.**JOPLIN ZINC METALS CORPORATION****MISSOURI****Offices:** 74 Broadway, New York, and Joplin, Mo.**Officers:** E. P. Hoyt, pres.; Geo. Neighbor, v. p.; C. W. Gould, sec.; W. V. Le Count, treas., with E. M. Farrier, Albert Higson and J. F. Dexter, directors; Austin Allen, mgr., at Joplin.

Inc. Feb. 9, 1916, in New York. **Cap.**, \$1,500,000; in \$750,000 com., and \$750,000 pfd. 7% shares; all the former issued and \$250,000 of the latter; shares \$10 par.

Property: six 40-acre leases at Spring City, near Joplin, Mo., that have produced over 30,000 tons of blende and lead during 25 years. A 300-ton mill is to be erected.

KANSAS CITY-JOPLIN MINING CO.

MISSOURI

Office: West Fourth St., Joplin, Mo. Is reopening the Red Lion mine zinc at Joplin, Mo. Has a 200-ton mill on the property.

KENEFICK ZINC CORPORATION

MISSOURI

Controlled by United Zinc Smelting Corporation, which see.

Office: 99 John St., New York.

Officers: R. H. Cowles, pres.; Arthur Day, v. p., with C. Bucknam, C. L. Graff, A. L. Davis and P. H. Easby, directors; Gustave Ross, sec.; T. C. Davidson, treas.

Inc. Feb. 2, 1916, in New York. **Cap.**, \$5,000; 7% preferred shares at \$100 par and 200,000 shares of common stock of no par value; all issued. Stock listed on New York Curb.

Dividends: five of 10c each were paid on common stock to Aug., 1916. After payment of a 7% dividend on preferred and \$1.20 annually on common stock, 50% of net earnings are to be applied to the retirement of the preferred stock at par. Empire Trust Co., New York, transfer agents. Bankers Trust Co., New York, registrar.

Property: includes 5 producing zinc mines; the Airedale and Coyote mines at Joplin, the Media, Milan and Electrical at Webb City, and the Coronet mine at Baxter, Kan. Company also owns and operates 5 mills with total daily capacity of 4,200 tons.

Production: in 1915 was 30,000 tons of high-grade zinc concentrates, assaying 60% zinc with only a small percentage of lead.

Apparently no change of operating capacity during 1916.

LARSH LEAD & ZINC CO.

MISSOURI

Address: Commerce, Mo.

Property: N. E. of Commerce. Company is erecting a 750-ton mill, including an 18" crusher, 36x30" rolls, 4 jigs, 8 concentrators, compressor and steam plant.

LITTLE MARY MINING CO.

MISSOURI

Webb City, Jasper Co., Mo.

Cap., \$100,000. Operates a lease on 40 acres of mineral land, owned by D. S. Weaver, in S. 6, T. 29, R. 32. Developed by 3 shafts to depth of 175'.

Equipment: includes 500-ton concentrating mill, pumps, 3 drills, 2 hoists, steam power and Ingersoll compressor. Employs 25 men. No record of production received.

LONE ELM DEVELOPMENT & MINING CO.

MISSOURI

Address: N. of E. St., Lone Elm Road, Joplin, Mo. Holds a lease on 240 acres of Granby M. & S. Co.'s land and 80 acres of Picher Lead Co.'s land, N. of Joplin, Mo. Company unwatered the ground, sub-leases its holdings in small tracts and operates a 150-ton custom mill.

LONGACRE-CHAPMAN MINING CO.

MISSOURI

Address: 14 Unity Bldg., Webb City, Mo.

Inc. in Missouri. **Cap.**, \$56,250.

Company operates a lease on 10 acres of mineral land owned by the Reliance Mng. Co. in Sec. 8, T. 29, R. 32, Jasper Co., Mo. Developed by 2 shafts to depth of 185'.

Equipment: includes 200-ton concentrator, pumps, 2 air-drills, steam

power, Carterville crusher, and compressor. Employs 25 men. Production figures not available.

LOWER LEVEL MINING CO.**MISSOURI**

Sarcoxie, Mo. Is a reorganization of the Bearcat Mining Co.

Directors: J. W. Bbyd, J. J. Stephenson, Geo. Spiva and Sam Tamblын.

Property: the Cameron mine on J. W. Boyd land, at Sarcoxie, 20 miles E. of Joplin, Jasper Co., Mo., is a zinc producer. Developed by 278' and 200' shafts.

Equipment: includes compressor, boilers and 400-ton mill. Company plans deep development work.

LUCKY MINING CO.**MISSOURI**

Address: J. G. Marcum, sec. and mgr., Joplin, Mo.

Company states that it has 8 active mines in the district with the best equipment and costs lower than the average.

LUCKY TIGER MINING CO.**MISSOURI**

Property transferred, 1916, to Utah-Missouri Mines Co., which see.

MEDIA MINING CO.**MISSOURI**

Address: N. Allen St., Webb City, Mo.

Has a lease on Guinn land, north of Webb City, covering the site of the old Hold Out mine.

Ore: zinc sulphide, in sheet ground formation at a depth of 230', with ore faces 9' high. Company recently completed one of the largest mills in the Missouri-Kansas-Oklahoma district, capacity 600 tons per ten hours.

Equipment: mill includes two 18" crushers, 3 sets of 42" rolls, two 48"x96" trommels, jigs and tables. Mill can treat 2% ore profitably. Concentrates assay about 59% zinc, with only a trace of lead. Steam power is used.

MISSOURI ZINCFIELDS CO.**MISSOURI**

Office: 805 Chambers Bldg., Joplin, Mo. W. L. Chambers, mgr.

Inc. in Missouri.

Property: 1,100 acres in Joplin, Jasper Co., Mo. Ore carries blende, calamine and galena.

Development: by shafts from 40' to 200' deep.

The property is operated by lessees. There are three mills on the ground owned by the Fifteenth St. Mng. Co., Yellowstone Mng. Co. and Mary L. Mng. Co.; also a custom mill owned by the Gager M. & M. Co.

MISSOURI ZINCFIELDS CO.**MISSOURI**

Address: Geo. J. Kusterer, mgr., Webb City, Mo.

Officers: J. N. Smith, pres.; W. E. Colley, sec.-treas., Boston, Mass. **Inc. 1898 in Maine. Cap., \$400,000.**

Gross returns from ore sales in 1916, totaled \$500,000.

Property: 400 acres at Webb City and Carterville, Mo. Company does not operate any mines but owns the fee title and leases properties to others.

Ore: assays 3% zinc and lead. Shafts are 100 to 200' deep.

In 1916 output of concentrates was 6,000 tons, containing 60% zinc and 80% lead, respectively.

MISSOURI ZINC MINES CO.**MISSOURI**

Office: 608 Sellwood Bldg., Duluth, Minn.

Office: 422-23 Frisco Bldg., Joplin, Mo. Albert M. Plumb, manager, Platteville, Wis.

Officers: E. A. Lamb, pres.; H. J. Kruse, v. p. and gen. mgr.; B. F. Osborne, sec.; W. W. Fegan, treas.; Guy E. Neault, mine supt.; David Shoemaker, mill supt.

Inc. July, 1916, in Delaware. Cap., \$500,000.

Ore sales in 1916 amounted to \$155,000 and operating expenses to \$55,000. Dividends earned in 1916 and 1917 were 30% and total, \$500,000, from the Quick Seven, 1909, and Teximo mines.

Property: 78 acres at Neck City, Mo., including the Quick Seven Teximo and 1909 mines.

Ore: carries high-grade zinc blende and no lead. The deposit is 900x400' and is opened by 8 shafts to 160' depth.

Equipment: includes three 250-ton mills using Blake crushers, Cornish rolls, jigs, screens, etc.

Production: from one mill is 500 tons of 60% zinc concentrate per month. Cost of mining by open pit is 50c per ton.

NAPOLEON MINING CO.

MISSOURI

Joplin, Mo.

Inc. in Missouri. Cap., \$10,000. Operates a lease on 40 acres of mineral land owned by E. N. Perry in S. 22, T. 28, R. 33, Joplin, Jasper Co., Mo. Developed by 2 shafts to depth of 200'. Production in 1915 came from the 180' level.

Equipment: includes 250-ton concentrating plant, 450' aerial tram, steam power, pump and hoist. Output is lead-zinc concentrate. About 35 men employed.

NATIONAL ZINC & LEAD CO.

MISSOURI

Offices: 53 State St., Boston., and 420 Main St., Joplin, Mo.

Officers: W. R. Brown, pres.; F. G. Wright, sec.; J. J. Hammers, treas.

Cap., \$500,000; shares \$1 par; 300,000 shares issued. Stock is listed on New York and Boston Curbs. Company has paid dividends of 42%, or \$126,000, from Nov., 1915, to May, 1917.

Properties at Dixie, Neck City, and Webb City, Mo., are developed by shafts, 85'-225' deep, sunk in pay ore. Company operates four large mills on ore from its mines.

Company is operating the Slim Jim zinc mine in the Picher district of Oklahoma, showing rich ore at 227'. One of the mills was moved from Missouri to this mine. For week ended Aug. 11, 1917, mine produced 32 tons of concentrate.

NEW ENGLAND ZINC CORPORATION

MISSOURI

Address: Belle Center, Joplin, Mo.

Inc. in Connecticut. Cap., \$100,000.

Operates a lease on 160 acres of mineral land owned by C. W. Edwards, with S. 23-24, T. 28, R. 34, Joplin, Jasper Co., Mo. Developed by 3 shafts to depth of 150'.

Equipment: includes 150-ton concentrating plant making a mill recovery of from 20-25% zinc; pumps, air drills, steam hoists, and compressor. Employs 11 men. Company also reported operating a lease on the Leckie land at Klondike, Mo. Output is lead-zinc concentrate.

NORTH AMERICAN ZINC CO.

MISSOURI

Officers: Dr. J. W. Boyd, pres., Sarcxie, Mo.; Geo. Saunders, sec.-treas., with M. C. Goodwin, J. B. Gorman, directors. Operates a lease on 40 acres of mineral land at Wentworth, Newton Co., Mo., said to show a 30' deposit of zinc ore at 100'. Developed by 3 shafts to depth of 114'.

Equipment: includes electric power, 250-ton mill, office and change room.

NYMO ZINC & LEAD CO., INC.

MISSOURI

Office: 34 Wall St., New York.

Officers: Benj. L. Love, pres.; John L. Morrison, principal owner, v. p. and sec., Germantown, Phil., Pa.; above with W. H. Johnson, Douglas Fenwick and Hugh T. Halbert, directors; E. R. Cowan, treas.

Inc. Feb. 25, 1916, in New York. **Cap.**, \$100,000; shares \$5 par; outstanding, \$50,000. Douglas Fenwick & Co., 34 Wall St., New York, transfer agent. Franklin Trust Co., New York, registrar. Listed on New York Curb. Dividends: 1%, paid April, 1916.

Financial statement of April 21, 1916, shows cash, \$1,865. Gross receipts from ore sales, \$7,004; cost of production, \$3,533.

Property: formerly known as the Brattleboro mining lease, 6 acres, in East Joplin mining district, has lead-zinc ore occurring at 65'-86' in depth, said to be proven by 6 drill holes.

Development: a shaft with drifts east and west for only 30'.

Equipment: includes hoist and 2 boilers.

OANAMENA MINING CO.

MISSOURI

Address: Box 71, Webb City, Mo.

Officers: Geo. J. Kusterer, pres. and mgr.; Thos. H. Noonan, v. p. and supt.; C. G. Talcott, sec-treas.

Inc. 1913 in Missouri. **Cap.**, \$40,000.

Gross returns in 1916 were \$422,000, and operating expenses \$313,387.

Property: 150 acres at Duenweg, Mo., which carries a 3% zinc and lead ore in a blanket, deposit 20' thick. Shafts are 210' deep.

Equipment: 400 ton mill (10 hours) using Webb City crusher, rolls, rougher and cleaner jigs, and Arbuthnot tables. Concentrate contains 62% zinc. All costs are \$1.30 per ton.

O. F. & L. MINING CO.

MISSOURI

Duenweg, Jasper Co., Mo.

Inc. in Missouri. **Cap.**, \$30,000. Operates a lease in S. W. $\frac{1}{4}$ of N. E. $\frac{1}{4}$ of Sec. 5, T. 27, R. 32, Duenweg.

Development: by two 200' shafts. **Equipment:** includes 250-ton concentrating plant, boiler, pump, steam power, Freeman crusher. One hundred men employed. It is a steady producer

Company's former holdings in Sec 3 were sold to the Baltic Mining Co.

ONCE MORE MINING CO.

MISSOURI

Office: 119 W. 4th St., or Box 299, Joplin, Mo.

Officers: J. A. Cotton, pres.; Jno. Cowell, v. p.; H. Connelly, sec-treas.

Inc. July, 1915, in Missouri. **Cap.**, \$24,000.

Property: is a tract in the sheet-ground district of West Joplin, carrying an ore deposit of 16' to 18' thick, opened by shafts 145' and 182' deep. The ore has an average zinc and lead content of 3%.

Equipment: Sullivan angle-compound compressor, Freeman first-motion hoist, 250-ton mill (10 hours), one 25 and two 100 h. p. G. E. motors. Concentrate assay 62% zinc and 83% lead.

ORONOGO CIRCLE MINING CO.

MISSOURI

Entire stock issue owned by Connecticut Zinc Corp'n., which see.

ORONOGO MUTUAL MINING CO.

MISSOURI

Guy H. Waring, mgr., Oronogo, Jasper Co., Mo.

Property: 40 acres of zinc bearing land, includes the Old Judge mine on the Elliott land, the Hockaday tract, purchased from the American Z. L. & Sm. Co. and mining rights of city lots at Oronogo. The Old Judge is developed by 2 shafts, 165' and 170' deep.

Equipment: includes 16 air drills, 2 electric hoists, 2 compressors, Carterville crusher and a new 500-ton electrically driven concentrating plant with 2 sets of jigs, slime tanks and 11 tables.

Installed \$70,000 steam power plant, 1917, consisting of 2 boilers, condensing engine and 2,600' Corliss compressor.

Production of concentrates was begun the latter part of 1914, and was at the rate of 45 tons of lead concentrate (80% metal) per week in Oct., 1917. About 85 men employed.

OTIS MINING CO.

Sold its property to the Consumers Mining Co., which see.

OWOSSO MINING CO.

H. H. Culver, mgr., 1409 Wall St., Joplin, Mo. The mine is owned by J. L. Harris, Daniel Fisher, Jas. Fisher, Jr., T. G. Shubert, all of Hancock, Mich., and H. H. Culver.

Property: a 10-year lease on 1 claim, 40 acres, on Baker land, in S. E. $\frac{1}{4}$ of Sec. 33, T. 28, R. 32, Jasper Co., Mo., carrying lead and zinc ore in sheet ground formation. This is a virgin mine in the sheet ground field in Duenweg between the Lincoln and Coahuila mines.

Development: by 2 shafts deepest 242' in sheet ground, with 20' ore face, 1917.

Equipment: includes compressor, 8"x8" steam hoist, 3 Gardner pumps and 200-ton concentrating mill with jigs, crusher, rolls and tables. Is reconstructing 200-ton mill at Duenweg which will double capacity.

Production: for 1915, begun in Sept., 1915, amounted to 4,240 tons of ore, or \$9,872. Concentrates averaged 58% zinc and 78% lead.

PHOENIX MINING CO.

Not incorporated. E. N. Cunningham, mgr., Joplin, Mo.

Property: 40 acres in S. W. $\frac{1}{4}$ N. W. $\frac{1}{4}$ Sec. 22, T. 28, R. 33, Jasper Co., Mo., carries lead-zinc ore in a soft limestone formation.

Development: by 176' vertical shaft and total workings of 600'.

Equipment: includes steam power, hoist, pump and 150-ton concentrating mill.

Production: in 1913 was 3,222,450 lbs. zinc and 1,003,450 lbs lead; in 1914, 5,524,310 lbs. zinc and 428,080 lbs. lead.

Mine was idle from Oct., 1914, to Dec., 1915. Diamond-drill exploratory work in progress in 1916.

PICHER LEAD CO.

Merged, June, 1916, with the Eagle White Lead Co., of Cincinnati, and a new company organized called the Eagle Picher Lead Co., which see.

PLAYTER BROS. MINING & REALTY CO.

Office: 315 Wall St., Joplin, Mo. C. C. Playter, pres.; G. H. Playter, sec.-treas.

Inc. 1914, in Missouri. **Cap.** \$30,000. Company engages in prospecting and development and when ore is opened and mining started, operations are then controlled by separate organizations.

PROSPERITY MILLING CO.

Prosperity, Mo. Operates a lease on 40 acres of mineral bearing land belonging to W. E. Saum, in Sec. 21, T. 28, R. 32, at Prosperity, Jasper Co., Mo.

Development: by 5 shafts to depth of 175'. **Equipment:** includes 150-ton concentrating plant, 3 air drills, steam power, Carterville crusher and air compressor. About 25 men employed.

QUICK SEVEN MINING CO.

Alba, Mo. Inc. in Mo. **Cap.**, \$105,000.

Operates a lease on 78 acres of mineral bearing land owned by J. Richardson, in Sec. 6, T. 29, R. 32, Jasper Co., Mo. Is reported to be the largest producer of zinc concentrate in the Alba district.

Development: by 3 shafts to depth of 150'. Equipped with 200-ton concentrator, pumps, drills, compressor and steam power. About 45 men employed.

ST. REGIS MINING AND SMELTING CO.

Duenweg, Jasper Co., Mo. E. R. McClelland, pres.-treas. Inc in Sept., 1915. **Cap.**, \$100,000.

MISSOURI**MISSOURI****MISSOURI****MISSOURI****MISSOURI****MISSOURI****MISSOURI**

Company took over the 40-acre lease of the old American Beauty mine, N. W. of Duenweg, which had been idle for some time owing to low price of spelter. The company unwatered the property which is developed by two 208' shafts in sheet ground formation; said to have a 20'-25' ore face, and built a 350-ton concentrator.

Equipment: includes 4 gas engines, 2 compressors, two 100-h. p. boilers and a change house.

SCHOOL HOUSE MINING CO.

MISSOURI

Joplin, Jasper Co., Mo.

Inc. in Mo. Cap., \$100,000. Operates on 40 acres lead-zinc land near Cartersville.

Development: by 3 shafts, average depth 167'. Equipped with 800-ton concentrator. Does not reply to requests for information.

SHORT CREEK ZINC & LEAD CO.

MISSOURI

F. A. Hornaday, mgr., Joplin, Mo.

Inc. April, 1916, in Missouri. Cap., \$100,000; \$1 par.

Dividends: paid 1½¢ per share, regular May, July and 2% extra, or 8½¢ in three months. Stock dealt in on New York and Boston Curbs.

Property: lease on 115 acres of zinc land, 2 miles from Joplin, Mo.

Mines have been in active operation since 1914, producing concentrates, returning \$107,000 October, 1914, to Dec., 1915.

SPIRAL LEAD & ZINC CO.

MISSOURI

Chas. Dudley, supt., Joplin, Mo. J. S. Mullen, pres., Ardmore, Okla.

Property: the Martha Ball mine, bought for about \$30,000; a sheet-ground mine W. of Chitwood, S. W. of Sparkler mine and E. of La Nora B mine, with ore 195' deep.

SULLIVAN ZINC MINING CO.

MISSOURI

Inc. by Harry Kingsbury, Allen Dorsey and R. D. Talmadge, Jan., 1916, to take over a 20-acre lease at Joplin, Mo., on sheet ground. The workings are 180-205' deep. Company has a new 150-ton mill.

Letters returned in May, 1917.

TENNESSEE ZINC & LEAD CO.

MISSOURI

Office: 220 Miners Bank Bldg., Joplin, Mo.

Officers: P. H. Corbett, pres.; R. H. Allen, v. p.-treas.; W. V. Fox, sec.-gen. supt.

Inc. 1916, in Missouri. Cap., \$100,000. Gross income from Jan. 1, 1917, to Oct. 31, 1917, was \$100,426; expenses were \$41,925.

Property: 62 acres, 8 miles N. W. of Joplin, Mo. Ore: carries zinc blende from 3 to 20%, the average in 1917 being 7.15%. The deposit is 12' thick, 600' long and is opened by 92 and 123' shafts.

Equipment: includes 100-ton mill, using Rogers rolls, crusher, jigs, screens and Arbuthnot tables.

Production: 70 to 335 tons of 63% zinc concentrate, with up to 0.16% lead per month. Costs are \$1.90 for mining, 32.9c for milling, a total of \$2.23 per ton.

TWIN CITIES MINING CO.

MISSOURI

Address: Geo. Moore, mgr., Webb City, Mo.

Inc. in Mo. Cap., \$50,000. Is a merger of the Laura Alice and Ben Franklin mining companies.

Operates lands leased from Daugherty & Davey, in Jasper Co., on Center Creek, between Webb City and Cartersville, using the 175-ton Davey No. 1 mill. Developed by two shafts, steam power being used.

UNDERWRITERS LAND CO.

MISSOURI

Address: Joplin, Mo.

Officers: G. H. Worthington, pres.; A. Good, sec.; F. N. Bendelari,

treas.; F. R. Harrington, gen. mgr.; with J. W. Gibbons, A. E. Bendelari, directors.

Inc. 1901. Cap., \$1,000,000; shares \$1 par; outstanding \$1,000,000; non-assessable. Annual meeting in February. No bond issues. Transfer office: 812 Hippodrome Bldg., Cleveland, Ohio. **Registrar:** Delaware Trust Co., Wilmington, Del. Dividends in 1916 were 6%.

Property: 240 acres, leased and 232 acres, in fee, in Jasper Co., Mo., and Ottawa Co., Okla. The blende ore is hoisted by vertical shaft, total depth of working, 250'. Two concentrating mills yield 62% zinc concentrates.

U. S. LEAD & ZINC CO.

MISSOURI

Promoted by C. L. Glass & Co., Vandergrift Bldg., Fourth Ave., Pittsburgh, Pa.

Directors: P. S. Chambers, D. A. Rees and W. S. Maxey.

Inc. in Delaware. Cap., \$600,000; shares, \$1 par; non-assessable.

Property: one 20-acre lease in Joplin district, opened by 190' shaft and several drifts, and one 24-acre lease opened by two 120' shafts, two 50' shafts, and drifts, all in high-grade ore.

Equipment: each mine has a 150-ton mill for concentrating the zinc-lead ore.

UNITED ZINC SMELTING CORP.

MISSOURI

Office: 99 John St., New York.

Officers: R. A. Cowles, pres.; Arthur Day, v. p.; with M. M. Pearlman, Otto Proelss, A. L. Davis, G. M. Pyncheon, B. Lissberger, W. E. Reis, and Harry Raymond, directors; Gustave Ross, sec.; T. C. Davidson, treas.; M. M. Pearlman, mgr. at Clarksburg; Otto Proelss, mgr. at Moundsville; and J. A. Skinner, mgr. at Joplin.

Inc. April, 1916, in New York. Cap., 600,000 shares without par value, but offered for subscription at \$12.50 per share; 565,684 outstanding. No funded debt. Bankers Trust Co., New York, transfer agent. Equitable Trust Co., New York, registrar. Listed on New York Curb.

Statement for the first year's operations, ended April 30, 1917, show gross earnings of \$807,026, less \$51,342 for operating and \$116,727 for depreciation, leaving \$638,957 net. Dividends are expected in the near future.

Controls through stock ownership all of the assets of the Pearlman Co. Inc., and the Clarksburg Zinc Co., and a substantial majority of the common shares of the Kenefick Zinc Corporation.

The Pearlman Co., Inc., owns a large zinc mill and refining plant at Clarksburg, W. Va., comprising 3,648 retorts with capacity of 30,000,000 lbs. of spelter per year; a pottery plant with a capacity of 500 retorts per day; a power plant and a refining plant with a capacity of 15,000,000 lbs. of spelter per year; all the capital stock of the Clarksburg Zinc Co.; owns patents, controls brands and trade-marks.

United Zinc has at Moundsville, W. Va., one Hegeler roaster, 1,738 retorts, pottery, gas producers, nitric acid works, plant producing 50 tons of 60° sulphuric acid daily, and power plant. These works were ready in Sept., 1917.

The Kenefick Zinc Corporation is the largest producer of zinc concentrates in the Joplin, Mo., district, the capacity of its mines and mills being 25,000 to 30,000 tons of concentrates per year. The United Zinc Corporation offered to exchange 1¼ shares of its stock for each common share of the Kenefick Zinc Corporation.

Properties operated by the Kenefick Corporation, Electrical Zinc & Lead Mining Co. and Milan M. Co., north of Webb City; the Coyote Mining Co., and Airedale Mining Co., west of Joplin, and the Coronet mine at Baxter, Kansas.

At the Media mine, ore occurs in 17 acres of land, and the mill treats 1,500 tons daily. The Milan produces the highest grade ore in the district and treats 600 tons daily. The Electrical yields 600 tons of ore daily, and since 1904 has not varied 0.25% in its zinc recovery. At the Coyote the ore deposit is 18' thick, supplying 800 tons daily. In 8 acres the Airedale has 18' of ore, yielding 700 tons daily.

UTAH-MISSOURI MINES CO. MISSOURI

Address: Neck City, near Joplin, Mo.

Property: the Big Four and Lucky Tiger mines, the latter transferred from a Utah company early in 1916.

Development: at Big Four by 2 shafts to 315', yielding sphalerite; and at Lucky Tiger by 2 shafts to 276'.

Equipment: at the Lucky Tiger is a 250-ton mill, etc., which treats ore from both mines. Property is fully equipped.

VACATION MINING CO. MISSOURI

Address: Duenweg, Mo. Has a 40-acre lease with Miami field 2 miles E. of Duenweg. Seventeen drill holes cut ore from 90 to 123' depth, averaging 15% blende and lead. A mill may be erected if development warrants it.

VESUVIUS MINING CO. MISSOURI

Address: M. V. Eardley, mgr., or S. Drake, supt., Carthage, Mo.

Officers: C. W. Lambourne, pres.; W. H. Eardley, v. p.; M. V. Eardley, sec.-treas.; with Chas. Lange and Geo. Blood, directors.

Inc. 1916, in Utah. Cap., \$75,000; shares \$1 par; all issued; 50,000 assessable.

Gross earnings in 1916 were \$45,000, and expenses \$44,000.

Property: lease on 54 acres, 4 miles N. W. of Carthage, Mo. **Geology:** dissemination of zinc blende in blue flint, or chert. Ore yields 3% blende.

Development: by 200' shaft and 2,000' of workings. Reserves blocked out are given as equal to 36,000 tons of concentrate, containing 60% zinc.

Equipment: small Freeman hoist, 12x16" Norwalk compressor, 8" Pomona pump, electric power (purchased), and 500-ton mill.

Production: in 1916, 18,000 tons of 'dirt' (ore) yielded 650 tons of concentrate containing 60% zinc.

Is a new mine that should be very profitable under present conditions.

WACO MINING CO. MISSOURI

Address: 319 Frisco Bldg., Joplin, Mo.

Officers: Robt. Law, Jr., pres.; Jas. A. Dunn, sec.; P. B. Butler, mgr.; R. S. Butler, mine supt.; W. S. Estes, mill supt.

Inc. in Missouri.

Property: 346 acres in 8 leases at Waco in the Lawton district. **Ore:** carries 8% blende. The deposit is 400x600' in area, and is opened by shafts, 160, 138, 90, 128 and 127' deep.

Equipment: No. 1 mill, started work in August, 1917, has 600-ton capacity, while No. 2 of 800 tons was under construction in November. Crushers, rolls, jigs, tromeels and tables are used.

Production: 500 tons of 63% zinc concentrate monthly. Costs are \$1.75 per ton for mining and 25c. for milling, a total of \$2 per ton.

WADE MINING & MILLING CO. MISSOURI

Offices: St. Louis and 620 Joplin St., Joplin, Mo.

Officers: C. E. Brenton, pres.; Frank Boehm, v. p., St. Louis; and E. W. Buskell, treas., Joplin.

Property: a lease formerly held by Gilt Edge Mng. Co., on the Wade farm, 120 acres, 3 miles W. of Diamond and 3 miles E. of Tipton Ford, Mo.

Is a lead and zinc mine, the proportion being 33% lead and 66% zinc.

of the metallic contents of the ore. Two shafts, drifts and drill holes have been opened. Ore is treated in a 150-ton mill.

WALLOWER MILL**MISSOURI**

Built in 1914 by F. C. Wallower, 100 Neill Bldg., Joplin, Mo., to treat lead and zinc ores of Prosperity Camp, Joplin district. Capacity, 300 tons per 10-hour shift.

Equipment: includes 100-h. p. electric motor, 16" crusher, rolls, screens, jigs, classifiers, Deister tables and slimers. Operated steadily in 1916-7, and opened another shaft in order to supply the mill with ore.

WASHINGTON LAND & MINING CO.**MISSOURI**

Address: W. Maclay, mgr., Bliss, Mo.

Officers: A. L. Shapleigh, pres.; J. D. Filley, v. p.; R. W. Shapleigh, sec.; the foregoing are directors.

Inc. about 1880 in Missouri. **Cap.**, \$50,000; \$100 par; all issued.

Owens 6,250 acres lead and baritic lands in Washington Co., operated on royalty basis.

WILSON MINES CO.**MISSOURI**

Address: Webb City, Mo.

Cap., \$10,000. **Dividends:** 10% in April, 1916, 5% May 1. Stock held mainly in Milwaukee, Wis.

Operates under lease, 150 acres of land of the **Boston Duenweg Mining Co.**, Webb City, Jasper county. Has developed extensive ore bodies by drilling, operating 2 shafts and producing the bulk of the output of Boston-Duenweg holdings. Has invested \$30,000 in plant, capacity 500 tons daily.

WINGFIELD MINING CO.**MISSOURI**

Address: Webb City, Mo.

Inc. in Missouri. **Cap.**, \$32,000; investment, \$48,222.

Operates, under lease, 50 acres sheet-ground lands of Scott, Bowman & Ware, working through 3 shafts. Capacity, 1,000 tons daily. Mill equipment includes Webb City crusher and 4 tables.

WINNIE-LAWSON ZINC CO.**MISSOURI**

Highly advertised in the Joplin papers January, 1916, as an "investment offering of great significance and importance." The company claims to have under lease, 270 acres of land in the "most promising portions of the southwest lead and zinc district," and that it has let a contract for a 400-ton mill. Edward Lawson is the promoter. No reports of big undertakings on the part of this company have come from other sources.

Letters returned unanswered in July, 1917.

LEAD & ZINC MINES OF SOUTHEASTERN MISSOURI

The mining region in St. Francois county is the most important lead producer, not only of the United States, but of the world.

In 1915 the output was 183,906 tons of lead, a little more in 1916 and probably a considerable gain will be shown in 1917. The area is 70 miles south of St. Louis, with Bonne Terre and Flat River as the principal centers. Over 20,000 tons of ore is treated daily. Deposits consist of ore in dolomite averaging 4% to 6% lead. All concentrating mills employ flotation methods.

Geology is described by H. A. Buehler and ore treatment by A. P. Watt, in Bull. 130 of the A. I. M. E., 1917, while mining was discussed by H. A. Guess in the A. I. M. E. Transactions of 1914.

BAKER LEAD CO.**MISSOURI**

Address: Leadwood, St. Francis Co., Mo.

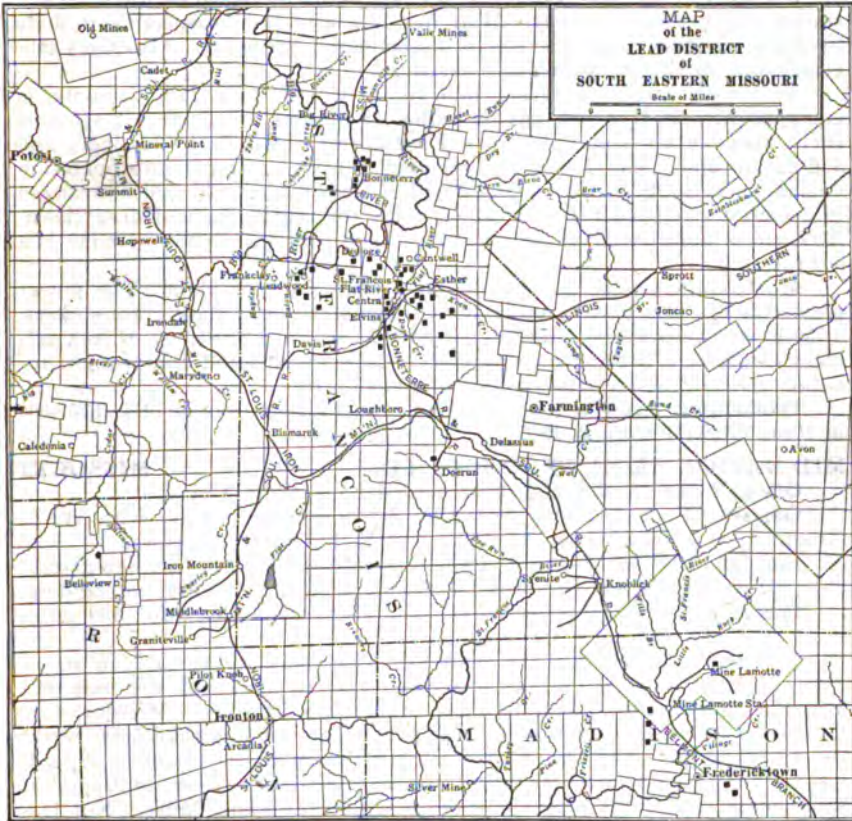
Property: the old John Day tract of the **St. Francois Lead Co.**, at

Leadwood, and the Jones tract at Elvino. Company has no mill, but ships ore to the St. Louis Sm. & Ref. Co.'s plant at St. Francois.

BOSTON-ELVINO LEAD CO.

MISSOURI

Address: Elvino, St. Francois Co., Mo. Ore shipped to the St. Louis Sm. & Ref. Co.'s plant at St. Francois.



DESLOGE CONSOLIDATED LEAD CO.

MISSOURI

Address: Desloge, St. Francois Co., Mo.

Inc. in Missouri. Cap., \$1,000,000, with almost \$2,000,000 invested in land and plant.

Property: 4,704 acres, developed by several shafts, 2 of which are 300' deep and another 500' deep. Two of the shafts are near Desloge, but No. 4 is near Leadwood.

Equipment: a 1,700-ton concentrator equipped with Wilfley tables, Frue vanners, rolls, Chilean mills, and a 780-k. w. steam turbine; also a smelter equipped with Flintshire-Tarnowitz reverberatory furnaces. Flotation is employed in the mill. Employs about 500 men.

DOE RUN LEAD CO.

MISSOURI

Absorbed in 1916 by the St. Joseph Lead Co.

FEDERAL LEAD CO.**MISSOURI**

Flat River, Mo.; H. G. Washburn, mgr. Subsidiary of American Smelters Securities Co.

Inc. in Delaware. **Cap.**, \$2,000,000; shares \$10 par. The lead-smelting and refining plant, at Federal, Ill., near Alton, comprises 302.5 acres. The plant is a custom smelter.

Property: 13,690 acres in the Flat River districts, southeastern Missouri, shows lead ore in limestone. Mine has 12 shafts and prospecting is done by diamond drills, as no outcrop of disseminated ore occurs. Also the Catherine mine in the Fredericktown district.

Two mills are in operation, mill No. 3 of 5,000 tons daily capacity, is equipped with 12 Hancock jigs, 72 tables, 18 vanners arranged in 2 sections each; also regrind rolls, elevators, Esperanza-Federal drag classifiers and a flotation unit. Mill No. 4 of 3,000 daily capacity was put into operation during January, 1917; it is equipped with 6 Hancock jigs, 40 tables arranged in 2 sections, regrind rolls, elevators, mills for regrinding and drag classifiers, and a flotation plant for slime treatment. At the Catherine mine is a 600-ton mill.

Most of the power is generated at a central power plant. The power plant consists of a battery of 12 boilers, equipped with chain grate stokers, 2 750-k. w. Curtis vertical turbines, 2 2,000-k. w. and 1 800-k. w. Allis-Chalmers turbines, 3 Nordberg compressors, 1 Ingersoll-Rand compressor, together with necessary condensing equipment, etc.

Production: 1,163,000 tons of ore in 1913; 1,212,000 tons in 1914; 1,355,000 in 1915; 1,328,474 tons in 1916.

MID-NATION IRON PRODUCTS CO.**MISSOURI**

Office: 2082 Continental & Commercial Bank Bldg., Chicago.

Officers: E. A. Clemons, pres.; W. R. Leeper, sec.-treas., with W. C. Groetzingler, J. F. Lindsay, E. Abby and F. J. Quinn, directors.

Inc. Jan., 1917, in Missouri. **Cap.**, \$2,000,000; shares \$10 par, non-assessable; all issued. Bonds authorized \$1,000,000, of which \$160,000, outstanding.

Property: 88,000 acres in Wayne and Butler counties, Mo., 150 miles S. of St. Louis, owned in fee simple.

The Missouri Ore Co., 14 Wall St., New York, presumably a subsidiary of Midvale Steel Co., has a 99-year lease to mine iron ore only, the Mid-Nation retaining rights to mine other than iron ore. Missouri Ore Co. has 1 year to explore and take up 1 lease on not less than 5,000 acres; to pay \$40 per acre and a royalty of 25c. per ton on all ore removed, regardless of analysis. Second year calls for lease on 10,000 acres additional at same price; and third year to lease remainder at same figure. Not less than 300,000 tons per annum to be extracted. All ore that will concentrate 48% or over can be removed.

Development: property contains brown hematite and limonite, assaying 53.48% metallic iron. Estimated that 50,000,000 tons are available. Four drills at work. Mining will be by steam-shovel. Output in last 15 years was 1,500 carloads; no production at present.

MINE LA MOTTE CO.**MISSOURI**

Name changed Nov. 1, 1916 to Missouri Metals Corp., which see.

MISSOURI COBALT CO.**MISSOURI**

Address: Thos. J. Mateer, mgr., Fredericktown, Mo.

Officers: M. J. O'Brien, pres.; J. A. O'Brien, v. p.; C. T. Smith, sec.-treas.; with S. F. Kirkpatrick, directors; R. F. Taylor, mine and mill supt.

Inc. in Missouri.

Property: that of old North American Lead Co. at Fredericktown.

Ore: occurs in limestone and contains sulphides of copper, iron, cobalt, nickel, and lead. Developed by shafts.

Equipment: includes 500-ton mill completed in August, 1917, employing flotation as part of the process.

MISSOURI COPPER MOUNTAIN MINING CO. MISSOURI

Office: Room 4, Pehl Bldg., Sedalia, Mo. **Works office:** Sullivan, Franklin Co., Mo.

Officers: S. Urban, pres.; F. Maerschel, v. p.; Peter Pehl, treas.; J. W. Graham, sec., with H. H. Graham, C. C. Kelly, and F. T. Mulcahy, directors.

Inc. Jan., 1903, in Arizona. Cap., \$1,500,000; shares \$1 par; issued, \$1,396,000.

Property: about 7,000 acres in Crawford and Washington counties, Missouri, including some farm lands. The Copper Hill mine, 32 acres, worked in a small way before 1850, shows an orebody with a good gossan in magnesian limestone.

Development: by a 50' shaft and about 200' of tunnels.

MISSOURI METALS CORPORATION MISSOURI

Inc. in Maine. as the Mine La Motte Co., 1914; name changed, 1916.

Office: 1945 Railway Exchange Bldg., St. Louis, Mo. **Mine office:** Wm. G. Dooley, asst. treas., Mine La Motte, Mo.

Officers: A. J. Meier, pres.; A. W. McLimont, v. p.; F. E. Butcher, sec.; with W. S. McCall, G. G. Moore, A. J. Drexel, Jr., Hamilton Fish, and J. E. Liggett, directors; R. Morrison, Jr., treas.

Inc. Nov. 1, 1916, in Missouri. Cap. \$5,000,000; shares \$100 par; all issued. Security Transfer & Registrar Co., New York, transfer agent. Equitable Trust Co., New York, registrar.

Bonds: \$1,000,000 1st refunding gold 6s, due Nov. 1, 1926. Coupon, \$1,000. Empire Trust Co., New York and S. H. West, St. Louis, Mo., trustees. Is first lien, subject to \$330,000 prior lien, retired by this issue. Offered Feb., 1917, at 96½.

Net earnings (applicable to interest) \$169,432 for year ended June 30, 1916; quarter ended Sept. 30, 1916, \$53,438.

Property: 37,614 acres of mineral and farm lands in Madison and St. Francois counties, Mo. Lands have produced since 1723, over \$20,000,000, mostly lead. For geology, see Kemp's "Ore Deposits," p. 228, also Mo. Geol. Survey, Vol. IX, Report 4, p. 48.

Development: by a number of shafts, average depth 125'. The shallow surface diggings, which were first worked, were followed down 100-125' and from this level the ore has been coming that for 50 years has supplied the mill and smelter. In recent years the copper and nickel-cobalt sulphide ores, which occur in bunches and masses in the lead ore, have not been mined, owing to the difficulty of smelting them. In 1915 four shafts were operated, and much of the ground was reworked with steam shovels. Much carbonate of lead is recovered.

Production: figures cannot be given, as the company gives out no information, but the plants were treating 2,000 tons daily in 1917.

Reserves are reported to be equal to 3,000,000 tons yearly for 60 years, half of which can be mined by open cut methods.

Equipment: 19 miles of railway, 1,000-ton ore concentrator with 350-ton flotation unit, 1,000-ton tailing plant, etc.

SAINT FRANCOIS LEAD CO. MISSOURI

Property sold to the Baker Lead Co., which see.

ST. JOSEPH LEAD CO.

MISSOURI

Offices: 61 Broadway, New York and Bonne Terre, Mo.

Officers: Clinton H. Crane, pres. and chairman Ex. Comm.; Hugh N. Camp, Jr., v. p. and treas.; Irwin H. Cornell, v. p. and sales mgr.; L. H. Besson, sec.; preceding are directors, with Daniel C. Catlin, Firmin Desloge, Max Kotany, M. F. Watts, all of St. Louis, Gust. Setz, San Antonio, Charles M. Chapin, F. W. Shibley, New York, and E. C. Smith Vermont. C. J. Adami, gen. mgr., W. A. Smith, mgr. of Herculeaneum plant.

Inc. March 25, 1864, in New York. Cap., \$20,000,000: shares \$10 par; outstanding \$14,647,798. Annual meeting, third Monday in Feb. Transfer office: 61 Broadway. Registrar: New York Trust Co. Stock traded in on New York Curb. Bonded debt retired Jan. 1, 1916.

Dividends: 1885-1912, 6%; 1913, 5%; 1914, 2½%; 1915, 4%; 1916, \$1 regular and \$1.50 amortization; 1917, \$2.75 in 1917 up to Sept. 20, including 50c special, from amortization reserve, equal to a total of \$4,028,195 for the year. Total to date, 72%, or \$10,253,458.

Comparative General Balance Sheet:

Assets—							
	Property & Equip.	Invest's	Working Assets	Cash and Accts. Rec.	Deferred Accounts	Other	Total
1916...	\$9,744,246	\$7,689,854	.....	\$3,779,037	802,979	\$4,192	\$22,020,309
1915...	10,712,066	8,641,497	\$413,951	\$721,307	318,294	31,381	20,838,496
1914...	10,797,061	9,684,793	753,504	648,943	379,637	512,797	22,776,728

Liabilities—							
	Capital Stock	Miss. & B. T. Loan	Gold Notes	Accounts Payable	Due Affil. Cos.	Reserves & Surplus	Total
1916...	\$14,094,600	\$2,032,000	.....	\$346,704	\$1,353,614	\$4,193,330	\$22,020,309
1915...	\$14,094,600	2,359,769	.....	213,612	569,918	3,610,537	20,838,436
1914...	14,094,050	2,415,934	\$2,239,000	502,276	618,476	2,906,992	22,776,728

Gold notes of the Miss. River & B. T. Ry. amounting to \$154,588 have been taken up.

Summary of Operations 1914-1915 (as reported in the Mining & Scientific Press):

	Lead Output Tons	Value per Ton	Net Profit	Total Income	Net Income	Surplus after Dividends	Previous Surplus	Final Surplus
1916	91,073	...	.....	.....	\$4,674,467	\$3,265,001	\$7,789,996	\$11,054,997
1915	84,356	\$90	4,283,425	4,392,360	3,489,964	1,998,883	9,416,629	11,415,512
1914	77,404	74	2,317,040	2,427,686	1,547,275	1,273,580	8,237,190	9,416,629

Subsidiary bonds: Miss. River & Bonne Terre Ry. 1st M. 5%, sinking fund gold bonds, due Oct. 1, 1931, \$2,394,922. During 1915, the company reduced its indebtedness by \$2,428,313; this reduction in debt saves the company about \$130,000 per year in interest charges, exclusive of sinking fund.

The company is the largest independent lead producer in America and the second largest after the A. S. & R. Co.

Property: 20,000 acres of land in the Southeastern Mo. lead district, in St. Francois and Jefferson counties, power plants, mill, smelting plants, the entire \$3,000,000 capital stock and \$323,000 par value additional bonds of the Miss. River & Bonne Terre Railway; also \$483,940 of the \$500,000 capital stock of the Bonne Terre Farming & Cattle Co. and all of the capital stock of the Doe Run Lead Co.; the Miss. & Bonne Terre Ry. owns the St. Francois Co. R. R. Co.

The holdings are in the disseminated lead ore region of S. E. Missouri, where production from ores in the lower Bonne Terre dolomite began in 1869. The producing area is within 5 miles of the towns of St. Francois and Desloge. There are six companies operating and seven concentrating mills in commission, those of the St. Joe Co. and its subsidiary handling 8,600 tons out of a total of 20,000 tons daily output.

Concentration was described by A. P. Watt in Bulletin 130 of the A. I. M. E.

In 1915, ten shafts were operated that furnished the ore for the old 1,500-ton mill at Bonne Terre, for the 1,500-ton mill at Owl Creek, and for the 4,200-ton Doe Run mill at Rivermines in the Flat River district. The flotation process has been extensively adopted by the company.

In 1914, the company finished reconstructing its smelting plants at Herculaneum, Mo., and now has one of the most modern lead smelters in the country, capable of treating 12,000 tons of concentrates per month. Materials treated are lead concentrates from the company's mills at Bonne Terre, Leadwood and Doe Run; concentrates said to assay from 65 to 74% lead, 14% sulphur, and 1 to 5% zinc.

The baghouse and matte granulation plants at Herculaneum were described in the Engineering and Mining Journal of Feb. 17 and Dec. 16 last.

Equipment: includes 8 Dwight-Lloyd sintering machines, 42x264", and 4 blast furnaces 42x192". Recovery of the plant is over 98%. Concentration practise at company's mills and in neighboring plants is fully and well described in Metallurgical and Chemical Engineering, July 15, 1916, p. 93

New construction at all mills included additional flotation machines, Oliver filters, and ball-mills; at the smelter a double roasting plant equipped with 4 Dwight-Lloyd machines, a Scotch hearth building with 12 Newman mechanical hearths, 1,000 kw. G. E. turbo generator, and Cottrell precipitation for roaster gases. Company has licenses from the patentees of these processes.

The power plants of the St. Joseph and Doe Run Lead companies on a basis of 34,359,458 kw.-hr., showed a cost of 0.77 cts. per kw.-hr. Power consumption was equivalent to about 16.3 kw.-hr. per ton of ore mined and milled. The new power-plant at Rivermines has two 3,000 kw. G. E. turbo generators, Heine boilers, and coal handling plant.

Production:

Year	Ore, tons	Concentrates, tons	Lead, tons
1916.....	2,431,939	169,302	91,073
1915.....	2,127,333	136,379	90,120
1914.....	1,989,047	120,710	81,716

In 1916, company produced 182,000,000 lbs of lead. The 1917 output will exceed 200,000,000 lbs.

During 1916 the company set up an amortization reserve, based on a capital of \$20,000,000; an estimated life of 20 years; an annual ore production of 2,000,000 tons; and an annual lead production of 80,000 tons. Whenever the company's monthly average sale price of lead exceeds \$60 per ton (3c. per lb.) a charge of 2c. per ton of milled ore for each dollar of such excess is charged to profit and loss surplus and credited to reserve for amortization.

ST. LOUIS SMELTING & REFINING CO.

MISSOURI

Subsidiary of National Lead Co. Wm. W. Lawrence, pres.

Address: J. A. Caselton, sec., St. Louis, Mo.

Inc. in Mo. Cap., \$2,000,000.

Property: 1,295 acres at St. Francois, Southeastern Missouri. Ore carries lead in dolomite. Six shafts are in operation, deepest 565'.

Equipment: complete with a 4,000-ton concentrating plant. Flotation is employed with gravity concentration. Besides treating its own ore, company treats that from the Baker Lead Co. at Leadwood and the Boston-Elvino Lead Co. at Elvino.

MONTANA

Butte is the one great mining center of Montana, and the companies of this camp, less widely known as the Summit mining district, Silver Bow county, are grouped under that title. All others are arranged by counties, the Helena region, following Lewis & Clark Co., although it embraces parts of other counties and several mining districts.

BEAVERHEAD COUNTY

ARGENTA-DILLON MINING CO. MONTANA

Idle. Property taken over by Montana Mines Co., which see.

BANNAK GOLD MINING CO. MONTANA

Office: 809 Kearns Bldg., Salt Lake City, Utah. Mine address: Bannack, Beaverhead Co., Mont.

Officers: F. B. Stephens, pres., Salt Lake City, Utah; W. C. Ebaugh, sec.-treas., Salt Lake City; G. T. Hansen, managing director; above, with W. S. McCornick and B. Binnard, both of Salt Lake City, directors. C. W. Stallings, supt.

Inc. April, 1915, in Montana. Cap., \$1,000,000; shares \$1 par. Title Guarantee & Trust Co., New York City, transfer agt. and registrar. Stock listed on New York Curb, Salt Lake City and Butte Exchanges.

A \$125,000 bond issue, secured by a mortgage on the property, was issued at a special stockholders' meeting, Jan. 30, 1917, to cover all outstanding obligations and to provide working capital until the mill could start operations.

The first discovery of gold in Montana was made in the Bannack district in 1862, and in that year the placers are reported to have produced \$600,000 in gold. "Quartz" mining began very shortly after. In 1863 a 6-stamp mill was in operation. A reasonable estimate from available data puts the total production of the district to 1905 at not less than \$4,000,000. From 1905 to 1913 the production reported is approximately \$2,000,000. The ores have been of value almost wholly on account of their gold, but they contain also some silver, lead and copper. The district has been comparatively inactive during the last twelve years. The Bannack property has been operated in the past in a desultory manner by owners and lessees.

Property: adjacent to the town of Bannack, at an altitude of 5,935', consists of the Golden Leaf group of 8 patented claims, part interest in 2 claims, the Junction millsite, with underground rights, also an additional area of 200 acres, besides the underground rights in Excelsior and Horace Placer millsites. Nearest shipping point is at Grant, 12 miles from Bannack, on the Pittsburgh-Gilmore Railroad, which connects with the Oregon Short Line at Armstead.

Geology: the rocks of the Bannack district consist of Paleozoic limestone intruded by a nearly circular shaped boss of syenite about $1\frac{1}{4}$ miles in diameter. Around the edges of this intrusive is formed the irregular contact deposit on which the company's claims are located. The orebodies are along the contact or in irregular masses in the limestone, and vary in width from 1' to 30' and even 40', averaging about 10'. The high-grade bodies vary in length from 50' to 100'; the milling orebodies are of much greater extent. The best ore is usually in the widest parts of the vein, and is for the most part very soft, requiring little blasting, though the ground stands well without timbering. A large tonnage of shipping ore, estimated at over \$1,300,000, has been removed from the property, leaving in the mine large reserves of milling grades of ore. See U. S. G. S., Bull 574, pp. 72-75.

Development: approximately 17,000' of underground workings to a depth of 600'. The Priscilla tunnel, the main working adit, was driven 800' to the contact at an elevation of 90' above creek level, and cuts the contact 250' below surface, though the highest point of contact on the surface will be 800' above the Priscilla tunnel.

Ore reserves: estimated Feb. 1, 1917, as 130,700 tons, averaging \$7.34

per ton, with a net realizable value of \$632,750. There are also 100,000 tons of probable low-grade ore at \$6, 5,000 tons medium grade at \$20, and 1,000 tons high grade at \$100 per ton, a total of 106,000 tons of a net value of \$535,000. Values are principally in gold, the silver contributing 50c to \$1 per ton. No account has been taken in above estimate of ore below the Priscilla tunnel level.

Equipment: a well-equipped surface plant, also a reduction plant; the first unit of the cyanide plant has a daily capacity of 150 tons. The plant, which started operations May 5, 1917, uses the continuous counter-current decantation process. Power for mine and mill is furnished by a hydro-electric plant at the mill; water being obtained from Grasshopper Creek, 2½ miles above the mill, furnishing a net working head of 39'. During the winter, when water is not available, a Diesel oil engine will furnish the power.

Milling costs estimated not to exceed \$2 per ton; mine and overhead costs not to exceed \$1 per ton. Average mill-heads are estimated at \$10 per ton, with an extraction of over 90%.

Mine is well developed and ore reserves, as estimated, are sufficient for 4 years' operation. The possibility of developing new orebodies seems good, since less than ¼ of the mineralized contact area owned by the company has been prospected, and no work goes below the water level. Using modern methods and under an efficient management, the Bannack mine has great possibilities and is very favorably regarded.

Owing to insufficient water supply the mill was obliged to shut down in July, 1917, until after the irrigation season was over.

Mr. McCornick is arranging for the purchase and installation of a Diesel engine power plant to obviate the power shortage that has closed down the mill and mine. To provide funds for this, an assessment of 10c per share has been ordered.

BEAVER MINING CO.

MONTANA

Office: 1501 Alworth Bldg., Duluth, Minn.

Officers: M. H. Gannon, pres.; W. L. Harnan, Butte, Mont., v. p.; Morgan M. Pattison, Duluth, v. p.; Dr. J. B. Sullivan, Butte, Mont., treas.; J. W. Neukom, Duluth, sec.

Inc. 1917. Cap., \$950,000. Treasury stock being offered, 1917, at 40c a share.

Property: 320 acres, 7 miles from Brown, on O. S. L. R. R.; in Beaverhead Co., Montana, about 50 miles from Butte, said to show several copper-bearing veins. A shipment of about 1,200 tons is reported to have averaged 4% copper and over 3 oz. in silver.

Development: work has only been done on 2 veins, and management plans to drive 650' tunnel with raises, winzes, etc., to open up the orebody at a depth of 400' from surface.

BEAVERHEAD MONTANA COPPER MNG. CO.

MONTANA

Argenta, Beaverhead Co., Mont. Property taken over by the Montana Mines Co., which see.

BOSTON & MONTANA DEVELOPMENT CO.

MONTANA

Offices: Daly Bank Bldg., Butte, Mont., and 35 Congress St., Boston, Mass. Mines at French Gulch, Deer Lodge Co., Mont., and Elkhorn, Beaverhead Co., Mont.

Officers: Hon. W. R. Allen, pres.; W. C. Siderfin, v. p.; L. P. Benedict, sec.; W. H. Coade, treas.; preceding with exception of L. P. Benedict, J. G. Brown, Helena, Mont., C. M. McCoy, Butte, Mont., Chas. E. Miller, Wisdom, Mont., Geo. Gallup and Joseph I. Wall, Boston, directors.

Inc. 1913, in Montana. Cap., \$15,000,000; shares \$5 par; 1,661,000 issued April, 1916; no bonded debt. U. S. Corporation, New York, transfer agent; Equitable Trust Co., New York, registrar. Stock listed on Boston and New York Curbs.

Balance sheet, Jan. 1, 1917, shows cash and available cash on notes and contracts, \$223,243; bills and accounts payable, \$29,763.

Property: is extensive, covering two entire mining districts, including

27 lode claims and 6 placer claims in the French Gulch district, Deer Lodge Co., Mont., and 89 lode claims in the Elkhorn district, Beaverhead Co., Mont. Company will practically control all these districts.

Both French Gulch and Elkhorn were opened in 1865, in the rush which followed the discovery of gold at Bannack, a few miles to the south, in 1862.

The French Gulch group of claims includes 1,100 acres, patented, water rights to 5 streams and 15 miles ditches and flumes. About \$750,000 is said to have been spent in development work. The claims have been opened up by shafts and tunnels, principally upon the Spain, Lucky Strike, Golden Crown and Leo. The work on the Spain consists of a 900' tunnel and 200' shaft, with 800' of drifting on the 200' level. The drift tunnel is about 350' below the apex and shows the vein to carry from a few inches to 4' of sulphide ore, averaging \$17 a ton, according to estimates made by James E. Beveridge, E. M. Ore is said to be blocked out to the value of \$500,000.

The Lucky Strike has a 200' tunnel following a contact vein reported to be 20' to 40' wide, and 100' shaft with 300' of drifting on the vein whose thickness is reported to be 35', with a paystreak of ore running from \$41.50 to \$80 gold, 5 to 7 oz. silver and 2½% copper.

The vein has been opened to the west by another 100' shaft, with 600' of drifting, showing an orebody 12' wide averaging \$18 a ton, according to the management. Eight hundred feet of tunneling on the Golden Crown claim shows a 1' to 3' vein said to carry \$8 to \$20 ore.

Besides these there are numerous smaller shafts and tunnels on the various claims in the French Gulch group.

The Elkhorn property consists of the Central and other groups, including the Idanha, Park, Aspen, Blue Eyed Annie and other mines, about 1,500 acres, all adjacent, either owned or held under bond and lease. This tract is crossed by numerous big, strong, well-mineralized quartz veins, cutting quartz monzonite and showing narrow zones of alteration adjacent to the veins. In the western part of the estate the veins are silver bearing and were opened, and high-grade ore extracted many years ago, a mill being erected on one property. The ore contains gray copper and high-grade silver sulphides and occurs in shoots whose size and extent is as yet undetermined, since the workings are shallow, seldom exceeding 100' in shafts or tunnel backs. The veins appear to belong to two distinct systems, one E. W., the other N. E.-S. W., the latter having a southerly and flatter dip and being the larger veins.

The eastern claims include the Park, a large N. E.-S. W. vein, 20' to 30' wide and dipping 75° N. W., traceable across four claims. It is formed of hard white brecciated quartz with altered granite streaks and carries shipping ore with copper and lead sulphides, having gold-silver values. Samples from a number of open cuts for a distance of 250' along the vein average 1.7% copper and 13.6 oz. silver, and the lead ore from these cuts carries 7.5% lead, 3% copper and 11 oz. silver for 4' across, the full width of the vein not being disclosed. An old 250' shaft sunk to develop this vein, encountered a fault and did not reach the vein. High-grade ore has also been found in several shallow shafts and cuts to the S. W., but the development does not permit a definite estimate of amounts.

Copper ore occurs in the Idanha or Mono vein, a great lode 20' to 30' wide with a dip of 55° to the south. This vein is parallel to the Park and ½ of a mile N. W. of it. It is a copper-bearing quartz pyrite vein, which resembles the older veins of the Butte district. It is developed by a 900' tunnel, giving a 250' back at the face. This tunnel cuts the ore at a point 600' from the portal and crosses the vein at a slight angle, crosscuts exposing its full width. Eight samples show an average of 2.9% copper and 6 oz. silver per ton for 10', there being a persistent hanging wall band and two other bands of sulphide ore.

The Aspen is an E.-W. cross vein, and is said to be faulted by the other system. It is 2' to 5' thick and has been exposed for 600' by a drift tunnel, showing for this distance a 12" pay streak of silicious ore carrying bornite, chalcopyrite and gray copper. This ore shows values of 0.9% copper, 40 to 60 oz. silver and \$10 gold per ton.

The Mary-Montreal vein, developed by a 250' tunnel; the Red Sky vein, opened by a 100' shaft and long drift tunnel, and the Elkhorn vein, with half a dozen shallow shafts close together, all show high-grade oxidized silver ore. The Blue Eyed Annie vein is said to carry 15' of \$15 ore on the 200' level. There are also half a dozen other veins of promising outcrop, but slight development.

The main working tunnel intersects the veins from 1,000' to 1,200' beneath their outcrops. This tunnel is 2,065' long with branches east and west from near its face that intercept the Park and Idanha veins, the total tunnel workings aggregating 5,637'. High-grade ore was cut in one vein and milling ore in the other in September, 1917.

Reports from property Dec., 1917, state that high grade ore has been cut in the Park vein.

Company controls the Southern Montana Railway, now being built as a narrow gauge line from Divide on the Oregon Short Line (Union Pacific system) to the mine on Wise river.

The company's plans are daring and ambitious and the properties long known, but heretofore unworkable for lack of cheap transportation. The property is regarded as promising and the management competent.

BOSTON & MONTANA MILLING CO. MONTANA

Sub. of Boston & Montana Dev. Co.

Inc. in Oct., 1916. Cap., \$250,000; \$25 par; divided into 5,000 shares 7% preferred, and 5,000 shares common stock; preferred stock all sold.

Boston & Montana Dev. Co. will hold B. M. M. Co. stock in treasury, agreeing to redeem the preferred stock on Jan. 1, 1919, at \$27.50 a share, and to give one share of B. & M. D. stock as a bonus.

Company was formed to provide money for the erection of a concentration-flotation mill, to handle the ore developed in the big haulage tunnel.

BUTTE-ARGENTA COPPER CO. MONTANA

Probably dead. See Vol. XII.

BUTTE & VIPOND GOLD MINING & MILLING CO. MONTANA

Office: 34 Owsley Bldg., Butte, Mont.

Officers: Jas. M. Hinkle, pres.; Thos. P. Manley, v. p.; Wm. Worth, treas.; preceding officers are directors; Wm. E. Carroll, sec.

Inc. May 14, 1910, in Montana. Cap., \$600,000; shares \$1 par; outstanding 363,412 shares. Annual meeting 3d Tuesday in May.

Property: 5 claims, unpatented, at Vipond Park, Beaverhead Co., Mont., said to show free milling gold ore in fissure veins 4' to 7' wide in granite. Ore is said to have an average assay of \$10 per ton.

Development: 200' vertical shaft and 400' tunnel, with total underground workings of 680'.

Equipment: includes boiler, hoist and pumps. Little work was done in 1915. Company expects to resume operations at an early date and will then connect the tunnel with shaft workings. Value of property remains to be proven.

HECLA (CONSOLIDATED) MINE. MONTANA

Glendale, Beaverhead Co., Mont. Mine worked by lessees until 1912, when it was taken over by the Longmaid Bros. of Helena, who installed electric power.

Property: the Atlantis, Cleves and other mines, formerly owned by the Hecla Consolidated Mining Co., which for 20 years was a large producer of silver and lead, with considerable gold and copper, latter reaching 100,000 lbs. fine copper yearly. Property paid dividends of \$2,250,000 on an original investment of \$40,000, but was bought, 1906, at sheriff's sale, for \$28,000. About 65 men employed for a year or two, but the little ore found was low grade, and the mine was again closed down, and abandoned, after some \$300,000 had been spent.

INDIAN QUEEN MINING & SMELTING CO. MONTANA

Idle. Office: Butte, Mont. Mine near Apex, Beaverhead Co., Mont.

Officers: Thos. F. Stephens, pres., treas. and gen. mgr.; Wm. Robertson, v. p.; Thos. W. Ellis, sec.; A. H. Stephens and T. J. Ellis, directors.

Inc. July, 1904, in Montana. **Cap.**, \$450,000; shares \$1.50 par; non-assessable; issued, \$228,000.

Lands: 2 claims, 40 acres, and a 3-acre millsite, in the Utopia district, known as the Indian Queen mine. Owned jointly by this company and the Anaconda Copper Mining Co. The property shows granite, quartzite and dolomite, having 2 contact deposits between granite and limestone, of 8 to 10' average width, carrying malachite, azurite and chalcocite, estimated by management to average 8% copper, 10 to 12 oz. silver and \$1 to \$4 gold per ton. Mine was opened 1867, and has been worked intermittently by lessees.

Development: by shafts of 150' and 220', and 820' tunnel, with about 1,600' of workings.

LOST RANCH & TUNNELSITE MINE.

MONTANA

Address: Harvey Sullivan, Grant, Beaverhead Co., Mont.

Property: 9 claims in the Bloody Dick section, in Upper Horse Prairie, 5 miles from Brenner, shows gold, silver, lead, copper ore in narrow fissure veins (2" to 3') in porphyry. The ore carries brittle silver, argentite and mixed sulphides in streaks 8" to 12" thick, the ore as shipped carrying 44 to 1,300 oz. silver, 4 to 20% copper, 60% lead.

Development: totals 1,300', including 420' tunnel, with 300' back, blocking out 100 tons of ore with 39 tons stoped.

MONTANA MINES CO.

MONTANA

Formerly the Beaverhead Montana Copper Mining Co. holdings were taken over, share for share.

Ray A. Cobban, Butte, Mont., sec.-treas.

Cap., \$100,000; shares \$1 par. Company obtained a lease and bond on the old Jack Rabbit mine, in Argenta, Beaverhead Co., Mont.

Developed: by a shaft 100' deep.

Equipment: includes a gasoline hoist.

Company shipping, 1917, from the Jack Rabbit mine, shipments in April said to have returned 10% copper and 12 oz. silver.

MONTANA OREWAY MINING CO.

MONTANA

No recent returns.

Office: 522 Postal Telegraph Bldg., Chicago. **Mine office:** Briston, Beaverhead Co., Mont.

Officers: W. P. Jahnke, pres.; J. B. Scott, v. p.; Fred W. Scott, sec.; J. D. Rankin, treas.; preceding, with Frank Kimball and B. F. White, directors.

Inc. 1909 in Arizona. **Cap.**, \$1,000,000; shares \$1 par; issued, 950,000.

Property: 5 claims, patented, 100 acres, and a 25-acre millsite, known as the Straight Tip group, in the Big Hole basin. Claims show several fissure veins averaging 10' thick in quartzite and contact deposits between quartzite and serpentine. Opened by a 3,025' tunnel driven to cut a mineralized diorite dike carrying copper oxide ores, with lead and small silver and gold values.

Equipment: includes a 35-h. p. steam plant, with 1-drill air compressor. These are 6 small buildings. Mill to be erected, at last accounts.

ORIGINAL BANNAK MINING CO.

MONTANA

Office: 302 D. F. Walker Bldg., Salt Lake City.

Officers: Lorenzo Price, Jr., pres.; A. J. Bruneau, v. p.; E. F. Mobley, sec.-treas.; with W. L. Smith and Ambrose Nord, directors.

Inc. in Utah. **Cap.**, \$1,000,000; shares \$1 par; assessable; 600,000 shares outstanding. Listed in Salt Lake City.

Property: 9 patented claims in the Bannack mining district, Bannack, Beaverhead Co., Mont., adjoining the Bannack Gold Mining Co., and said to have the extension of the latter's ore zone. Credited with a production of \$350,000. Management claims there is an ore-shoot 1,800' long and from 50 to 125' in width, containing "hundreds of thousands of tons of ore, that will average \$11 per ton," values mainly in the gold content, with some copper, a statement that is considered to be a gross exaggeration.

Reported that property has been equipped with new machinery, including a 325 cu. ft. compressor and a 25-h. p. gasoline hoist.
Development work under way and shaft down 300'.

SAGINAW COPPER CO.**MONTANA**

Jackson, Beaverhead Co., Mont.

Officers: Geo. North, pres.; E. M. Frank, sec.-treas.; with Elmer North and Kenneth Campbell, directors.

Inc. Jan., 1916, in Montana. Cap., \$125,000; shares \$25 par.

Property: 5 claims, including the Saginaw mine, in Beaverhead Co., shows fissure veins in porphyry, with E.-W. strike, dip 35° and 3' average width. Developed by a 300' incline shaft.

Equipment: includes steam hoist. Shipped 19 cars ore in 1915, average assay, 11% copper.

SELWAY-BOND COPPER GROUP**MONTANA**

Address: Herbert B. Selway, or H. A. Bond, Armstead, Beaverhead Co., Mont.

Property: 12 claims, 240 acres, situated 1½ miles from Armstead, Mont. Claims cover 4,000' on the course of several E.-W. fissure veins, 3' to 3½' wide that cross beds of quartzite, schist and limestone. The ore carries 3%-9% copper.

Development: by 130' shaft and several shallow openings, all said to show ore. Two shafts at water level show 3½ to 10% ore. An open cut has yielded 250 tons of ore.

SILVER FISSURE MINING CO.**MONTANA**

Idle. Sec., A. W. S. Cochrane, 30 Broad St., New York. Mine near Polaris, Beaverhead Co., Mont., known as the Polaris mine, formerly operated by F. Aug. Heinze, carries silver, gold and copper ores, latter produced in small quantities as a byproduct.

Equipment: includes steam and electric power, and a 100-ton smelter. Shut down 1915, 1916 and 1917.

BROADWATER COUNTY**BROADWATER COUNTY MINING CO.****MONTANA**

Idle. **Offices:** J. J. Fisher, pres., Harlowton, Mont.; Len Jobb, sec.; John A. Matthews, treas.

Inc. 1910. Cap., \$225,000; shares \$1 par.

Property: 7 claims, includes the Evening Star, Copper Glance and Lombard, about 5 miles west of Townsend, on the Radersburg road. Claims show good outcrops and development is said to disclose veins 4' to 12' wide, with chalcocite assaying up to 60% copper, 6 oz. silver with gold and lead values. Management plans having property prospected and reported on with a view to resumption of operations in near future.

CASTLETON COPPER CO.**MONTANA**

Address: Helena, Mont. **Mine office:** Canyon Ferry, Mont.

Officers: O. W. McConnell, pres.; F. M. Bowers, sec.; W. A. Castleton, mgr.

Inc. 1916, in Montana. Cap., \$50,000; shares \$1 par. Gross earnings to Jan. 15, 1917, given as \$141,073, all from ore sales.

Mine optioned to Furnace Creek Oxide Copper Co., et al., for \$225,000 in January, 1917, and property operated by that company, which see.

Property: 5 claims, 2 patented, in Hell Gate Canyon, Broadwater county, shows a fissure vein in shale and limestone, running N. 70° E. with dip of 80° N. Ore occurs in shoots, said to be 12" wide and to average 25% copper for the 1st class ore and 2% for the 2nd class.

Development: by 3,000' of underground workings, including shafts and tunnels.

Equipment: includes compressor, hoist, pump, steam power and 50-ton concentrator.

Production: about 2,000,000 lbs. copper from 1903-1907. Inactive until

1916. During 1916 the mill treated 1,307 tons, producing 680,424 lbs. copper, concentrates stated to have averaged 27%.

Reported on by F. A. Linforth, Butte.

EAST PACIFIC MINING CO.

MONTANA

Address: Box 122, Helena, Mont.

Officers: R. A. Bell, pres.; O. N. Kessler, v. p.; W. A. Dickinson, sec.; A. L. Smith, treas.; above with N. Gage, directors.

Inc. in Arizona. Cap., \$1,000,000; \$1 par; 556,118 shares issued. Annual meeting 1st Saturday in April.

Property: 8 patented claims, 139 acres, and a millsite, 5½ miles from Winston, Broadwater Co., Mont., and 20 miles S. E. of Helena. Claims reported to show a fissure vein in andesite, carrying gold, silver, lead values. Ore said to run \$7-\$10 a ton.

Development: by 4 tunnels, longest 3,300', and by a 134' winze. Equipment includes 75-ton mill, pump and compressor.

Property closed down several years and only worked by leasers.

ECLIPSE ARGO MINING CO.

MONTANA

Address: E. G. Hoffman, sec.-treas., New Britain, Conn. Mine near Argo, Broadwater Co., Mont. Bondholders foreclosed and in April, 1913, deeds were given to trustee for entire property. Eclipse-Argo mine sold, 1917, to Furnace Creek Oxide Copper Co., for \$300,000.

KEATING GOLD MINING CO.

MONTANA

Office: care Jesse B. Roote, Lewisohn Bldg., Butte, Mont. Mine near Radersburg, Mont.

Officers: Julius H. Barnes, pres. and treas., Duluth, Minn.; Jesse B. Roote, v. p.; A. P. Barnes, sec.; preceding with Ward Ames, Jr., and A. T. Banning, Jr., directors.

Inc. 1908, in Mont. Cap., \$2,000,000; shares \$5 par; 375,000 issued. No dividends to date. Superior State Bank, Superior, Wisc., registrar and transfer agt. Annual meeting 1st Tuesday in June. Listed on Butte Stock Exchange.

Property: 19 patented claims, about 300 acres, contains the Keating gold vein in andesite with a number of other veins, two of which have been worked. The Keating is a strong fissure vein with well defined walls and quartz-pyrite filling with more or less calcite. The ore is pyrite, frequently very coarsely, but massively crystalline, with some chalcopryrite and no visible gold, only occasionally showing gray copper, lead or zinc sulphides. The pay ore varies from a few inches to 8' in width, the average stopping width being about 3'. The value cannot be estimated from the amount of pyrite present, nor from its physical character but must be determined by assay. The ore shipped for several years past has averaged about 1% copper.

Development: to the 1,200' level has been by an inclinal shaft on the vein with a vertical southerly shaft, now idle, down to the 600' level. Cross-cutting to adjacent veins has disclosed ore but not in large amounts. The geology is described by Stone in Bull. 470, U. S. G. S., p. 93-96.

Equipment: ample for an output of 100 tons a day. As the mine is wet and the water from the old stopes very acid the pumping item is a large one.

Production: for 9 years has aggregated about \$4,500,000, but without profit to the stockholders, heavy teaming charges with freight and smelter treatment costs aggregating over \$7.00 a ton, having absorbed temporary profits. Lack of railway transportation and failure to mill the ore is therefore responsible for the present financial position of the company.

The mine was examined by Walter Harvey Weed, Jan., 1916.

In 1917, management considered the developed ore insufficient to warrant erection of a mill. A large sum would be necessary to open additional ore. The outlook is unfavorable. If the investment is a total loss, J. H. Barnes has offered to personally refund \$1 per share to those holders who desire it.

MONTANA RADERSBURG MINING CO.**MONTANA**

Townsend, Broadwater Co., Mont.

Officers: A. E. Spriggs, pres., Helena; Fred Allen, v. p. and supt., Townsend; B. E. Mathews, sec.-treas., with Hugh Broderick, C. A. Whipple, Sol. Genzberger and L. A. Sarecky, directors.

Inc. Nov., 1914, in Montana. **Cap.**, \$300,000; shares \$1 par; \$100,000 stock donated to treasury. Annual meeting, in November. Operating expenses in 1914-1915, \$10,000; receipts, none.

Property: 5 claims, unpatented, 100 acres, in Broadwater county, said to show gold, silver, lead, zinc ore in a fissure vein in lime and quartzite. Vein has a N.-S. strike, dips 20°, and is said to be 12' wide, with average assays per ton of \$2 gold, 50 oz. silver, 20% lead, 2% zinc.

Development: 500' incline shaft with 1,500' underground workings.

Equipment: includes a 40-h. p. electric hoist. Management states the company is preparing to erect a mill.

Ore reserves: management claims 200,000 tons with 100,000 tons already blocked out.

Production: said to have been \$300,000 in gold and silver produced up to the close-down of the property in 1908.

OHIO KEATING GOLD MINING CO.**MONTANA**

Address: P. O. Box 1711, Butte, Mont. Mine at Radersburg, Broadwater Co., Mont.

Officers: J. E. Oppenheimer, pres.; J. S. Cohen, v. p.; C. H. Smith, sec.-treas., with B. E. Calkins and W. M. Tuohy, directors.

Cap., \$800,000, increased Dec., 1910, from \$500,000. Company had \$113,924 debts, July, 1914, and property closed down, pending decision of stockholders to change the stock from non-assessable to assessable and payment of an initial assessment of 15 cts. per share.

Property: a promising, though small gold mine, producing some copper from pyrite ores found as shoots in strong fissure veins in igneous rocks.

Development: to 300' level, with about 3,800' of drifts and crosscuts.

Equipment: includes electric and steam pumps, electric hoist, mining cars and tools.

Fred T. Green examined the property in 1914 and estimated probable ore in mine at \$486,151, about \$116,914 worth of ore blocked out (6,680 tons) and \$90,000 worth of \$4 ore on the dump.

SUMMIT GOLD MINING CO.**MONTANA**

Succeeded by the Polaris Mining Co. (which see). Transfer made share for share, June, 1916, with payment of 25c per share.

THREE FORKS COPPER MINING CO.**MONTANA**

Copper City, Broadwater Co., Mont. Herbert G. Dunbar, supt., Three Forks, Mont.

Property: a group of claims, at Copper City, 7 miles north of Three Forks. Operations resumed Feb., 1916, shaft deepened to 400' and vein shown to dip at 45°. As shaft is in lead material from top down, the lode is said to be 200' wide. Sulphide copper ore appears at 325', or 25' above water level. Company planned extensive prospecting on 400' level.

The ore is somewhat bismuthiferous, assaying up to 20% copper, with small gold and silver values.

Equipment: includes steam power and an air compressor.

BUTTE DISTRICT**ALICE GOLD & SILVER MINING CO.****MONTANA**

Office: Salt Lake City, Utah. Former mine office was Butte, Silver Bow Co., Mont.

Officers: John D. Ryan, pres.; Wm. D. Thornton, v. p.; J. W. Allen, sec.-treas.; preceding officers, Arthur C. Carson and E. S. Ferry, directors.

Inc. May 16, 1880, in Utah. **Cap.**, \$10,000,000; shares \$25 par. Total dividends paid, from March 15, 1881, date of first, to March 15, 1888, date of last, were \$1,500,000. Control was purchased, 1906, by Butte Coalition

Mining Co. Stockholders voted, May, 1910, by a large majority, to sell the property to the Anaconda Copper Mining Co. at the ratio of 15 shares of Alice for 1 of Anaconda, and deed to property was given May 31, 1910, the company receiving in return 30,000 shares of Anaconda stock.

A suit by minority stockholders to set aside the sale, resulted in a decree annulling the sale and ordering a public resale, Nov. 10, 1915, no bid to be less than \$1,904,391. No bid being made, the sale was declared off, which under the decree confirmed the previous sale. The U. S. Circuit Court upheld this decree on Oct. 1, 1917.

Property: The Alice, Magna Charta, Curry, Valdemere, Rooney and many other claims on the Rainbow lode and its neighbors.

The mine had a 1,500' shaft, and was operated actively, 1880-1893, and intermittently thereafter. The mine was worked for its zinc ore in 1917, but closed down in October owing to scarcity of labor and because the Emma mine (Butte Copper & Zinc) could supply the demand for zinc ore.

Minority stockholders will appeal the case to the U. S. Supreme Court.

ALLIANCE COPPER CO.

MONTANA

Idle several years. **Mine office:** 3 Lewisohn Bldg., Butte, Silver Bow Co., Mont. Donald Campbell, pres.

Inc. May 19, 1906, in Montana. **Cap.**, \$400,000, fully issued, shares \$2 par. Statement of Dec. 31, 1914, gave debts of \$129.19.

Property: is very small acreage in the northeastern portion of the Butte district, with surface rights to sundry town lots.

Development: is by shaft, sunk jointly by the Alliance and Farrell companies, and a little ore of good grade was shipped, 1907, from the 200' level.

Stock listed on Butte Exchange.

ANACONDA COPPER MINING CO.

MONTANA

Office: 42 Broadway, New York City. **Mine office:** Hennessy Bldg., Butte, Mont. **Smelting works:** Anaconda, Mont., Great Falls, Mont., Tooele, Utah, and Miami, Ariz.

Officers: John D. Ryan, pres.; B. B. Thayer, v. p.; C. F. Kelley, v. p.; A. H. Melin, sec.-treas.; R. D. Cole, asst.-sec.; J. T. Roberts, gen. aud.; D. B. Hennessy, asst. treas. **Directors:** John D. Ryan, B. B. Thayer, George H. Church, Nicholas F. Brady, Wm. Rockefeller, C. F. Kelley, J. Horace Harding, Andrew J. Miller and H. H. Rogers.

Operating officials:

Mining Department

John Gillie, gen. mgr. of mines; B. H. Dunshee, asst. gen. mgr.; C. W. Goodale, chairman Safety First committee. W. B. Daly, gen. supt. of mines; John O'Neill, asst. gen. supt.; C. L. Berrien, asst. supt. The mine supts. are as follows:

Anaconda Group

Ed. Renouard, Badger State Mine.	Dan Cronin, Never Sweat Mine.
Jas. S. Egan, Montain Con. Mine.	Dan. P. Sullivan, Original Mine.
E. G. Kane, Bell-Diamond Mine.	Dan. Griffin, Steward Mine.
T. H. Oass, High Ore Mine.	W. H. Price, Moonlight Mine.
D. H. Crowley, St. Lawrence Mine.	Thos. McGrath, Gray Rock Mine
Wm. Nevin, Anaconda Mine.	John Andrew, Belmont Mine.
C. E. Calvert, Safety engr.	A. Barton, Asst. Safety engr.

Boston & Montana Group

John Varker, Mountain View Mine.	E. M. Norris, Tramway Mine.
Herbert R. Tunnell, Penn. Mine.	Geo. Bennett, Leonard Mine.
K. P. Krueger, West Colusa Mine.	John C. Gaul, Berkeley Mine.
G. E. Moulthrop, Tramway Mine.	Wm. McLain, Silver Bow Mine.
C. E. Calvert, Safety engr.	Jas. McQuay, Tropic Mine.

Zinc Group of Mines

J. J. Carrigan, gen. supt.	Jas. Brennan, Emma Mine.
Herbert Tonkin, Poulin Mine.	John Hewitt, Alice Mine.
J. F. Dugan, Nettie Mine.	M. Finnigan, Southern Cross Mine.
Wm. E. Kane, Lexington Mine.	John Berkin, Bonanza Mine.

Reduction Departments**Washoe Red'n Works, Anaconda**

Fred Laist, mgr.	W. M. Kelly, gen. smelter foreman.
L. V. Bender, gen. supt.	W. N. Tanner, chief engr.
H. S. Ware, asst. supt.	W. C. Capron, asst. chief engr.
L. E. Jones, supt. elec. dept.	A. E. Wigginn, concentration supt.

Boston & Montana Red'n Works, Great Falls

James O'Grady, mgr.	A. T. Elliott, gen. smelter foreman.
J. H. Klepinger, supt.	Edgar C. Maclay, chemist.
M. W. Krejci, asst. supt.	W. T. Burns, supt. elec. refinery.
E. S. Bardwell, metallurgist.	Dan'l Tracy, supt. furnace refinery.
W. H. Gunniss, mgr. brick dept.	Peter Thill, asst. chief engr.
	F. J. Brule, supt. surface dept.

International Smelting Co.

For Tooele, Utah, and Miami, Ariz., smelters, the East Chicago and Raritan refineries, see International Smelting Co.

Coal Dep't

F. W. C. Whyte, mgr., Anaconda.
 Thos. Snedden, supt. Diamond Coal & Coke Co., Diamondville, Wyo.
 Thos. Good, supt. A. C. M. Co., Coal Dep't., Washoe.
 C. A. Sederholm, supt. A. C. M. Co., Coal Dep't., Sand Coulee, Mont.

Lumber Dep't

Kenneth Ross, mgr., Missoula, Mont.
 M. M. Ross, supt., St. Regis.
 J. E. Totman, mill supt., Hamilton.

B. A. & P. Railway

H. A. Gallwey, mgr., Anaconda.	C. F. Murphy, supt.
C. H. Spengler, master mechanic.	C. A. Lemmon, chief engr.

Inc. June 18, 1895, in Montana, as successor of Anaconda Mining Co. Cap., \$150,000,000, shares \$50 par, 2,331,250 issued. Funded debt: \$16,000,000, 2-year 5% gold notes, due March 1, 1917, were paid off in cash at maturity. Company has a very broad charter, permitting it to acquire, mortgage, lease, assign and transfer the capital stock, bonds or securities of any other corporation. National City Bank, N. Y., transfer agt.; Bankers Trust Co., N. Y., registrar. Pogson, Peloubet & Co., auditors. Annual meeting, 3rd Wednesday in May at Anaconda. Stock listed New York, Boston, London.

Dividends paid quarterly; 13% in 1901, 4% in 1902, 1903, 1904; 11½% in 1905, 19½% in 1906, 26% in 1907, 8% in 1908 to 1911, inclusive; 9% in 1912, 12% in 1913, 10% in 1914, 6% in 1915, 14% in 1916, and 12% to Sept., 1917.

Assets total \$224,013,841, and excess of current assets over liabilities, \$39,810,110. Surplus at end was \$48,395,863.

Early in 1916 the following companies were organized under the laws of Delaware, the Anaconda owning 78% of the stock of the first named and all that of the other two companies:

Andes Copper Mining Co., cap., \$50,000,000; shares \$100 par; Andes Copper Co., cap., \$50,000,000; shares \$25 par; and Potrerillos Railway Co., cap., \$5,000,000; shares \$100 par. These companies are operating in Chile, and development so far shows 100,000,000 tons of 2¼% copper ore.

Anaconda's investments in sundry companies, not entirely owned, are valued at \$18,936,376. During 1916, \$7,968,836 was spent in purchasing 20,740 shares of Alice Gold & Silver Mining Co., making the holding 382,912 shares out of 400,000 issued; 26,100 shares of Greene Cananea Copper Co., making 56,900 held; 50,000 shares of Inspiration Consolidated Copper Co., making 200,000 held, and 188,300 shares of Butte Copper & Zinc Co.

Finances of the company are well diagnosed by W. R. Ingalls in the Engineering and Mining Journal of June 16, 1917:

Net earnings, 1905-1916, were: \$146,480,402, or \$62.83 per share, and divi-

dends paid \$35.29 per share, averaging \$2.94 annually. Earnings for 1916 were \$58,892,980, or \$25.26 per share; while those for 1917 are expected to be about \$26,000,000.

Gross Revenue: \$61,258,755 in 1913; \$51,533,659 in 1914; \$87,273,886 in 1915; \$150,540,688 in 1916.

Assets, Dec. 31, 1916, amounted to \$224,013,841, or \$96.90 per share of stock compared with \$75 in 1915.

Production—	Copper lbs.	Silver oz.	Gold oz.	Zinc lbs.
1917**	258,000,000	.....	.....	.....
1916	331,893,273	11,837,769	92,099	20,906,439
1915	254,311,574	9,005,618	106,702	.....
1914	223,720,292	8,314,116	99,651	.....
1913	270,303,644	10,321,296	64,898	.....
1912	294,474,161	11,014,737	61,314	.....
1911	259,407,092	9,731,561	48,950	.....
1910	266,608,461	9,534,888	57,260	.....

** 233,000,000 lbs. for 11 months, and December estimated.

Production and operating costs can be summarized as follows:

	Tons Ore Mined	Mining Costs p. t.	Reduction Costs	Trans- portation
1916	5,589,157	\$4.420	\$3.430*	\$
1915	4,383,339	3.930	2.440	0.235
1914	3,904,883	4.134	1.612	0.274
1913	4,651,445	4.124	1.679	.320
1912	4,579,957	3.912	1.749	.308
1911	3,848,673	3.766	1.820	.331

* Reduction and transportation not given separately.

Copper content in 1915 averaged 2%, and costs are estimated at 17c per lb. of metal sold.

Smelting operations of company are shown in the following table:

Smelteries						
Plant:	Ore Smelted tons	Copper lbs.	Silver oz.	Gold oz.	Lead tons	Zinc lbs.
Washoe..	5,193,573	287,082,079	10,624,727	81,393	.....	8,320,522
Great Falls..	813,496	44,811,194	1,213,022	10,706	.....	12,585,917
Tooele...	863,952	20,041,089	5,549,777	41,009	58,988	.....
Miami....	332,966	181,518,396	257,543	2,882	.....	.....
Total...	7,203,987	533,452,758	17,645,069	135,990	58,988	20,906,439

The zinc produced was from the electrolytic treatment of 196,680 tons of ore and concentrates, 54,456 tons being from other companies.

Of the 6,007,069 tons treated in Montana, 724,355 tons were from other companies. Precipitate amounting to 7,081 tons was also smelted.

Tonnage treated by the four plants in 1915 totaled 5,559,050, 320,352,417 lbs. copper, 14,165,773 oz. silver, 155,545 oz. gold, 56,501 tons lead, and no zinc save that from experimental work.

Production in 1917 was at the rate of 27,000,000 lbs. monthly, but after June, labor troubles curtailed this considerably, the works being closed for several weeks.

Refineries					
Plant:	Copper lbs.	Silver oz.	Gold oz.	Lead tons	Zinc lbs.
Washoe	.....	.....	.....	.....	8,320,522
Great Falls	127,620,000	1,213,022	10,706	.....	12,585,917
East Chicago	.....	4,468,775	20,580	54,100	.....
Raritan	462,666,262	18,606,866	167,024	.....	.....
Total	590,286,262	24,288,663	198,310	54,100	20,906,439

The East Chicago works also yielded 15,682,151 lbs. of antimonial-lead. The figures for the refineries duplicate to a large extent those of the smelters, the difference representing bullion that was refined for other smelters.

As company reports do not give details of operating costs, the actual cost of producing a pound of copper can only be calculated from the figures given, which gives an apparent cost of 10c per lb. of copper produced.

This cost was obtained by dividing 331,893,273 lbs. of copper into expenses of mining and depreciation, ore transport, treatment and depreciation, metal transport, refining and selling and administration, a total of \$52,266,097. But there is included in this the cost of reducing purchased ores, credits from gold, silver, and zinc. A mere study of the published figures cannot reveal the actual cost of producing copper, which is thought not to exceed 9c per pound.

In the first six months of 1917, the output was usually large, that of March being 31,300,000 lbs., and of May, 28,400,000 lbs. A disastrous fire in June lowered the output.

After June, operations were seriously curtailed by labor strikes and consequent shortage of workers, and greatly reduced production, culminating on August 25 in a complete shut down from that date to September 27. The production for the year, 1917, will not, therefore, be more than 70% of that of 1916.

The Anaconda properties for years produced 1/3 of the copper output of the United States, and 1/6 of the world's production. The splendid technical force and equipment of the company, and the excellent showing of its mines, indicated that it will maintain its pre-eminence for years to come.

Property: Company owns 1,168 acres mineral claims at Butte, including all the property formerly held by the following companies: (1) Boston & Mont. Cons. C. & S. Mng. Co.; (2) Butte & Boston Cons. Mng. Co.; (3) Red Metal Mng. Co.; (4) Washoe Copper Co.; (5) Parrot Silver & Copper Co.; (6) Alice Gold & Silver Mng. Co.; (7) Trenton (formerly Colorado) Mng. & Dev. Co.; (8) Big Blackfoot Lumber Co.; (9) Diamond Coal & Coke Co.; (10) Original Cons. Mng. Co.; (11) Colusa Parrot Mng. & Sm. Co. It acquired the International Smelting Co. in 1914, together with its subsidiaries, the Tooele Valley R. R., a lead refinery at East Chicago, the Raritan Copper Refinery. In 1915 it acquired the United Metals Selling Co., 150,000 shares Inspiration Copper, 30,800 shares Greene Cananea and 1,100 shares Mountain Trading Co. It owns the Southern Cross Gold Mines near Anaconda. In 1915 it bought the Alex Scott mine at Butte, and in 1916 the Pilot Butte mine, the latter purchase ending all existing apex litigation at the camp. Company owns 1,100,000 acres lumber land (Big Blackfoot Lumber Co.) and sawmills at Bonner and St. Regis, Mont., and 13,280 acres coal lands at Diamondville, Wyo.; Washoe, Belt and Sand Coulee, Mont. The Raven mine was bought Aug. 4, 1915, for \$65,000. Company has a 5-year lease on the Emma mine (Butte Copper & Zinc Co.) and owns 88,300 shares of the stock thereof, operated as a zinc producer and bought the Czarroma claim fraction, containing the continuation of the Emma vein for \$225,000 late in 1915. Company stopped work on the low-grade gold property, called the Porphyry Dike, near Rimini, Mont.

Options were secured on several placer claims in the S. W. part of Butte. The E. portion of the Alex Scott claim, and the Little Annie claim, were purchased for \$750,000.

The reduction plants at Great Falls and Anaconda, including the new zinc plant, are described later. The Anaconda plant produces fire and building brick and sulphuric acid, as well as copper, zinc, gold and silver, with a small amount of arsenic, and in the future probably bismuth. Through ownership of the International Smelting Co., the Anaconda owns the Tooele, Utah, and Miami, Ariz., smelters, the East Chicago and Raritan refineries (described under International Smelting Co.)

By the merger of the Anaconda and Boston & Montana, both among the six largest copper producers of the world, and the addition of a sum-

ber of other mines of second and third rank in productive capacity, the Anaconda became the largest copper company in the world, employing about 12,000 men, at high wages, and with a payroll in Butte alone of over \$1,000,000 monthly, with very large additional payrolls, at its works in Anaconda and Great Falls. Since the absorption of the other mines of Butte has practically eliminated property lines, so far as underground work is concerned, and workings have been so connected as to permit the most economic mining regardless of claim boundaries, the property can be most usefully described in sections called by the familiar names used under former ownership, or by the names of the 22 operating shafts of the company.

The mines of the company produced in 1916, 5,582,077 tons of ore and 7,081 tons of copper precipitate, compared with 4,376,556 tons ore and 6,783 tons precipitate in 1915. The 1917 output is much less, owing to labor strikes and the partial shut down of the mines.

The Anaconda mine was opened, 1880, as a silver producer, but at about 150' depth the oxidized silver ores were succeeded by high-grade copper ores, mainly chalcocite and bornite, while at depth there is a large amount of enargite. Net earnings of the mine, during the 15 years, 1880-1894, are unknown, but may be safely estimated at not less than \$50,000,000. At a depth of about 1,600' quartz pyrite veins of the Anaconda showed impoverished values, there being considerable pyrite, but the fault veins showed large ore-bodies at depths of 1,200' to the deepest levels yet reached in mining which is 3,400' in the High Ore mine. The various mines of the Anaconda have immense reserves of ore of all grades.

The Anaconda mine proper has a 3-compartment shaft, 2,800' deep, connected underground with the Never Sweat, St. Lawrence, Bell, Belmont and Moonlight mines. Considerable trouble has been had, at times, with gases, from the adjoining St. Lawrence mine, and the fire has crept from the St. Lawrence into several of the upper levels of the Anaconda. The mine has electric locomotives for tramping, installed 1907, on several levels. Hoisting is by 8-ton skips, swung under double-deck cages and worked in counter-balance.

The St. Lawrence mine has a 2,600' three-compartment main shaft, connected underground with the Anaconda, Never Sweat, Mountain View and Pennsylvania mines. The St. Lawrence has been on fire since 1889, in an extensive area above the 1,100' level. The fire has been fought constantly, and walled off by cement bulkheads wherever possible, but cannot be extinguished, and must be allowed to burn itself out, though it is possible to control its progress to a considerable extent. While the fire is troublesome, it does not result in the loss of copper, as the sintered ore remaining after the burning of the sulphur can be mined later, and the mine waters are strongly charged with copper, much of which is recovered by precipitation on surface where it is run over scrap iron and "cement" copper made. The hoist has 32"x72" cylinders, raising 5-ton skips swung under single-deck cages.

The Never Sweat mine has a 2,500' three-compartment main shaft. Square-set timbering is used in stoping, as well as back filling. Some trouble has been had with fire from the St. Lawrence. The surface plant includes a 28"x48" double drum Nordberg hoist, raising 3-ton skips swung under single-deck cages.

The Belmont mine, about 1 mile south of the main shaft of the Anaconda, and 375' lower, has a new 2,400' four-compartment working shaft, the largest in the district. Connections have been made with other mines and a 1,500-ton ore bin erected. Equipment includes a powerful new hoist, with capacity of 3,500', taken from the Corra mine.

The Diamond mine has a 3,400' three-compartment shaft, developing the Corra vein and other veins to the bottom level. Equipment includes a 34"x72" Risdon hoist, operating single-deck cages with 5-ton skips.

The High Ore mine is one of the deepest in Butte, having a 3,400' three-compartment shaft, producing high-grade chalcocite. The High Ore does

the pumping for a number of connecting mines of the Anaconda, handling all water from the Anaconda, Washoe and Parrot properties. The mine has 9 electric pumps, each good for 600 gals. per min., with 1,200' lift. These are located on the 1,200', 2,200' and 2,800' levels. Relief pumps to run by steam or air are also installed on different levels.

The Modoc mine has a 2,500' three-compartment shaft, connected with the 2,800' level of the High Ore mine. The Modoc has several veins besides the one of this name, its chief ore supply coming from the veins, which are stoped up to the North Butte Co.'s boundaries on the north and to the Ballaklava mine on the south.

The Mountain Chief mine, area 1.15 acres, lies next north of the Butte-Ballaklava, and is said to have produced about \$1,500,000 worth of ore from a shallow shaft. The Mountain Chief is developed to 500' by its own shaft, but its deeper levels are worked through the High Ore mine.

The Parrot group of properties includes the former holdings of the Parrot Silver & Copper Co., 19 fractional claims, area 40.6 acres, embracing the Parrot, Little Mina, Bellona, Original No. 6 and the Oro Butte, Champion and Copper Reef mines, and various other small properties. Main shaft of the Parrot mine is now used as an air shaft, and the ground is worked from the West Steward and Never Sweat shafts.

The Little Mina 1,200' shaft is now used for air only.

The Original, Steward and Gagnon shafts are on a western continuation of the Anaconda and Steward veins, and in 1912 a continuous ore shoot of good grade, over 2,700' long, was opened in the bottom level of these mines.

The Original mine has a 3,100' shaft with three compartments below 1,100'. The mine was located, 1864, in the first stampede to the new Silver Bow diggings and was the first mine patented in Butte.

The Steward mine has a 3,200' vertical shaft, showing, in the bottom workings, a 30' vein, carrying ore of good copper tenor, with fair silver values. Equipment includes a 120' steel headgear and a 34"x72" first-motion duplex hoist, good for 3,500'.

The Pilot mine, purchased for \$1,125,000 cash, in 1916, is now part of the Badger State mine.

The Gagnon old 2,800' three-compartment incline shaft, sunk at an angle of 74°, is now used as an auxiliary shaft, all ore being hoisted through the Original shaft. The new vertical 2,800' shaft, near the west end of the property, is as yet used for ventilation only. Equipment includes a 22"x48" Dickson hoist.

The Gagnon is the westernmost of the productive copper mines of Butte. Its ores have carried more silver than those of the mines farther east and have held a number of minerals, such as hübnerite, unusual elsewhere in the camp.

The Moonlight mine, once the principal producer of the Washoe Co., has ore averaging about 1 oz. silver for each unit of copper. The Moonlight has a 1,700' three-compartment shaft, connected underground, with the Blue Jay, Never Sweat and Anaconda.

The Poulin mine, formerly owned by the Washoe Co., has a 1,200' shaft, but is operated through the 1,500' Buffalo shaft, and is to be operated for zinc ore.

The Silver Bow No. 1 mine has a 1,000' shaft, connected with the Pennsylvania, Berkeley and No. 3 mines. It has been a good producer for many years.

The Berkeley 1,500' three-compartment shaft has a 28"x48" double drum Nordberg hoist, handling 3-ton skips in each compartment.

The Rarus mine has a 2,800' three-compartment shaft, connected with the Tramway mine. The veins have divergent branches, and constitute a sort of stockwork, with an ore zone up to 300' in width, in places.

The Tramway mine, lying between the Minnie Healy and Rarus, formerly owned one-third by Butte Coalition and two-thirds by Butte & Boston, has a new shaft that is being made the central shaft for the Minnie Healy-Rarus group. The Tramway shaft, 2,800' deep, has 3 compartments.

each 5'x4'x2" in the clear. The first of the new levels in the Minnie Healy is the thirteenth, about 50' below the old 1,500' level, in which fire was burning, 1908-1909. The Tramway has numerous bodies of ore, of 5 to 6% copper tenor, with good gold and silver values, the really great orebodies coming in between the 1,300' and 1,400' levels, and on the 1,700' level there is an orebody up to 75' in width, averaging nearly or quite 7% copper.

Equipment: at the Tramway mine includes a 92' steel headgear with 12' sheave wheels. A 34"x72" Allis-Chalmers 2-cylinder Corliss hoist, with 12' drums, using 1½" round wire cables, has capacity to raise 7-ton skips from a depth of 3,500'. Each compartment has 5-ton skips changeable to 4-deck cages, for lowering men, an auxiliary hoist being used for sinking and handling supplies through the third compartment. The main surface plant of the department, at the Tramway shaft, includes a boiler house, engine house, carpenter shop, machine shop, office buildings, warehouse and changing house with hot and cold water and shower baths.

The Nipper mine of the Red Metal group, includes the Nipper, Chief Joseph, Balm and L. E. R. claims. The Nipper mine, area 15.18 acres, has 2 shafts, of 1,000' and 1,200' depth, with 12 exits, being connected underground with the Parrot, Never Sweat and Little Mina mines, and has been operated to some extent through the Parrot shaft.

The Green Mountain mine has a 2,200' three-compartment shaft, not deepened for several years.

The Mountain Consolidated mine has a 2,500' three-compartment shaft, with a good ore showing on the 1,400' level and below, and an especially good showing on the bottom level, at 2,500'. The mine has a 28"x72" Union Iron Works hoist, operating 2 four-deck cages. The East Grey Rock shaft is used for ventilation only.

The West Grey Rock mine, producing ore carrying values mainly in gold and silver, with a small percentage of copper, has a 1,826' shaft, the 1,800' being the deepest level open in 1916. The veins, though small, carry good ore, rich in silver. The Corra shaft is kept open for ventilation.

Coal mines of the company in Montana produced 325,300 tons of coal, and those in Wyoming 638,821 tons. Of this, 282,417 tons were sold. The lumber department cut 105,495,846' in 1916, and bought 30,005,910'. Of the total, 80,800,144' were sold. Stocks amount to 50,971,698'.

The Leonard has an old 1,800' shaft, used for men and supplies, and the main, or No. 2, a new shaft of 4 compartments, 2,800' deep. Mine is timbered with 12x12" and 14x14" square sets, requiring monthly an average of about 1,000,000' of mine timber, board measure. The 2,000' level shows equally large and good orebodies. Water from the Mountain View, Pennsylvania, Tramway, East Colusa and West Colusa mines drains to the 1,300' level of the Leonard and is forced thence to surface by 4 electric pumps. Valves are of pot form, and the entire water end is phosphor-bronze, columns being lined with wood, thoroughly soaked in oil, to withstand the corrosive action of the mine waters.

The Leonard surface equipment is the show plant of Butte, and is very complete, including a 152' steel headgear and 2,000-ton ore bins. The power plant has ten 250-h. p. boilers, and a 34x72" Nordberg hoist, good for 3,500' depth, raising cages with 5-ton skips swung under, with 1½" round cable. There also is a 12x14" Risdon sinking engine. Plant includes 3 air compressors, of 3,000, 4,000 and 5,000 cu. ft. capacity per minute, respectively, and 2 of 7,500 cu. ft. each.

The West Colusa mine has a 2,200' three-compartment shaft, with levels 100' intervals to depth of 1,200', and thereafter at 200' intervals. Shaft was retimbered, early in 1910, and cut down to 3 compartments, being given false sets, to obviate squeezing, which caused much trouble in the past. Mine is timbered with 10x10" and 12x12" square sets, and shows vein matter up to 400' in width. Connection is had underground with the Mountain View and Leonard mines. Surface equipment includes a 23x60" Nordberg hoist, operating 2 double-deck cages, a tramway and a 28x48" Nordberg single drum auxiliary hoist.

The East Colusa mine has a 2,000' three-compartment shaft with levels opened at 100' intervals from 300' to 700'. The mine has a vein of about 65' width, formerly averaging 3 to 4% copper, but mine is now an important producer of zinc ore for the new electrolytic zinc plant. Production is about 200 tons daily.

The Pennsylvania mine has a 2,800' three-compartment shaft, with levels at 100' intervals from 100' to 1,000', and at 200' intervals below. This property has extensive stopes above the 600' level, ore lying nearer surface than in most of the Butte mines. Equipment includes a 350-gal. electric pump on the 1,800' level, forcing water to a crosscut to the Leonard mine, whence it goes to the precipitation plant. Surface equipment includes 2,000-ton ore bins, a 34x72" Allis hoist, operating 2 5-ton skips and a 28x48" single drum Nordberg hoist sinking engine.

The Badger State mine in the northwestern part of the camp, develops the Badger State, Jessie, Edith May, Emily and several other veins. Mine has a 2,800' four-compartment shaft with extensive orebodies opened up on the 1,100', 1,300', 1,400', 1,600', 2,000' and 2,200' levels. The Emily shaft, auxiliary to the Badger, was deepened from 400' to 917', or 1,000' level of the Badger and connection made in 1912. Property is now an important producer of copper-and-zinc ore.

The Mountain View mine has a 2,249' three-compartment shaft, and a 2,000' air shaft. The Mountain View shows 6 veins of 8' to 60' width, ore averaging nearly 5% in copper tenor, being among the richest mines in the camp. Equipment includes 4,500-ton ore bins, a hoist good for 3,000' depth, and a 28x48" single drum auxiliary hoist.

The Tropic shaft on one of the most easterly claims of the company is 900' deep and mine is now a producing property.

The Greenleaf mine, located east of the proven ore zone of Butte, has a 1,000' shaft, with about 800' of lateral workings. Work was suspended, July, 1908, but the property is by no means devoid of promise.

The Southern Cross mine, situated in the Georgetown district, west of Anaconda, purchased 1912, for \$370,800, is a gold property developed by a 500' shaft, equipped with electrical machinery. Is extensively worked because its oxidized ore is good iron flux.

Butte hill is a network of metalliferous veins, the older with nearly east and west strike being displaced by a number of northwest fault veins cut in turn by still later northeast fault veins and these all cut by the Rarus fault. The geology is fully described in Prof. Paper 74 of the U. S. Geol. Survey, which can be had free of charge from that bureau. The matter of clearly defining apex and extra-lateral rights, under the present Federal mining laws, is one of the greatest possible difficulty, and in the past had led to litigation costing millions of dollars, all of which ultimately had to be paid out of the profits from copper produced. In 1916 the mines now owned by the Anaconda were developed by 42.06 miles of new openings, of which 2,879' was shaft-sinking.

The mine waters are highly charged with copper, and precipitation tanks have been built at practically all of the big mines merged in the Anaconda. Old scrap iron, tin cans and wire rope are used as precipitating agents, these articles commanding a standard price of 1 ct. per pound. The flow of the water in the precipitation tanks and launders is much more rapid than is the case in the large Spanish lixiviation plants. The principal plant, at the Leonard mine, cost about \$20,000, and treats water from all of the Boston & Montana mines. It has a building for drying and shipping the copper precipitate.

The air-compression plant at the High Ore mine has 8 1,200-h. p. Nordberg air compressors, each with a capacity of 7,500 cu. ft. of free air per minute. The air is compressed to 90 lbs. and is used in the hoisting engines in place of steam. A building 300' long, contains 25 receivers, each 10x30' on the ground, for the compressed air, this air-storage plant having reserve power for 8 hours. In connection with this plant is the largest steel water-tank in the world, 100' in diameter.

Electric power, supplied by the Montana Power Co., is brought from Great Falls, 130 miles, and from Canyon Ferry, near Helena, 70 miles distant, current being wired to the mine with a primary voltage of 50,000 volts, reduced to 2,000 volts in a transformer station, just outside of Butte, power being distributed to the various workings from a main station at the Never Sweat mine, the current being used at 440 volts.

The Washoe Smelter: At present this plant can treat 16,000 tons of ore per day using 500 tons coke, 900 tons coal for reverberatory furnaces, 3,000 tons limestone flux and 260 tons coal for power and heating. Sixty million gals. of water are used each day and 42,000 gals. per minute. 3,200 men are employed at a monthly wage of \$400,000 in and around the works.

The accompanying illustration shows the course of the ore through the plant. From the storage bin the ore passes through an automatic sampler; thence to the concentrator plant of 2 great buildings, each housing 4 units comprising Black crushers, Harz jigs for coarse and Evans jigs for medium and fine concentrates, 4 sets of 55x24" rolls, 8 Wilfley tables using Butchart riffles, six 8' Anaconda classifiers, six 7½"x72" Hardinge mills, each with 225-h. p. motors and using steel linings and steel balls; 6 Dorr classifiers, 4 Mineral Separation flotation machines, each having 15 agitators and 14 spitzkasten with 150-h. p. motors.

No. 1 section differs from the other 7 in having Hancock instead of Evans jigs, and 8x12' tube mills using Forbes liners and pebbles.

The coarse concentrate goes to the blast furnace; the fine to settling tanks, the flotation concentrate to Dorr thickeners, 12x50', discharging 60% solids to Oliver filters.

The slime treatment is very fully described in the Mining World, Mar. 4, 1916, and in Transactions of A. I. M. E. for 1916.

There are 2 roaster divisions, one having Evans-Klepetko type of McDougal roasters, each handling 215 tons per day of fine concentrate, fine lime rock and first-class screenings. A Ruggles-Coles dryer prepares concentrate for the acid plant and for converter. Roaster No. 2 contains 28 Anaconda roasters, a modified Wedge-McDougal furnace and treats material from the Tank house and Oliver filter cake.

The reverberatory furnace plant is in 2 buildings, each with 4 furnaces and 5 boiler sets. Each furnace is 143x23' and handles 700 tons material per day when burning 100 tons coal in 24 hours. The coal previously ground in Raymond Bros. 5-roller pulverizer to 100 mesh, is blown into furnaces through Warford burners under 16 ounces pressure. Coal dust firing is much more efficient than grate firing and each furnace develops 6½ boiler h. p. per ton coal burned, hot gases passing through Sterling boilers. Furnaces are fed from top, banking concentrates against side walls. Slag flows off continuously instead of being intermittently skimmed and matte is tapped at intervals, running into 10-ton ladles trammed direct to converters.

The blast furnace building contains two 51' furnaces, and one 87' long, each 56" wide at tuyeres. The latter handles 3,000 tons per day, the others 1,600.

Converter building contains 7 stands for Great Falls type converters. Latter are 20' diam., 17' high and weigh 450,000 lbs. with magnesite brick lining. The charge for each converter is 85 tons matte, 35 tons ore, blown to blister copper in one converter. Blister copper is poured into 2 casting furnaces, each of 140 tons capacity, with one in reserve. Air at 15 lbs. pressure oxidizes copper which is then skimmed and poled and poured into a casting machine. All handling of material is done by electricity.

The Sand leaching plant, 2,000 tons capacity, recovers the copper from sands of the old tailings dump. These sands are roasted in McDougal furnaces, cooled in a rotating drum, wetted to lay dust and conveyed to tanks 50' in diam. and 14' deep, each holding 1,050 tons, where it is leached by hot solution of salt and sulphuric acid and copper precipitated from solution by scrap iron.

The arsenic plant treats flue dust in Howell White rotary furnace, the dust-laden gas going to a Cottrell electrical treater for removal of dust, then

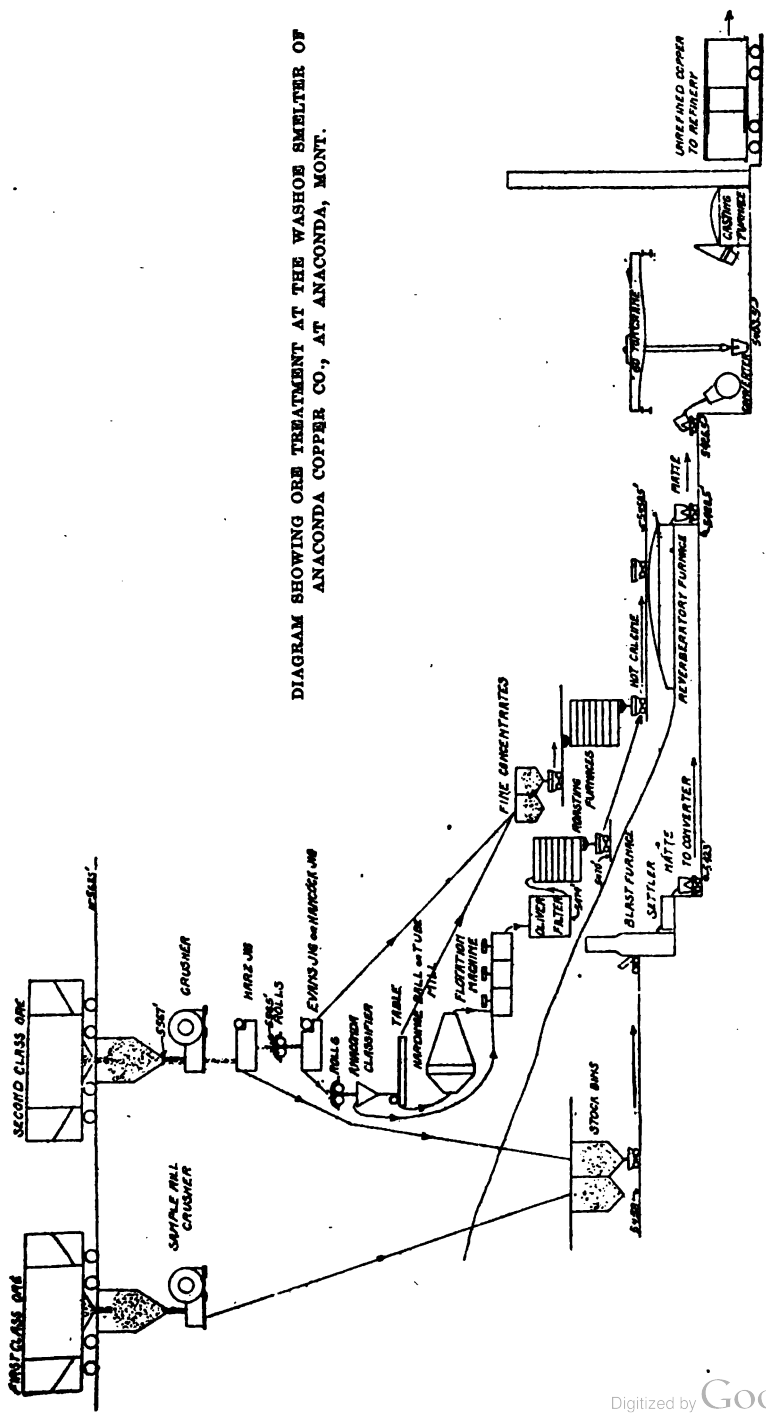


DIAGRAM SHOWING ORE TREATMENT AT THE WASHOE SMELTER OF ANACONDA COPPER CO., AT ANACONDA, MONT.

cooled and condensed arsenic trioxide removed by a second Cottrell treatment, the fine powder being discharged by a screw conveyor into barrels.

A brick plant making 11,000 standard fire brick per day and another making 15,000 building brick from retreated tailings is one of the newer features of the works.

The reverberatory costs have been reduced from \$1.75 to \$1.25 per ton of ore by coal firing and other changes in practice, as compared with \$1.35 per ton of charge for the blast furnaces, but so much limestone has to be used in the blast furnaces charge that the cost, per ton of copper ore, is higher.

It has been found that leaching produces cleaner tailings than flotation, though other factors equalize the 2 processes, since for leaching the roasting costs are 25c-30c, excavating 14c, hauling 8c, and other costs 33c, a total of 80c per ton, using 65 lbs. of 60% acid for 9 lbs. copper.

Leaching plant in 1916 treated 525,501 tons of tailing from the concentrator dump, yielding 3,648 tons of cement-copper. When more acid is available the capacity will be greater.

Full descriptions of the new plant and the technical treatment have been published in the *Trans. Am. Inst. M. E.* and in *Mining & Scientific Press*, Feb. 26, 1916, and *Mining World*, Mch. 4, 1916.

The acid plant produces 150 tons a day of 60% acid, but a much bigger plant will be built in the next few years to supply acid for the zinc plant and other uses. In March, 1916, the leaching plant and zinc plant used 75% of the acid output, the balance being sold.

The changes in the Great Falls plant have been equally important. The refinery has been enlarged 50% and now turns out about 200,000,000 lbs. of refined copper a year.

Probably the most important event of 1916 was the commencement of production on a large scale of high-grade electrolytic zinc. The 10-ton test plant showed such good results that a 2,000-ton concentrator, using flotation, was erected at Anaconda, and a refinery of 100-ton capacity of metal per day at Great Falls. Both company and custom ore is treated, the total last year being 196,680 tons, yielding 20,906,439 lbs. of zinc. The refinery is being increased to 150 tons of spelter daily. In two years plant improvements at all points cost \$13,645,908. Changes in practice are ably described by Frederick Laist in *Engineering and Mining Journal* of October 7, 1916.

The Washoe smelter, where all the Anaconda ore is now concentrated and most of it smelted, is about 2 miles from Anaconda and 26 miles from Butte, all ore being hauled by electric power over the Butte, Anaconda & Pacific R. R., owned by the company. In 1914-15 the entire plant was remodeled, the capacity increased to 15,600 tons per day, leaching and flotation plants installed, an acid plant erected, a zinc plant put in operation and brick works built, the improvements costing, it is said, over \$6,000,000. The results are so remarkable as to be almost startling. The great items of saving of the remodeled plant comprise coal dust firing of reverberatory furnaces with greatly increased capacity (583 compared with 239 tons per day) with less slag loss; the abandonment of briquetting and blast furnace smelting in favor of the new reverberatory practice; the treatment of all ore in the Anaconda concentrator, instead of sending it to Great Falls; the introduction of flotation and the operation of the leaching plant. The saving has been increased from 75% to 96%, the tailings formerly carrying 0.62% copper now carry but 0.1% copper—that is, 2 lbs. of copper to the ton. The savings amount to 8.4 lbs. copper per ton, and paid the entire cost of reconstruction in the first half year of operation. This work has put the Anaconda company in the ranks of low cost producers and is a great triumph for its metallurgists.

In November, 1917, it was announced that the company engineers expect to have the copper rod and wire manufacturing plant, under construction at the Boston & Montana works at Great Falls, Mont., in operation by May 1, 1918. W. A. Wood of New York, who designed the mill, announces that the installation of machinery would begin in January.

This will be the first rod and wire plant to be built in the west, and will mark the entrance of the Anaconda Co. into a new field, that of manufacturing.

The Chicago, Milwaukee & St. Paul system will require large quantities of wire and rods in connection with future electrification plans, as will other northwestern railroads, and to meet this demand was one of the reasons promoting the construction of the Great Falls plant, the manufacture of rods and wire at Great Falls obviating the expense incident to shipping refined copper products from eastern plants to northwest points.

With the proposed 25% increase in the capacity of the zinc reduction plant at Great Falls, which now is capable of producing around 7,000,000 pounds of spelter monthly, the proposition of establishing brass works at Great Falls is expected to be considered by the Anaconda, as freight charges east would cost the Anaconda no more than a brass product, which is made up of an alloy of copper and zinc.

This cost was obtained by dividing 331,893,273 lbs. of copper into expenses of mining and depreciation, ore transport, treatment and depreciation, metal transport, refining and selling and administration, a total of \$52,266,097. But there is included in this the cost of reducing purchased ores, credits from gold, silver, and zinc. A mere study of the published figures cannot reveal the actual cost of producing copper, which is thought not to exceed 9c per pound.

In the first 6 months of 1917, the output was unusually large, that of March being 31,300,000 lbs., and of May 28,400,000 lbs. A disastrous fire in June lowered the output and after that time operations were seriously curtailed by labor strikes and consequent shortage of miners, until on August 25th, matters culminated in a complete shut-down which lasted until Sept. 27th. The 1917 production will therefore not be more than 70% of that of 1916. September output was 2,800,000 lbs., compared with 11,175,000 lbs. in Aug.; October followed with 22,360,000 lbs., and 21,600,000 lbs. in November, with 25,000,000 lbs. expected in December.

The Anaconda properties for years produced one-third of the copper output of the United States and one-sixth of the world's production. The splendid technical force and equipment of the company and the excellent showing of its mines indicate that it will maintain its pre-eminence for years to come.

ATLANTIC MINES CO.

MONTANA

Company dissolved, May, 1916, and properties sold to Anaconda Copper Mining Co., Nov. 1, 1916. Fully described, Mines Handbook, Vol. XII.

BAMAR COPPER CO.

MONTANA

Idle. Mine office: 410 Daly Bank Bldg., Butte, Mont.

Mine office: 410 Daly Bank Bldg., Butte, Mont.

Officers: Dr. M. J. Scott, pres.; F. H. Butler, v. p.; J. B. Frisbee, sec.; M. A. R. Scott, treas.

Inc. Sept. 24, 1910, in Montana. Cap., \$1,500,000, shares \$1 par, non-assessable. Annual meeting, 1st Tuesday in June.

Lands: 12 claims, 230 acres, in the Summit Mountain district, near Buxton Switch, in the foothills of Fleeceer mountain, 13 miles southwest of Butte. Claims were bought of Butte & Buxton Copper Mining Co. for 150,000 shares of Bamar stock. Lands carry several veins, of which 1, of 50' estimated average width, opened on surface for 6,000', was mined 1890, by several shallow shafts, for silver-lead ores. Country rock is granite, markedly similar to that at Butte, covered by 1' to 8' of wash, with a mineralized zone of about one-half mile width carrying 4 veins, with a diorite dike to the northward. Shallow pits and trenches show continuity of the veins, which are leached at surface, carrying a little carbonate ore below commercial tenor.

Development: a 180' two-compartment Linda shaft, connecting with the 700' Linda tunnel, a total of about 1,000' of workings. The tunnel shows a ledge, carrying a mineralized 10' streak along the footwall showing mainly pyrite, with some argentiferous chalcopyrite and occasional carbonate

stains and a highly silicious gangue. Property has yielded ore carrying 1 to 36% copper and 43 oz. silver per ton, with up to \$2.50 gold, also galena assaying 11% lead, 24 oz. silver and \$1 gold per ton.

Equipment: includes a 40 h. p. boiler, 20 h. p. hoist good for 500', 2-drill air compressor and several mine buildings. Company plans deepening shaft, drifting and crosscutting.

BLUEBIRD COMPANY (THE)

MONTANA

Office: 706 Sears Bldg., Boston, Mass.

Officers: W. B. Dickerman, v. p.; Clarence W. McGuire, sec.-treas.; with F. M. Stone and H. K. McHarg, directors.

Inc. 1893, in New York. **Cap.**, \$500,000; shares \$5 par; 66,667 shares issued.

Property: 237 acres, in Butte, Mont., shows silver, copper and zinc ores. Company has never operated its property. See W. H. Weed, U. S. G. S. Prof. Paper 74 for geology, etc.

Reported Nov., 1917, that property had been bonded by the Lee Higginson interests to a syndicate which proposed immediate reopening of the mine.

BLUE VEIN COPPER MINING CO.

MONTANA

Office and mine: 17 Owsley Blk., Butte, Silver Bow Co., Mont.

Officers: F. L. Melcher, pres.; Lewis A. Smith, sec.; W. F. Noyes, treas.

Inc. June 21, 1906, in Montana. **Cap.**, \$1,000,000; shares \$1 par.

Property: 9 claims, patented, being the Little Boulder, Valentine, Bunker Hill, Blue Vein, Blue Vein No. 1, Myrahl, North Star No. 1, the Ozone and Columbia lode claims in the southern part of the Butte district. Idle since Nov., 1909.

BONANZA-BUTTE MINING CO.

MONTANA

Care: John Kenoffel, 111 S. Main St., Butte, Mont.

Inc. June, 1915, in Montana, with Chas. H. Lane, Wm. Youlden, J. J. McCarthy, H. H. Walrath, Wm. Meyer, John and Geo. E. Johnson, directors. **Cap.**, \$500,000; shares \$1 par. Mine is under lease and bond to a syndicate of Butte people, who have already made one substantial payment on the property.

Property: the Bonanza, Bonanza Extension, and Ruth claims, 4 miles north of Butte. The Bonanza vein is opened by a 55' shaft and 300' cross-cut tunnel. A new tunnel being driven, 166' lower than old tunnel, is now over 1,000' long and has exposed 5 different but parallel E.-W. tourmaline veins, showing stringers and spots of galena. This tunnel cut (Sept. 1917) the downward extension of the oreshoot exposed in the winze sunk below the upper tunnel. The shoot shows bunches of high-grade silver-lead ore, as fine grained and dense galena, with no copper. Selected samples carry quite high silver values, but average samples are too low-grade to work even for mill feed. The known ore-shoot is too low-grade to be profitably worked. The vein is in a granite area surrounded by rhyolitic rocks, near the B. & M. reservoir, on the road to Lowland Creek. The ore carries a little gray copper, but the bulk of the black material seen in it is tourmaline and not copper glance.

BOSTON-BUTTE COPPER & ZINC CO.

MONTANA

Hon. W. W. McDowell, pres., Butte, Mont.; W. E. Reynolds, sec.-treas.

Inc. 1913, in Montana. **Cap.**, \$1,000,000; shares \$1 par.

Property: 12 patented claims at Butte, adjoining the Anaconda Copper Mining Co. property on the N. E. and South. Idle and undeveloped.

BULLWHACKER COPPER CO.

MONTANA

Reorganized as Butte Bullwhacker Mng. Co., which see.

BUTTE-ALEX SCOTT COPPER CO.

MONTANA

Dissolved. **Property:** 4½ acres at Butte, Mont., sold to Anaconda Copper Mining Co., for \$750,000 cash, on Feb. 10, 1916. Stockholders received dividend of \$10 a share, and a further small dividend is expected. There were 79,311 shares outstanding and \$80,000 in the treasury. See Copper Handbook, Vol. XI.

BUTTE & BACORN MINING CO.**MONTANA**

Owned by Great Butte Copper Co., which see.

Office: 53 Silver Bow Block, Butte, Mont. **Pittsburgh office:** 331 Fourth Ave. Chas. Hyde, treas.

In June, 1916, company was reorganized and sold its property to the Great Butte C. Co., which company paid indebtedness and exchanged 400,000 shares of its stock in ratio of 4 to 1. Stock being distributed. See Vol. XII.

BUTTE-BALLAKLAVA COPPER CO.**MONTANA****Office:** 510 Sellwood Bldg., Duluth, Minn. **Mine office:** Butte, Mont.

Officers: Gust Carlson, pres.; I. Freimuth, v. p.; with J. G. Williams, M. W. Lee, F. J. Pulford, P. A. Lignell and J. C. Morrell, directors; C. J. Zachow, sec.-treas.; J. H. Manwaring, supt.

Inc. Mar. 15, 1907, in Arizona. **Cap.**, \$2,500,000, shares \$10 par; non-assessable; fully issued. Bond issue of \$200,000, 7%, dated Jan. 1, 1916, authorized with \$95,200 issued. Listed on Boston and Butte Stock Exchanges. Paid a 50c dividend Aug. 1, 1910. Boston Safe Deposit & Trust Co., transfer agt.; Federal Trust Co., Boston, registrar.

Interest on bonds due June 1, 1917, delayed because company had no money on hand. The directors have under consideration the reorganization of the company and taking in of a new property.

Property: the Burke and Ballaklava claims, about 6½ acres in eastern part of Anaconda hill, adjoining Mountain Chief, Modoc and High Ore mines of the Anaconda Copper Co. Property willed to Bishop Carroll of the Catholic Church, who sold it for \$400,000 cash to this company.

Claims form a narrow tract 1,860' long running with the veins on the northeastern slope of Butte hill. The Burke vein crosses the claim of that name and has been worked in the Modoc mine. There are 4 veins, but one of which is generally workable. This vein is generally correlated with the Jessie, but complex geologic conditions led to a lawsuit with the Anaconda Co. for ownership of the rich orebody mined on the 800' level. This suit was settled by a division of the orebody, Nov. 28, 1913.

Development: 1,625' three-compartment shaft with 12 levels. The mine has been connected on the 800' level, for ventilation and safety, with the Modoc mine of the Anaconda, and on the 1,200' level with the West Colusa. This crosscut is used for drainage.

The veins on the 100' and 300' levels show ore carrying 5 to 8.5% copper and 45 to 60 oz. silver per ton, from which small shipments were made. The 500' level shows pyrite and a little high-grade silver ore, and the 700' level shows stringers of massive bornite, pyrite, glance and some chalcopyrite, all argentiferous. Principal ore production has come from the 800 to 1,600' levels, inclusive, ore being mainly chalcocite, carrying good silver values. The vein ranges up to 34' in width, carrying rich ore on the 800' level; the 1,200' level shows the vein up to 20' in width, with ore averaging 4 to 4.5% copper, and the 1,400' level carries 9' of chalcocite and bornite of about 7.5% average copper tenor. This vein has been stope westward to the workings of the High Ore mine, whose stopes are continuous with those of the Butte-Ballaklava mine.

Development: by a drift from the High Ore mine, run by the Anaconda Co., opened up a fine body of commercial ore, but inability to reach it with its own shaft and a crowded capacity at the High Ore has retarded ore extraction. Above the 1,680' level the mine has been practically worked out and the proceeds used to pay off current debts without keeping up development work, with the result, that the company must now be content with a smaller production while new ore is opened up.

The 2,200' and 2,400' levels are worked from the Modoc shaft of the Anaconda Co., satisfactory arrangements having been made.

Early in 1916 a winze was sunk from the 1,600' to the 1,800' level and a crosscut run to the vein. It was reported that 24' of 3% copper ore had been found and drifting started.

Electric power is used throughout, an auxiliary steam plant being held in reserve for emergencies.

Equipment: includes a double-drum Lake Shore hoist, operated in counterbalance, driven by a 300-h. p. General Electric motor, designed to hoist an unbalanced lead of 5 tons, at a speed of 800' per minute, from a depth of 3,000'. There also are a 165-h. p. auxiliary double-drum hoist, good for 1,500', and a 10x12" auxiliary steam hoist, 2 Ingersoll-Rand air compressors, with cross-compound air cylinders, each driven by a 100-h. p. General Electric motor, and an electric station pump. The auxiliary steam plant includes a cooling tower for water.

Buildings include an engine house, office with warehouse on the ground floor, carpenter shop, smithy, and steam-heated changing house.

Production: begun April, 1910, was continued until stopped by injunction, granted the Anaconda Copper Co., in Aug., 1910. During this period shipments to the Pittsmtont smelter were about 125 tons daily, of ore assaying about 8% copper and 12 oz. silver per ton, this being the highest average grade of ore produced by any Butte mine for that year. Producing about 250 tons daily, 1916, mainly from 800', 1,000', 1,200' and 1,600' levels.

Company has had a checkered career, being successful at first, then involved in bitter litigation with the Anaconda C. M. Co., which was finally compromised; succeeded by operations which paid expenses until stopped by the big fire in the Modoc-High Ore mines in 1917.

BUTTE BULLWHACKER MINING CO.

MONTANA

John E. Corette, sec.-treas., Hennessy Blk., Butte, Mont.; Wm. F. Love, pres.; Henry Meloy, v. p.; G. A. Lauzier and P. W. Clark, directors.

Inc. Oct. 24, 1914, in Washington. Cap., \$1,000,000, \$1 par; assessable; all issued. Annual meeting 2nd Monday in Jan., at Butte. Security Transfer & Registrar Co., New York, transfer agents and registrar. Listed on New York Curb. Dividend of 1c per share declared payable, Oct. 25, 1917.

Property leased for one year to East Side Mining Co., inc. by I. A. Heilbronner and Patrick Wall, April, 1916. Lease calls for royalty of 25% and shipments of not less than 1,000 tons a month. Controlling stockholders also gave an option on 51% of entire stock at 50c a share, payments in 30 and 90 days and at intervals for 18 months.

Company is a reorganization of the Bullwhacker Copper Co., whose stockholders received share for share in the new company on payment of 15c a share in six months' installments. This wiped out a debt of \$121,200 due the sons of Patrick Clark (Clark Bros. & Klein) and put \$20,000 in the treasury. Mine was profitable when leased, but ran into debt for an experimental leaching plant. The Mines Operating Co. secured control by buying three-fifths of East Side stock at 75c per share.

Property: one claim, 30 acres, on the east side of the Butte district, near the Pittsmtont smelter. Easterly part of claim covers a zone of granite impregnated with oxidized copper ores, mined in an enormous open pit 275' across and 75' deep, from which 30,000 tons of 4.07% copper ore were extracted by lessees in 1912-13. It is a highly siliceous ore.

Development: by an old 300' shaft with crosscuts beneath the orebody at that level, also several new shafts, proving an extension of the orebody beyond the open pit.

Equipment: includes hoist, compressor plant and a 75-ton leaching plant, which as yet has not been successfully operated (described in detail by P. E. Peterson in Mining & Engineering World, Oct. 4, 1913, p. 584).

The orebody is extensive and, though probably not deep, has a large tonnage from which much money should be made. Deep development is expected to show veins carrying sulphide copper ore.

BUTTE CENTRAL COPPER CO.

MONTANA

Austin M. Pinkham, trustee in bankruptcy, 27 State St., Boston, Mass. Holdings sold to Wm. G. Burns and transferred to Butte Central Mng. & Mfg. Co., the operating company for the Butte-Detroit Copper & Zinc Mng. Co., which see. Company was a raw promotion, fully described Vol. XI, Copper Handbook. Judgment of \$50,000 in favor of D. W. Strong, Butte, Mont., had not been satisfied on July 16, 1917, as there was an appeal from the District Court, and case is pending in the Supreme Court.

BUTTE CENTRAL MINING & MILLING CO. MONTANA

See Butte Central Copper Co. and Butte Detroit Copper & Zinc Mining Co.

BUTTE-CONCORDIA MINING CO. MONTANA

Inc. Sept. 8, 1915, in Montana. Cap., \$50,000; shares 25 cts. Directors: G. F. Pitman, G. W. Deniger, G. Widmer, S. V. Wilking, 615 Phoenix Bldg., Butte, Mont. E. C. Schwardner, O. J. Olson, Geo. W. Wall, F. A. Kean and Alfred Pearson, all of Butte, Mont.

No further details obtainable.

BUTTE COPPER CO. MONTANA

Address: care James H. Rowe, pres., 120 West Granite St., Butte, Mont. E. T. Lawlor, v. p., Brookline, Mass.; W. M. Hanson, sec.; preceding officers, R. L. Rhule and B. J. Keenan, M.D., directors.

Inc. March 20, 1906, in Montana. Cap., \$1,500,000; shares \$1.50 par; fully paid and non-assessable.

Company owns two-thirds interest in the Robert Emmet claim Nos. 1 and 2; the remaining third being owned by the Anaconda Mining Co. Company also owns approximately one-half of the Anselmo, Anselmo No. 2 and Trifle claims, balance being owned by the Hauswirth family. Property lies directly west of the Gagnon mine and is supposed to carry the extension of the rich veins mined in that property. The group has produced about \$700,000 worth of gold and silver ore, the principal development being the 700' Tsifle shaft in which a large vein carrying copper ore was cut at a depth of 375'. The Robert Emmet shaft, 375' deep, is reported to show 7% copper ore.

The company has been dormant for several years and its relations to the Butte Copper Mining Co. and Butte Copper Montana are not fully understood, though the latter company is supposed to control this one through stock ownership. The president reports, May, 1917, that the property is under lease and bond to Eastern interests who are now operating and developing the ground through the Trifle shaft.

BUTTE COPPER CZAR MINING CO. MONTANA

Address: Butte, Mont. C. F. Murphy, pres.; R. M. Green, mgr. Cap., \$300,000.

Property: in the Butte district, developed by 300' tunnel reported to have cut the main vein at 100' depth, containing 4' of 1-6% copper ore.

Equipment: includes hoist and air compressors.

Management plans sinking 300' two compartment shaft and installing leaching plant, 1917-18. Property reported on by Arthur V. Corry.

BUTTE COPPER KING MINING CO. MONTANA

Address: care Beebe Grain Co., Butte, Mont. C. E. Beebe, pres.; A. P. Henningsen, sec.

Inc. April 19, 1906, in Montana. Cap., \$1,500,000; shares \$1.50 par.

Property: 3 fractional claims, 28 acres, known as the Frenchman No. 2, Rare Steak and Missouri Girl, west of the Jennie Dell mine. Idle sifice organization.

BUTTE COPPER & ZINC CO. MONTANA

Office: 61 Broadway, New York. Mine at Butte, Mont. Control of company is vested for a period of 5 years in the following trustees: A. J. Seligman, Albert Fries, J. Oppenheim. Additional directors, Chas. Wimpfheimer, A. S. Bailey and I. N. Spiegelberg.

Inc. 1904, in Maine. Cap., \$2,500,000; shares \$5 par; 411,700 outstanding; fully paid and non-assessable. Shares listed on New York Curb.

Property: known as the Emma mine, about 16 acres, is in the Butte district, 1½ miles from the main properties of the Anaconda Copper Mng. Co. Mine was formerly developed to 800' level, but due to low copper and relatively high zinc content of the ore, was idle for several years. Development resumed by Anaconda C. M. Co. by virtue of an option and lease, dated July 8, 1915, given to that company. Terms of lease are as follows: the Anaconda Co. acquired an option for 9 months on all or part of the 88,300 shares of Butte Copper & Zinc Co. stock remaining in the treasury

of the latter company, at a price of \$1 per share. The A. C. M. Co. takes a lease on the Emma mine for 5 years with privilege of renewal for an additional 5 years, and agrees to install equipment and to unwater mine to the 800' level. For expenditures actually made by the A. C. M. Co. in developing the Emma mine, the Butte Copper & Zinc Co. agrees to make payment in its capital stock in lots of 10,000 shares or fractional parts thereof, but total payment to the A. C. M. Co. for work and equipment shall in no case exceed 50,000 shares of Butte C. & Z. Co. stock. The A. C. M. Co. shall have a right to abandon the leased premises if it finds working them impractical, or impossible, in which event all machinery or equipment installed and permanently attached to the Butte property shall belong to that company. Any profits arising from sale of the output of the leased property shall be divided equally between the two companies. Further stipulations are provided in the event of a renewal of the lease.

The A. C. M. Co. has fulfilled the terms of this lease and taken up the shares optioned to April, 1916. An additional option which expired July, 1916, on 100,000 shares, has also been exercised.

Development: aggregates several thousand feet from a 1,000' shaft with levels at 200', 400', 500', 800' and 1,000'. The vein for a width of 21' on the 200' level is said to show 11% zinc ore containing fair values in gold, silver and lead. The 400' level has nearly 1,000' of workings, and a strike of 10' of 18% zinc ore reported, Oct., 1917. There is a 150' crosscut on the 523' level which does not reach the vein. The so-called 800'-level (720' deep) has 795' of work with 465' in ore. The vein is 125' wide and is said to show a 20' width of 18% zinc ore. Two bands of ore were developed by drifting, an 8' band at 60' from the footwall with 185' of drifting, said to show an average of 22% zinc, 8% lead, \$2.20 gold and 12 oz. silver. The 1,600' level, which is being developed through workings of an adjacent property cut early in May, 1917, a body of ore 8' wide, assaying 29% zinc, 12% lead and 23 oz. silver, at a place several hundred feet from where the main vein should be. This orebody is supposed to be a spur from the Emma orebody on the 1,200' level. Up to May 1, 30,000 tons of ore averaging about 16% zinc, 6% lead, 7 oz. silver, had been shipped.

With the completion of a crosscut to the Gagnon 1,800' level and development of the Emma in depth, there is reason to believe it will be a great zinc producer.

The mine now supplies the Anaconda Co. with the bulk of the ore needed by its zinc department.

BUTTE-CURTIS & MAJORS COPPER MINING CO. MONTANA

Idle. Address: Geo. D. Curtis, 35 W. Granite St., Butte, Mont.

Company organized upon a lease and bond to purchase the surface and mineral rights of the Curtis and Majors addition to the City of Butte, the bond price being \$125,000. The company went bankrupt and still owes about \$700 labor claims. There are no legal assets and having defaulted on bond payment past due, the company has no rights thereunder, save the sentimental courtesy extended by John Curtis and associates who would like to see the company rehabilitated and refinanced.

BUTTE DETROIT COPPER & ZINC MINING CO. MONTANA

Office: Dime Bank Bldg., Detroit, Mich. Is a promotion of Davison Co., 27 State St., Boston, Mass.

Officers: J. F. Austin, pres., Detroit; Louis A. Codorette, sec., Montreal; J. S. Pishon, treas., Boston; W. L. Creden, managing director, Butte, Mont.; other directors. Col. Sir Henry M. Pellatt, Toronto, Can.; Ellery C. Wright, Brockton, Mass.; Walter Coulson, Lawrence, Mass.; Jos. Renihan, of Grand Rapids, Mich.; J. E. Simpson, and Chas. A. Wilcox. Federal Trust Co., Boston, transfer agent; State Street Trust Co., registrar.

Inc. March 7, 1916, in Delaware. Cap., \$2,500,000; shares \$1 par; with 900,000 shares paid for stock control of the Butte Central M. & M. Co. This stock control, amount not stated, is the only holding of the company. As the Butte Central has a bond issue of \$300,000 outstanding as a prior lien secured by a mortgage filed in 1914 for this amount covering all

minerals, mill and surface in the entirety, of the Ophir property, besides an unsatisfied judgment of \$50,000, it is easy to see that this one claim must develop ore in large amount and great value to pay off the bonded debt and be worthy of the 900,000 shares of stock paid for control. Should the mine make good, the Butte Central M. & M. Co.'s bonds being convertible will be changed to stock, and if Butte Detroit owned all the remaining stock of its subsidiary, the Butte Central, it would get but 60% of this theoretical profit. In other words, if the Ophir mine should be lucky enough to make the extraordinary profit of \$1,000,000 a year, the owner of a share of stock in the Butte Detroit Co. would get 24 cents.

The subsidiary or operating company is known as the **Butte Central Mining & Milling Co.** W. R. Macdonald, pres., 50 Congress St., Boston, Mass.; W. G. Burns, v. p. and sec.; R. H. Gallagher, treas., 96 Franklin St., Alliston, Mass.; W. L. Creden, mgr., Butte, Mont.

Inc. Aug. 11, 1914, in Delaware. Cap., \$750,000; shares \$5 par; \$450,000 issued, balance held for conversion of \$300,000 bond issue, all outstanding.

Property: the Ophir claim, 20 acres in Butte, Mont., formerly owned and developed by the Butte Central Copper Co., a rank promotion in which nearly \$700,000 was obtained from the public by near-fraud methods. Possibly one-half of this amount was spent on the property, the mill being financed by separate funds derived from a bond issue.

The Ophir lode is a big quartz and replacement vein, carrying fair silver values for several hundred feet below the surface and irregular, bunched bodies of impure zinc and lead ore at greater depth. Some 40,000 tons of siliceous silver ore said to average \$7 per ton are reported to exist in the upper levels.

Development: by a 3-compartment shaft 1,065' deep on the Ophir with levels at 100', 200', 300' and 500', upon all of which mining has been done and on each of which considerable ore is now blocked out. Company plans to sink shaft to a depth of 2,500'; a station hoist will be put in at 1,500', and later a new surface hoist will be installed. The company expects zinc as well as copper, as a body of zinc ore running 14% was encountered on the 500' level of the mine. The owners of the mine hope the Ophir may repeat the performance of the Butte & Superior and the Emma, which latter property is distinctly a zinc mine, located a short distance north of the Ophir, and being developed by the Anaconda company. There are said to be several known veins in the 20 acres of the Ophir claim, including the two main veins known as the north and south veins, and a cross-fissure vein called the Blue vein. The mine is said to have about 3½ miles of workings; on the 300' level two parallel veins have been opened for a combined distance of 1,100', and on the 500' level for 700'. Drifting has started on the 1,000' level to the Ophir vein.

Equipment: mine has full equipment, including 200-ton mill, a hoist good for 2,000' depth, a 330-h. p. steam plant and a seven-drill Rand air-compressor. There are seven buildings, including engine house, carpenter shop, smithy and office.

The concentrating mill, designed to treat 200 tons zinc ore daily by water concentration and oil flotation, has been altered to handle manganese ore exclusively. Mineral Separation process is used. A Sullen gyratory crusher and tube mills are used for crushing. Mill treating ore from Davis Daly Copper Co. and other custom ore.

The manager, W. L. Creden, whose experience and reputation ensure confidence, has unwatered the mine and will sink the shaft to the 2,500' level where the full extent of the ground will be explored in hopes of finding large orebodies near the Rarus fault or in the veins cut by it.

The manganese ore treated in the mill comes from various sources, the heads averaging 25% manganese; the concentrate carries 46.2 to 48% manganese with 10% silica. Extraction is about 80%. Concentrate is to be briquetted. Product is handled by Rogers, Brown & Co., New York.

BUTTE-DULUTH MINING CO.

MONTANA

Chas. M. Everett, receiver, Lewisohn Block, Butte, Mont. Mine at

Butte, Mont. Capt. A. B. Wolvin, pres.; C. M. Everett, sec.-treas.; Meyer Genzberger, Al Green, John W. Neukom, directors.

The property is under lease to Mines Operating Co., of Butte, controlled by Alfred Frank and associates, for 5 years, and has been in active operation since July, 1917.

Inc. in Minnesota. **Cap.**, \$2,500,000; shares \$10 par; 200,000 issued, balance held for redemption of \$500,000 bond issue, on which interest is overdue since Dec., 1914, and sinking fund provision not fulfilled. Company went into receiver's hands on friendly suit, March 16, 1915. Receiver's report shows \$42,368 liens ahead of bonds and a floating debt of about \$190,833 unsecured. The prior lien is mostly for labor certificates (\$39,000) issued in half payment of wages in 1914. Bankruptcy proceedings instituted in March, 1915, were set aside by the Federal Court, Sept. 29, 1915.

In May, 1916, the Court ordered the company's personal property at the mine sold to satisfy labor liens, and the receiver petitioned the court for authority to sell the entire property to satisfy bondholders and other creditors.

Property: Brundy group, at the base of the mountains east of Butte, includes the Macarona, Montgomery and portions of the Altona, Colleen Bawn and Amazon claims. These claims aggregate 67 acres and are crossed by the Columbia Gardens street car line and adjoin the Pittsmonth mine on the southeast.

The ore thus far mined has come from open-cut work on the hillside back of the mill. This ore is an altered granite stained green and impregnated with silicate of copper with carbonate and oxide of copper in nests and bunches. As mined in the cut it has carried a little over 1.5% copper and with a mechanical loader can, it is said, be put in the mill for 15c a ton.

Development: underground is mainly on the Montgomery claim on which there is a tunnel 1,200' long and a 200' shaft, the latter with extensive workings at 100'. The main ore body on Altona hill, to the east of the street car line, has several tunnels, proving the downward extension of the ore on the property.

Equipment: is electrical throughout and includes a 75-h. p. Nordberg hoist and 750-cu. ft. Nordberg compressor at the Montgomery shaft.

The Butte-Duluth mill is fully described by C. F. Sherwood in the Salt Lake Mining Review, Nov. 30, 1915. Its total cost was \$725,000.

The property has merit, and aside from its leachable ores has a decided prospective value in the veins at depths of 1,000' below the surface.

In bankruptcy proceedings the former superintendent, Mr. Sherwood, said the mill ran on ore averaging 1.52% copper for 4 months before it was shut down, and that drill cores to a depth of 202' from the bottom of a 23' pit ran 0.98% to 2.70% copper. With acid at \$12.50 per ton, a saving of 38c per ton could be made in leaching costs.

Production in Feb., 1915, 120,000 lbs. electrolytic copper, 30,000 lbs. cement copper.

BUTTE EXEMPTION COPPER CO.

MONTANA

Idle. P. O. Box 143, Butte, Mont.

Inc. May 20, 1906, in Maine. **Cap.**, \$2,500,000; \$1 par; supposedly reduced to \$100,000 in 1913. Owned by Spokane capitalists, who sold control to parties represented by Chas. Mattison, attorney, Butte, Mont., the representative of the North Butte Copper Co.

Company owns Colleen Bawn, Canyon, Exemption and Mountain Spruce claims on hillside above Bullwhacker and Butte-Duluth properties and crossed by Horse Canyon and street railway to Columbia Gardens, Butte, Mont.

BUTTE & GREAT FALLS MINING CO.

MONTANA

Address: Box 1393, Butte, Mont.

Officers: E. Bryant Crump, Bloomington, Ill., pres.; R. M. Green, Butte, v. p. and gen. mgr.; Allen Pierce, sec.-treas.; preceding officers, Ira N. Honnold, L. G. Diehl, J. Cohan, Wm. Richardson, J. W. Beckwith, Louis Lauritson, R. M. Sutherland, J. P. Mondloch, Walter A. Kinney and C. F. Murphy, directors.

Inc. Nov. 28, 1911, in Mont. Cap., \$500,000; shares \$1 par; assessable; \$400,000 outstanding; \$32,000 was expended on development work during 1914-15. In Dec., 1916, an assessment of 5c per share was made.

Property: closed down and hoist sold, Sept., 1917. Was developing the Genevieve group of 8 claims, patented, 134 acres, in the Lost Child mining district, $3\frac{1}{2}$ miles N. E. of the Butte & Superior property, Butte, Mont. Claims show Butte monzonite cut by aplite and traversed by wide, rusty veins carrying tourmaline and occasional specks of chalcopyrite. The Genevieve vein runs S. W.-N. E., with dip of 35° and reported width of 30'. It is mainly decomposed granite with clay and quartz streaks and one 3' band of quartz and tourmaline carrying occasional sulphides. Has a $1\frac{1}{2}$ compartment shaft, 500' deep. The Genevieve is said to have a good showing in a 2' vein on 200' level, but average of assays is small. The Silver King claim has a 200' tunnel. Property reported on by Paul Billingsley, Jesse Cohan & Peterson, 1914.

Equipment; includes electric hoist, good for 1,500', pump, 10-drill compressor, mine buildings and dwellings.

Property regarded as a prospect of doubtful merit.

BUTTE HERCULES MINING CO.

MONTANA

Address: Geo. de Snell, sec., No. 1 North Montana St., Butte, Mont. Stock listed and quoted at 1c a share on Butte Public Stock Exchange. Is a dormant corporation, fathered by Passmore & Co. of 25 W. Granite St., Butte.

Owns 4 patented claims in the zinc-silver area on the western edge of the Butte district, near Rocker.

BUTTE HILL COPPER MINING CO.

MONTANA

Address: Harry A. Frank, sec., Daily Bank Bldg., Butte, Mont.

Officers: Maurice Eisenberg, pres., 61 Broadway, New York City; J. W. Murphy, v. p.; preceding officers, J. W. Murphy, Duncan MacRae, W. P. Cary, W. H. Hall, Thos. Driscoll and John S. Davies, directors.

Inc. April 18, 1906, in Montana. Cap., \$5,000,000; shares \$5 par; \$2,950,000 issued. Annual meeting, fourth Saturday in January.

Property: 11 claims, 173 acres, in an undeveloped district in granite area, north of Walkerville. Has a 200' shaft, cutting a vein of 40' estimated width, showing stringers and bunches of ore assaying up to 4% copper and 19 oz. silver per ton. Has not been worked for several years and power plant is dismantled. Property is well located, has strong veins and is much nearer developed ground than it was when operating.

BUTTE LODE EXTENSION MINING CO.

MONTANA

Idle. Address: care C. J. Kelly, treas., 805 W. Broadway, Butte, Mont.

Officers: Chas. S. Warren, v. p.; John M. Murphy, sec.

Inc. April 28, 1906, in Mont. Cap., \$500,000; shares \$1 par.

Property: 4 claims, known as the St. Angus group, 12 miles N. E. of Butte, has a 150' shaft with a crosscut showing 2 veins.

BUTTE & LONDON COPPER DEVELOPMENT CO.

MONTANA

Office: 46 East Broadway, Butte, Silver Bow Co., Mont.

Officers: W. W. McDowell, pres.; John D. Haines, v. p.; W. E. Reynolds, sec.; E. S. Passmore, treas.; preceding officers, Fred Whiteside, Guy W. Stapleton, H. B. Byrne, W. S. Cairns, J. A. Sheldon and Maurice Eisenberg, directors.

Inc. Jan. 1906, in Arizona, as Butte & London Copper Co. Cap., \$5,000,000; shares \$5 par; non-assessable; \$4,973,990 outstanding. Annual meeting, third Tuesday in January.

Property: 113 acres, known as the Greendale placer claims, lying immediately north of the Pittsburgh & Montana in the valley of Silver Bow Creek, east of Butte. Property claimed by the management to carry the possible extension of the Rainbow lode. Forty acres of the property is said to be valuable for townsite purposes.

Development: 1,350' three-compartment shaft, 2 crosscuts on the 1,100' level cutting 9 veins, none carrying ore of commercial value, except a streak that gave assays of 2% copper, 50 oz. silver, and \$2 gold, per ton.

The company agreed Dec. 24, 1912, to accept a contract with Thos. F. Cole, for the transfer of all its property to a new company, the Greendale Exploration Co., with a capitalization of \$200,000, to be organized by him. The terms of the contract provide that in consideration of sinking the shaft to 1,600' level, running crosscuts north and south 2,500' the entire width of the property, and doing other stipulated development work, Mr. Cole is to receive 51% of the stock of the new company, one-half to be paid as the work progresses, the balance remaining in escrow until the work is finished. Mr. Cole spent \$300,000 on this development, and contract was completed. Failing to find shipping ore in commercial quantities the property was closed down.

BUTTE MAIN RANGE COPPER MINING CO. MONTANA

See Tuolumne Copper Co., which controls and operates the Butte Main Range property.

BUTTE-MILWAUKEE COPPER CO. MONTANA

Assets sold 1914 to Butte & New York Mng. Co. a Butte & Superior subsidiary, for \$500,000. Stockholders were obliged to exchange their stock at the rate of 2½ old for 1 new share, or 30c cash per share. Company paid a liquidating dividend of \$0.3278 per share in July, 1914, and is now in course of liquidation. Fully described under Butte & New York Mining Co.

BUTTE MINE EXPLORATION CO. MONTANA

Officers: Clinton C. Clark, pres., 408 West Granite St., Butte, Mont.; C. P. Connolly, sec., at last accounts.

Inc. 1901. Cap., \$250,000; shares \$1 par.

Is no relation to the company of same title formerly holding the Six O'Clock property, in Butte, or to the Butte Mines Exploration Co., formerly having property at Tecoma, Box Elder Co., Utah. Property is the Pacific quartz lode claim, on which considerable work was done, 1901-02. Company practically defunct, but property reported under option to the North Butte Mng. Co.

BUTTE-MINNESOTA MINING CO. MONTANA

Officers: Peter E. Peterson, pres.; Angus McLeod, Butte, Mont., William Vuoti, J. E. Porthan, A. W. Havela, John Kukko, Emmanuel Autio, John Lampi, Ade Herranen, directors. Mines near Butte and Helena.

Inc. June, 1912. Cap., \$750,000; shares \$1 par.

Owns 6 claims, about 1 mile south of Rocker, at the western end of the Butte district. Ground shows well-defined veins, 1 of which is traceable for 3,000' across the surface. The country rock is granite and part of the same mass as that in which the mines of Butte occur.

Development: 400' tunnel on the vein and an incline shaft 35' deep sunk on the vein disclosing well-defined walls, 6' apart, from which ore has been taken carrying 0.5% copper, 8% lead, 12 oz. silver, and \$28 gold, per ton. The property is equipped with a gallows frame, boilers and hoist.

Late in June, 1913, the company bought a group of mining claims in the Wolf Creek district, 40 miles east of Helena, Mont. Reports state that development on these claims shows more than 100,000 tons of ore assaying 4 to 25% copper blocked out. A mill was to be built, but company has not reported any recent work.

BUTTE MONITOR TUNNEL MINING CO. MONTANA

Idle. Address: care C. J. Kelly, Daly Bank & Trust Co., Butte, Mont.

Inc. in Montana. Cap., \$3,750,000; shares \$1 par; 1,013,000 in treasury; 2,736,500 issued.

Lands: 8 claims, the Monitor, Sunlight East, Fraction, Alta, Emporium, Ironside No. 1 East and Burner patented claims in the eastern section of the Butte district. The usual Butte monzonite is cut by a great quartz porphyry dike on this group; the veins run E.-W. and are of the quartz vein type with wall alteration.

Development: by the 1,412' Monitor tunnel, which passes for 445' through other property. In the Sunlight claim 2 veins, the No. One, 5', and No. Two, 4' wide, are cut; the 4' Sunlight discovery vein is cut 250'

beyond. A winze on the vein at 700' from the portal showed 12' of ledge matter, and according to John R. Ryan, assays 6% copper and 4.2 oz. silver per ton.

A 230' crosscut tunnel on the Burner claim cuts a 12' vein, said to carry 10" to 20" band of shipping ore in a 30' winze, from which 22 tons shipped returned 8% copper, and 8½ oz. silver, per ton. The remainder of the vein is reported to average 1.5% copper, and 1.4 oz. silver, per ton.

BUTTE & NEW YORK COPPER CO. . . MONTANA

Subsidiary of the Butte & Superior Mng. Co., which see.

BUTTE RAMSDELL MINING CO. MONTANA

Address: Care Patrick Wall, Hirbour Block, Butte, Mont.

Inc. 1917, in Montana.

Owens the Maud S., or Ramsdell, claim, and has lease on ½ of Lizzie and the Red Chief claims of the Davis Daly Co. The Ramsdell claim has apex of vein on which a new shaft, 150' deep, Oct. 30, cut 9' of ore.

BUTTE & RED EAGLE COPPER CO. MONTANA

Officers: Fayette Harrington, pres., Missoula, Mont.; Jas. A. Canty, sec.-treas., Butte, Mont.

Inc. May, 1907, in Montana. Cap., \$5,000,000; shares \$5 par.

Lands: 7 claims, patented, S. E. of the Butte & Bacorn and N. E. of the Butte and Superior, the Red Eagle claim having a 400' tunnel, showing a little ore. Shut down since 1907, but company still alive.

BUTTE STANDARD COPPER MINING CO. MONTANA

Address: Care H. G. Klenze, Box 377, Butte, Mont.

Officers: H. G. Klenze, pres.; A. M. Stephens, v. p.; J. W. MacLane, sec., Butte, Mont.; with J. L. Templeman and H. H. Griffith, directors.

Inc. in Montana. Cap., \$1,000,000; shares \$1 par; 350,000 shares in treasury. Stock being offered at 12½c, August, 1917.

Owens 2 claims in the northern outlying section of the Butte camp and 2 patented claims at Amazon, Jefferson Co., Mont., both partially developed and said to carry commercial orebodies. Selling stock in 1917.

BUTTE-SUMMIT COPPER CO. MONTANA

Address: Supt. Hornet Mine, Hornet St., and Excelsior Ave., Butte, Mont.

Officers: Ed. A. Blomgren, Geo. P. Arnold and Wm. H. Smith, all of Lewistown, Mont., directors.

Inc. April, 1916, in Montana. Cap., \$3,000,000; shares \$10 par.

Property: the Hornet claim on the Yellow Jacket vein and a second vein 180' to the south.

Development: by 200' shaft, with levels at 100' and 200'. Oreshoot on 100' level. Yellow Jacket 13½' wide, with 4' of ore assaying high in lead and silver, with over 20% zinc. On the 200' level 7' of commercial ore was opened Oct., 1917, on downward extension of shoot cut on 100' level.

BUTTE & SUPERIOR MINING CO. MONTANA

Office: 25 Broad St., New York. Mine office: Butte, Mont.

Officers: N. Bruce MacKelvie, pres.; D. C. Jackling, v. p. and managing director; K. R. Babbitt, v. p. and gen. counsel; A. J. Ronaghan, sec.; C. W. Peters, treas.; N. Bruce MacKelvie, K. R. Babbitt, D. C. Jackling and F. L. Ames, directors. J. L. Bruce, gen. mgr. Angus McLeod, mine supt. J. T. Shimmin, mill supt. C. Boeking, asst. mgr. and cashier.

BUTTE & SUPERIOR MINING CO.

Our Statistical Department will furnish complete information on application.

HAYDEN, STONE & CO.

Members New York, Boston and Philadelphia Stock Exchanges.

25 Broad Street, NEW YORK

87 Milk Street, BOSTON

Inc. Oct., 1908, in Arizona. Cap., originally \$6,000,000; shares \$5 par; reduced Dec. 3, 1910, to \$2,500,000; shares \$10 par; non-assessable; increased Sept., 1912, to \$3,500,000. Outstanding Dec. 31, 1916, \$2,901,872. Outstanding bonds, Dec. 31, 1915, none. Stock listed on Boston, New York and Butte Exchanges and on the Paris Bourse. Name changed May, 1916, and new stock issued.

Controls the North Butte Extension Development Co., through ownership of 80% of the stock; also controls the Butte-New York Copper Co., through ownership of more than 55%. Equitable Trust Co., New York, and Old Colony Trust Co., Boston, transfer agents; Guaranty Trust Co., New York, and National Shawmut Bank, Boston, registrars. Annual meeting 3rd Friday in April, at New York.

Comparative General Balance Sheet: Years ending Dec. 31:—

Assets—	Prop., Equip. & Devel.		Invest's.	Current	Deferred Charges	Total.
	Cap. Stock	Current				
1916.....	\$5,245,260	\$692,063	\$4,393,668	\$542,163	\$10,882,153	
1915.....	4,458,133	574,295	5,267,080	486,129	10,785,638	
1914.....	4,190,872	338,567	1,269,633	274,330	6,073,402	
Liabilities—	Prem. on Sales		Cap. Stock	Undiv. Profits	Total	
	Cap. Stock	Current				
1916.....	\$2,901,872	\$1,155,337	\$1,214,222	\$5,610,722	\$10,882,153	
1915.....	2,726,970	606,317	1,214,386	6,237,965	10,785,638	
1914.....	2,726,089a	111,384	1,213,985	2,021,944	6,073,402	

(a) Includes \$5,900 first mortgage bonds.

On September 30, 1917, net quick assets were \$2,425,268, of which \$1,078,341 was cash.

Dividends: in 1914, \$611,908; in 1915, \$4,908,115, in 4 quarterly payments of 75c each and extra payments of \$15 per share; in 1916, \$9,490,472 in quarterly payments, 2@75c, 2@\$1.25, ea. and extra of \$30.00 per share; 1917, paid \$1.25 quarterly, for first three quarters, \$1.25, extra for first two, and Red Cross of 40c, a total of \$6.65 for the year. No further dividends can be paid until litigation with Minerals Separation Co. is concluded.

Property: 27 mining claims, 164.90 acres, about 2 miles N. E. of the business section of Butte, with the exception of 4 claims, Peake, Parker, Prescott and Pardee, which lie about 3 miles N. W. of Butte. In addition, fractional interests equivalent to 8.88 acres are owned in 11 claims, 60.3 acres, and surface rights only for 34.15 acres. The North Butte Extension Development Co. owns 4 claims and a fractional interest in a fifth, amounting in all to an equivalent area of 29.48 acres.

Geology: ore consists of zinc blende, galena and small quantities of pyrite and chalcopyrite occurring with gangue material, mostly quartz, silicified granite, rhodochrosite and rhodonite as vein replacement of the granite. The ore occurs in parallel or branching ore shoots ranging in thickness from narrow stringers up to orebodies as much as 100' wide within the limits of a broad general zone of mineralization known as the Rainbow Lode. Near the surface the commercial ore consisted principally of silver ore, which was mined in the early days of Butte mining. The commercial zinc ore shoots as developed during recent years occur downward from approximately the 500' level, and as far as disclosed by present development increase in horizontal area and in importance as greater depth is gained. Ore actually blocked out ready for mining is maintained at about one million tons, greater development than this being inadvisable owing to the difficulty in maintaining developed drifts and crosscuts for any considerable period before actual mining operations are to be conducted.

The ore carries from 10% to 30% zinc, averaging about 18% zinc, 1.25% lead, 0.2% copper, 8 oz. silver and 30c gold. The small amount of iron, lead and copper contents permits of the production of a good grade of zinc concentrates, but the very fine dissemination of the mineral requires fine

grinding for efficient concentration, and most of the zinc mineral is afterwards recovered by oil flotation.

Development: to end of 1916 was chiefly from the Black Rock shaft. Considerable work was done on the Sellers claim of the Butte-New York and fair bodies of ore developed. All concentrating operations subsequent to June, 1912, have been conducted in the mill of the company, located upon its property immediately adjoining the mine. The Black Rock shaft is now 1,900' deep, with considerable openings down to that level. Work in 1916 totaled 21,838', making 102,445' in all.

The October, 1917, reports show that on the 1,800' level the Rainbow orebody in the Black Rock mine continues into the Four Johns claim, the drift on that level extending in the latter property about 700' east of the end line of the Black Rock, the shoot maintaining a width of about 55' with the grade around 17% zinc with from 8 to 9.5 oz. silver.

The mill has been developed from an originally designed capacity of 1,000 tons per day to the present capacity of 1,800 tons per day, and zinc recoveries range from 93% to 96%, depending upon the tonnage treated and the character and grade of ore and concentrates.

Part of the concentrates are sold under contract to the American Metal Company for treatment at their smelters in the Oklahoma gas fields. The balance of the concentrates are treated in plants of the American Zinc, Lead & Smelting Co. in the Kansas gas fields under a toll basis, though small quantities have been disposed of by sale to various zinc retort smelters throughout the country or to the Anaconda Copper Mining Co. for treatment at its electrolytic plant at Anaconda, Mont.

Figures for the production of the property prior to 1913 are not available, but the results of operations since that time are as follows:

	Tons Milled	Oper. Cost	Tons Concts.	Assay Concts.	Lbs. Zinc Concts.	Zinc Rec.	Zinc Aver. Price	Net Total	Profit per share
1917(a)	275,672	\$7.25	80,191	46.82%	75,101,771	88.57%	\$9.60c	\$4,316,549	\$7.08
1916...	627,370	6.34	171,747	52.87%	181,624,842	93.10%	12.63	8,873,446	30.57
1915...	522,300	5.10	158,171	53.61%	165,382,921	93.00%	12.34	9,125,947	33.47
1914...	327,210	5.33	101,383	53.16%	108,644,120	88.71%	5.04	1,417,128	5.21
1913...	296,940	5.70	106,443	49.00%	102,997,916	88.43%	5.52	942,988	3.47

(a) First half of year.

The suit against the company over the use of the flotation process of concentration is still in the courts. An adverse decision by Judge Bourquin in September, 1917, has been appealed, but the Court enjoined the company from disposing of its assets, excepting ordinary current business expenditures, until termination of the suit. The order prevents further distribution of dividend payments.

The apex controversy with the Elm Orlu Mining Co., owned by Hon. W. A. Clark and his son, was decided by the U. S. District Court in the latter's favor, but giving the Butte & Superior Co. all rights to the Rainbow lode east of the point where it enters the Black Rock claim; the company thus loses only the westernmost 301' along the vein claimed by it, but subject to the prior rights of the Pyle vein of the Elm Orlu company below its junction with the Rainbow. This will be argued in 1918.

In 1912 the controlling interests of the company passed into the hands of Hayden, Stone & Co., who have been closely identified with the Utah Copper Co., Chino, Ray and other of our greatest and most successful mining companies, thus ensuring ample finances and competent direction.

Labor conditions at Butte resulted in a large decrease for the third quarter of 1917. From 60,106 tons treated, the net profit was only \$95,320, against \$947,901 in the same period of 1916. In November, the output was 45,000 tons of ore, yielding 12,000 tons of 49% zinc concentrate. Operations were 88% of normal.

In Nov., 1917, a syndicate, known as J. L. Bruce Trustees, was formed to acquire for the Butte & Superior 200 acres of zinc-lead ground W. of the Emma mine of the Butte Copper & Zinc Co.

Butte-New York Copper Co.

Controlled through stock ownership by Butte & Superior Mining Co.

General office: 25 Broad St., New York.

Officers: M. M. Ferguson, pres.; R. J. Schaefer, v. p.; W. G. Sargent, sec.-treas., New York; M. M. Ferguson, L. B. Holloway, Philip Lawrence, G. M. Minton, A. J. Ronaghan, W. G. Sargent and R. J. Schaefer, directors. Annual meeting 2nd Monday in January.

Inc. Oct. 17, 1906, in South Dakota. Previously a holding company controlling over 95% of the capital stock of the Butte-Milwaukee Copper Company. In 1914 it purchased all the assets of that company, comprising four claims in the Summit Valley mining district, Silver Bow Co., Mont., adjoining the property of the Butte & Superior Mining Co., and three claims in the Argenta mining district, Beaverhead Co., Mont. Claims aggregating 53 acres. **Cap.**, authorized, \$1,000,000; outstanding, \$582,172; par value \$1. The former authorized capital stock was \$4,000,000, consisting of 800,000 shares of par value of \$5 each; the stockholders, however, voted April 16, 1915, to change the par value from \$5 to \$1 per share, and to increase the amount of stock by 300,000 shares, making \$1,100,000 authorized. The Butte & Superior Mining Co. owns \$323,655 of the stock. Stock transferred at company's office. Registrars: Empire Trust Co., New York. No dividend paid.

Bonded Debt: \$150,000 First Mortgage Convertible Income Gold 6s; dated June 1, 1916; due June 1, 1925; int. J & D 1 (up to and including June 1, 1920, interest is payable only out of income at rate of 6%, but is cumulative for that period; thereafter interest will be paid unconditionally). Coupon, \$100, \$500, and \$1,000. Authorized, \$500,000. The unissued bonds are reserved for future requirements. Convertible at any time prior to maturity into stock of the company at par. Subject to call on and after June 1, 1918, at 105 and interest. First offered (\$150,000) to stockholders of record April 19, 1915, at par, on the basis of \$100 bond for each 400 shares of stock held. Normal Income Tax deducted from interest.

Holdings consist of 4 claims, patented, known as the Pollock, Colonel Sellers, Florence and Bird, lying immediately north of the Butte & Superior, and 3 lode mining claims in the Argenta district, Beaverhead Co., Mont.

The Colonel Sellers claim has a promising surface showing with strong, persistent quartz veins in granite. The Butte & Superior completed the sinking of the 1,200' Milwaukee shaft on Colonel Sellers claim and connected it by crosscutting with 1,200' level of Black Rock mine. This work was continued beyond the Colonel Sellers shaft so as to open the Mastodon vein on the Florence claim. The Milwaukee shaft is well equipped with power plant and hoist. The Butte & Superior Co. has spent \$24,000 in development work on the Butte-Milwaukee property and in return received 205,000 shares of the capital stock of the Butte & New York Co. Development work said to have proved good zinc orebodies.

Surface outcrop on Bird claim is 100' wide and resembles outcroppings of the typical fault veins of the district.

The Pollock mine has 4 veins, 2 more or less developed by a short tunnel and a 730' three-compartment shaft. A silver vein was opened on the 300' level and mine is said to have produced, years ago, about \$400,000 worth of ore, with values mainly in silver and gold, from above the 200' level. A little ore running 2% copper and 15 oz. silver per ton, with small gold values was produced, 1906.

BUTTE & ZENITH CITY MINING CO.**MONTANA**

Office and mine address: 30 E. Broadway, Butte, Mont.

Officers: I. Freimuth, pres.; G. T. Paul, v. p.; Sol. Genzberger, sec.; John Killorin, treas.; preceding officers, W. D. Gibson, C. O. Baldwin and L. S. Loeb, directors. Wm. D. Gibson, supt.

Inc. Oct., 1912, in Montana. **Cap.**, 300,000 shares; \$10 par, issued. In 1915, 50,000 shares of treasury stock were offered for sale at \$3 per share to provide funds for further development work.

Property: 320 acres patented ground, all in a compact group in Secs. 18 and 19, T. 3., R. 8 W., about 2 miles west of the developed section of the Butte district and a short distance south of Silver Bow junction, where 4 railroads meet. Ground shows Butte granite and aplite cut by numerous strong and persistent quartz veins and also the later fault veins which in the copper district of the Butte camp have proven so productive.

Development: by shaft, 1,500' deep, Oct., 1917, with a crosscut at 460' and crosscuts at 1,000' level showing good indications, with all surface veins in place. Shaft is being sunk to 1,500' level before developing the veins by drifting. Company hopes to finish this work in 1917. The veins show occasional values at the surface, but not in commercial quantities. The quartz veins are of the silver type, but the cross veins are similar to the copper veins of Butte. Samples taken from the shaft are said to assay 2% copper and 4 oz. silver. Equipment includes electric hoist, air compressor, and new electric pump of 400 gal. capacity and 1,000' head, which has been installed on the 1,000' level.

Property considered promising, and the work a meritorious mining venture.

CAYUGA DEVELOPMENT CO.

MONTANA

Office: 616 Lyceum Bldg., Duluth, Minn. **Mine office:** Divide, Silver Bow Co., Mont.

Officers: C. T. Fitzsimmons, pres.; Nels Anderson, v. p.; E. J. O'Rourke, sec.; Max P. Shapiro, treas.; John Helehan, gen. mgr.; preceding officers, Jacob Stein and Jas. L. Norman, directors.

Inc. April 4, 1910, in Minnesota. **Cap.**, \$150,000; shares \$1 par, non-assessable; issued, \$65,000.

Lands: 4 claims, 80 acres, in the Fleecer district, 15 miles southwest of Butte, near the Oregon Short Line railway. Property shows granite, with dikes of porphyry, aplite and quartzite, carrying veins with a generally E.-W. strike, main vein being estimated to range 50 to 125' in width, traceable for 2,000', carrying cuprite, melaconite, malachite, azurite, chrysocholla, chalcopyrite, chalcocite and bornite.

Development: by 100' tunnel, and shafts of 45', 125' and 150', showing ore assaying up to 30% copper, and from a trace to 70 oz. silver per ton. The 125' shaft has crosscuts of 150' and 180', cutting the vein for an apparent width of 30'. The vein at this depth is nearly vertical. Idle, and no work reported done since 1912.

CLARK MONTANA REALTY CO.

MONTANA

Address: 20 Exchange Place, New York City.

Is a close corporation, controlled by Hon. W. A. Clark, as a holding company for the Ophir mine, Utah; ½ interest in the Elm Orlu mine, Butte; ½ interest in the Timber Butte Milling Co., Butte, Mont.; Sunset mine, Wallace, Idaho, and in general all the Clark properties in the north-western States.

COLUSA-LEONARD EXTENSION COPPER CO.

MONTANA

See Tuolomne C. M. Co.

Officers: W. W. McDowell, pres., 804 W. Park St., Butte, Mont.; Guy Stapleton, v. p.; Meyer Genzberger, treas.; W. E. Reynolds, sec.; preceding and J. Kaufman, directors.

Inc. Oct. 1, 1906, in Arizona. **Cap.**, \$5,000,000; shares \$5 par.

Property taken over May, 1916, by the Tuolomne C. M. Co. under an agreement whereby the T. C. M. Co. acquires a 51% interest in the C. L. property for sinking shaft from present depth of 800' to 1,600' and driving crosscuts on the latter level to the N. and S. boundaries of the group.

Property: 5 claims, patented, 42 acres, consisting of the Maggie placer, Golden Hematite, Little MacQueen, Undine and Snow Bird placer, about a mile east of the Colusa and Leonard mines, and near the Pittsmtont shafts of the East Butte Copper Co. There is an 800' three-compartment shaft on the Little MacQueen claim lying about the center of the group, that has cut several small stringers of ore assaying up to 9% copper, but none of commercial size, and there is a 7' vein of 2% ore carrying a

14" paystreak said to range 8 to 10% in copper tenor, with small gold and silver values and some lead and zinc.

Equipment: includes a good air compressor, a temporary hoist and a 400-gal. electric pump.

Property reopened August, 1916, and operated as a unit of the Tuolomne Co.

COLUSA-PARROT MINING & SMELTING CO. MONTANA

Office: 503 Miner Bldg., Butte, Silver Bow Co., Mont.

Officers: Hon. Wm. A. Clark, pres.; Wm. C. Siderfin, v. p.; W. C. Messias, sec.

Inc. Nov. 26, 1897, in Washington. **Cap.**, \$500,000; shares \$50 par. Company is practically out of business, its only present property being lands, platted as an addition to the city of Butte. Has an asset of considerable value in a million-ton tailing dump at the Butte Reduction Works, which is being treated at the present time.

CONSOLIDATED CENTRAL BUTTE COPPER CO. MONTANA

Office: care R. M. Cobban, sec., Butte, Mont.

Officers: R. R. Jones, pres.; R. H. Wearing, v. p.; D. J. Charles, treas., and E. E. Hershey, directors.

Inc. Oct. 29, 1906, in Montana. **Cap.**, \$1,200,000; shares \$1 par, assessable; issued 446,000 shares. Has levied 3 assessments, aggregating 6¼ cts. per share, or about \$28,000. Annual meeting, second Thursday in January.

Owns a one-third interest in the North Star, South Star and January claims, patented and mineral and mining rights in about 110 acres of patented placer claims. The North Star, South Star and January claims are developed by a 225' shaft, said to show an orebody 3 to 6' wide. Idle several years for want of working capital.

CRYSTAL COPPER CO. MONTANA

Office: 85 Devonshire St., Boston, Mass. **Mine office:** 74 Hirbour Block, Butte, Mont.

Officers: W. W. Clarke, pres.; Bowdoin S. Parker, v. p.; Eugene H. Walker, sec.; Walter Harvey Weed, managing director, with Geo. W. Clement, Louis H. Goddu and John E. Allen, directors.

Inc., 1916, in Maine. **Cap.**, \$1,000,000; shares \$1 par; 610,000 shares outstanding, May 31, 1916. Stock listed on New York and Boston Curbs. Federal Trust Co., Boston, Security Transfer & Registrar Co., New York, transfer agents; Old South Trust Co., Boston and Security Transfer & Registrar Co., New York, registrars. Annual meeting, April 1.

Property: the Goldsmith mine, 16 acres, at Butte, Mont., held under bond and lease. Mine has shaft 367' deep developing 3 veins from which about \$1,500,000 worth of silver ore has been produced. Mine covers the western split of the Rainbow lode and lies west of the Moulton, Alice, Magna Charta mines on Butte's richest silver belt. Company will deepen shaft and develop veins on the 450' and 550' levels.

Also owns an undivided half interest in the Commerce, Crystal, Jack Fraction and St. Lawrence claims and all of the Mammoth claim, total of 84.59 acres, in Cataract district, Jefferson Co., Mont., 8 miles N. of Basin, on the Great Northern R. R., located about 25 years ago. It lies within the quartz monzonite area extending northward from Butte to Helena, which contains many old mines, notably the Comet, with a production of several millions, only a few miles N. of the Crystal and the Alta, which produced \$17,000,000, still further N., at Wickes.

The Crystal vein is a typical compound fissure vein 30' to 40' thick between granite walls; it extends for about 4,650' through the property, and where exposed for 1,200' in the mine workings contains footwall ore shoots that yield 3 to 6% copper, \$8 to \$9 gold, and \$6 to \$13 silver, per ton. The nature of the vein appears to indicate persistence of its present character in depth and along its course. Developed by 1,200' Crystal tunnel and the 890' Mammoth crosscut tunnel, 200' below the upper tunnel level.

The lower Mammoth tunnel cuts the vein at 871' from the portal and follows it for 600'. Low-grade material was encountered for the first 250', and at 400' from the crosscut ore carrying $1\frac{1}{2}\%$ copper, 14.8 oz. silver, and \$3.40 gold, was cut. It appears that the ore shoots dip W.

For geology, see Eva May and Bullion mines, Bull. 527, U. S. Geological Survey, pp. 122 and 124, 1913.

In the block of ground above the Crystal tunnel for 50 to 150' there is ore available for milling. The real value of the property can only be determined by deeper development and an extension of the two tunnels west to prove vein below the other claims.

Shipments up to June 1, 1917, representing a year's development work and extraction from a small stope above the upper tunnel, aggregated over \$24,000 net smelter returns, values running between \$13 and \$22 per ton for the copper ore. About 150 tons of lead ore was also produced from an ore band parallel to the copper ore and about 5' from it.

It is planned to erect a rope tramway to eliminate 2 miles of steep wagon haul for the ore and if development warrants it, to put up a concentration mill.

In September, 1917, all the copper ore above the upper tunnel had been stoped out, but zinc ore was exposed in considerable amount and shipments of this and of silver lead ore were begun. Shipments of zinc ore in October aggregating about 400 tons, yielded \$3,965 net, smelter returns.

DAVIS-DALY COPPER CO.

MONTANA

Office: 79 Milk St., Boston, Mass. Mine: Butte, Mont.

Officers: H. M. Burton, pres.; Wm. Bloom, v. p.; Charles G. Schirmer, sec.-treas.; preceding with F. M. Kimball and F. A. Schirmer, directors. W. L. Creden, gen. mgr. Wm. Frazier, mine supt. Federal Trust Co., Boston, transfer agt.; State Street Trust Co., Boston, registrar.

Inc. Sept. 14, 1908, in Maine, as successor of Davis-Daly Estates Copper Co. Cap., \$6,700,000; shares \$10 par, assessable; issued, \$6,000,000; paid \$8.50. Annual meeting 4th Tuesday in September.

For the earlier chapters in the history of the company, readers are referred to description of the Davis-Daly Estates Copper Co., in Vol. VIII, and to a spicy account by Stevens in Vol. X, of the Copper Handbook.

Comparative Balance Sheet: June 30, 1915 to June 30, 1916, shows: Assets, mining property, \$4,106,680 in 1915; \$4,106,671 in 1916; construction and equipment, \$110,159 in 1915; \$108,083 in 1916; development, \$1,359,366 in 1915; \$1,404,392 in 1916; investments, \$14,800 in 1915 and 1916; accounts receivable, \$12,867 in 1915; \$31,986 in 1916; cash, \$66,236 in 1915; \$93,831 in 1916. Liabilities: capital stock, \$4,800,000 in 1915; \$5,100,000 in 1916; notes payable, \$65,000 in 1916; accounts, wages and taxes payable, \$20,475 in 1915; \$35,778 in 1916. Income and expense account for fiscal year ending June 30, 1916; total income accrued (ore sales, \$229,789), \$236,991; mining cost, \$194,667; development, \$62,460; misc. expenses, \$26,997; deficit for year, \$47,335.

In first quarter 1917, ore sales amounted to \$250,396; misc. income, \$2,817; total disbursements, \$179,547; profit for 3 months' operations was \$73,666, compared with a deficit of \$27,504 for same period in 1916. In second quarter, 1917, ending June 30, net profits were \$75,732. Treasury balance was \$160,000. In third quarter, 1917, there was a deficit of \$12,010, from a gross revenue of \$109,560 and expenses of \$121,750.

Property: a small surface area and mineral rights of 320 acres under the city of Butte, adjacent to, but south and west, of the known productive area.

Development: consists of the Colorado shaft, 2,542' deep, with drifts and crosscuts. Development work for fiscal year 1915-1916, amounted to 5,000'. The chief workings are on the 1,000', 1,200', 1,400', 1,500', 1,700', 1,900', and 2,500' levels, 60% of the ore mined during 1916 coming from the 2,500' level.

Geology: two main veins have been developed, running in N. W.-S. E.

direction corresponding to the Blue Vein system of which the Jessie, Edith May and other very productive fault veins belong. There are also several east and west veins on which but a small amount of development has been done until recently. The first ore developed was on the "Fisher stopes" on the 1,400' level, 350' west of the Colorado shaft, showing an orebody 400' long, 7½' thick and 100' high, averaging 2.9% copper and 5.6 oz. silver per ton. The same vein was extensively developed down to the 1,700' level.

The veins are frequently faulted and a careful study of geological conditions is necessary to successful recovery of veins beyond the faults. The shaft was sunk to depth of 2,035' in 1912, and new crosscuts showed ore in several small fault veins, barren on the 1,700' level.

The Hesperus vein, the principal ore producer of the mine, was opened 1913 by a crosscut 85' south from the old Heinze workings on the 1,400' level, where it showed 12' of high-grade ore beneath the Hesperus claim. Drifting on this, together with crosscuts at other points, proved an orebody 12' to 14' wide, averaging 4.43% copper and 7 oz. silver per ton, for 325' in length. This ore shoot thinned out to a non-commercial width a few feet below the 1,200' level. Efforts made to find the faulted section of the vein beneath the Rarus fault, on both 1,400' and 1,500' levels have so far been unsuccessful. The Hesperus ore shoot was mined in V form for a height of about 300' and an average length of 150' and produced more than 60% of the total tonnage mined by the company since its organization to 1913.

Results of mining operations on upper levels, 1913-1914, being disappointing, the company decided to discontinue mining and to sink the shaft 500' deeper, for which a 50c assessment was levied. Shaft sinking started in May, and was completed to 2,500' level in December, 1914. During fiscal year ending June 30, 1915, no development of any consequence was done above the 2,500' level and the ore extracted from drift development, came from this level. While driving the crosscut to the No. 1 Hesperus vein on the 2,500' level a vein of good ore was reported to have been found. This vein was drifted on for 450' during 1916 and with exception of short stretches of faulting, the orebody has proved continuous throughout this distance, although of somewhat lower grade. No. 1 Hesperus vein was reached in August, 1915, 670' from the shaft. At this point, commercial ore, 10' wide, is said to have been cut and shipments made of ore coming from drift development work. Company owns 2,500' on the length of vein.

Shaft has recently been enlarged from 1,700' to 1,900' level, making it 3 compartments from the 2,500' level to surface.

The western half of the property is practically undeveloped. A long crosscut from the Original mine explored the ground, but failed to develop commercial ore. Upon the Silver King claim, 2,500' N. W. of the Colorado shaft, the Sutton shaft, 310' deep, developed ore, shipments of 489 tons carried 3% copper, 2½ oz. silver, and 86 cts. gold. As this western half of the property was entirely undeveloped, an arrangement was made with the Anaconda Co., to drive a crosscut south from the West Gagnon mine at a depth of 1,900'. The result was disappointing.

Besides the 2 shafts already mentioned, there are several old openings on the company property. The Smokehouse shaft, across the street and south of the Thornton hotel, is 700' deep and lost the vein on the 500' level. The Mount Moriah mine has a 640' three-compartment shaft and the ground is explored by a crosscut 2,000' long from the 1,800' level of the Original mine. When seen by the writer, the veins cut in this crosscut showed no payable ore, but not a foot of drifting had been done to disclose conditions along the strike of these veins. Leasors at the Mt. Moriah shaft reported 7' of ore on the 250' level, assaying 28 oz. silver, 18% lead and 18.2% zinc, October, 1917. There are various other shallow workings on the property held by this company, which it must be remembered, is a tract 1¼ miles long by one-half mile wide. These old workings yielded considerably over \$1,000,000, principally in silver from the enriched surface ore.

Considerable work is being done at the Hibernia mine developing the manganese orebodies. The mine adjoins the Nettie of the Anaconda Co. Old workings being reopened are reported to have exposed silver ore at 400' depth, Oct., 1917.

Equipment: a new hoist was installed early in 1917, with a capacity of 3½ tons per trip and speed of 2,000' per minute at depth of 4,000'. There is an electric-driven air compressor, and a large battery of boilers ready for action, in case electricity is cut off. The ground around the shaft being limited, the output at the mine is conveyed several blocks over a narrow-gauge surface tram to ore bins alongside the Northern Pacific railroad.

Production: the 1916 output amounted to 20,511 tons, averaging 4.04% copper and 5.366 oz. silver, and giving net smelter returns of \$11.20 per ton. Mining cost per ton was \$7.22. Shipments for first quarter, 1917, amounted to 12,503 tons, yielding 1,126,921 lbs. copper and 68,830 oz. silver. For second quarter ending June 30, produced 12,326 tons, yielding 1,158,356 lbs. copper and 71,535 oz. silver. For third quarter, 4,275 tons yielded 498,811 lbs. copper and 26,075 oz. silver.

The Davis-Daly ground has been generally considered to contain only low-grade and base zinc-pyrite ores and to be outside the copper section of Butte camp. Developments show, however, that good copper ores exist and that the extensive area of unexplored ground will make this property a profitable one. Under Mr. Creden's management the property will certainly receive proper exploration and development and it is believed the company will eventually be a dividend payer.

EAGLE MINING CO.

MONTANA

Idle. Care Harper McDonald Co., Lewisohn Block, Butte, Mont. Hon. Patrick Mullins, Arthur V. Corry and Thos. Bryant, directors.

Inc. March 10, 1906, in Montana. **Cap.**, \$150,000; shares \$1 par; is supposed to have increased capitalization, April 29, 1907, to \$250,000, shares 50 cts. par.

Property: north of Walkerville, has a 250' shaft, showing a 5' vein. Mine is dismantled, but worthy of further prospect work.

EAST BUTTE COPPER MINING CO.

MONTANA

Office: 85 Devonshire St., Boston, Mass. **Mine and works office:** Butte, Silver Bow Co., Mont.

Officers: Robt. H. Gross, pres.; Hon. Jas. H. Reed, v. p.; Wm. P. Everts, sec.; Frank P. Son, treas.; Oscar Rohn, gen. mgr.; preceding, with F. Ward Paine and Wm. A. Paine, directors; Andrew J. Ray, mine supt.; John E. Rothwell, mill supt.; Julius H. Warner, engr.

Inc. Oct. 14, 1905, in Arizona. **Cap.**, \$3,000,000; shares \$10 par; increased, May 11, 1909, to \$6,000,000, shares \$10 par, non-assessable; issued \$4,110,000. Has about 2,500 shareholders. State Street Trust Co., Boston, registrar; American Trust Co., Boston, transfer agent. Stock is listed on the Boston Stock Exchange and N. Y. Curb. Annual meeting, 1st Monday in April. Initial dividend of \$1 a share paid Jan. 29, 1917.

The East Butte Copper Mng. Co. has no indebtedness. It owns all of the outstanding bonds and all preferred stock of the Pittsmont Copper Co., the latter amounting to \$1,000,000 par value; also four-fifths of the common stock, amounting to \$4,000,000 par value. East Butte Co. works the property of the Pittsmont Copper Co. under an operating agreement.

Annual report for year ending Dec. 31, 1916 shows net surplus on operations of \$1,565,769 as compared with \$782,997 in 1915, \$222,252 in 1914 and \$531,772 in 1913. It shows cash and copper, \$2,214,568, accounts receivable, \$11,928, with accounts payable, \$1,219,600.

The 1917 operations were curtailed by six weeks shut down due to labor strike. For the fiscal year ending June 30, 1917, net proceeds were \$1,257,213 compared with \$1,070,069 in 1916. Though ore extraction was 249,385 tons, or but 265 tons greater than in previous year, its gross value was \$6,064,418, or \$24.32 per ton, contrasted with \$4,505,700, or \$18.76 per ton in 1916.

Property: the Dutton group, 134 acres, held by placer patent, is in the S. E. part of the Butte camp near the Pennsylvania mine.

Miscellaneous holdings include the Swissmont group of 6 claims, near Elkhorn, Jefferson Co., Mont., and the Chamounix group near Austin, Lewis & Clark Co., Mont., including the Christina group of 6 claims and the Fannie Parnell group of 33 claims. The Swissmont group has developed a considerable tonnage of low grade oxidized gold ore carrying an excess of iron over insoluble material, which ore has had value from its combined fluxing character and gold content.

The Chamounix group has shipped some silver-copper ore in the past, but is now idle. Company also has timber operations at Feely, Mont.

A mill was erected at the Elkhorn property in 1917, but owing to scarcity of labor and increased cost of cyanide, operations were postponed until conditions become more favorable.

Geology: the Pittsmont claims cover 280 acres of flat valley bottom, about $1\frac{1}{2}$ miles east of Butte and extending outward from the footslopes of the continental divide mountain ridge. The ground is a filled-in valley, the sandy wash and debris being in places several hundred feet deep, so that no outcrops of any kind exist on the ground. The underlying rock is the normal Butte granite (quartz monzonite) which is cut by 3 systems of veins: Northwest, corresponding to the Blue Vein series of Butte; Northeast, and an East-West vein series. Ore shoots occur in veins of each series.

Development: 2 shafts, Nos. 2 and 3, 1,830' and 1,240' deep, respectively. Shaft No. 2 in the working shaft. Levels are opened from it at 800', 1,000', 1,200', 1,500' and 1,800'. The 1,500' level is producing 25% of mine output, while some ore has been developed on the 1,800' level. The zone of oxidation and leaching of copper values extends from 500' to 700' below the surface. Underground workings amount to about 16 miles. There are some 12 principal veins on the property that have been productive. While these veins are not wide, usually under 5', the ore shoots are long and persistent. At least 2 veins on the 800' level have been stoped almost continuously for 1,500' in length. Though the 800' level has been the most productive level opened to date, due both to an increase primary mineralization and secondary enrichment which has affected the lower levels to a much lesser extent, the lower levels continue to yield strong ore shoots of commercial grade, though lower in values than ore from upper levels. Development for 1916 consisted of 12,027' of drifting and crosscutting.

Orebodies between the 600' and 800' levels on number 6 vein were largely exhausted in 1916, and although development work is being done, prospects are not favorable for maintaining 1916 output in 1917. Below the 800' level the major portion of the strong E. W. vein from which principal production has come, will dip outside of East Butte property.

Equipment: consists of hoisting plant, milling flotation plant and smelter. The above includes a 2,000-h. p. steam plant, 2,000-h. p. electric plant, 600-h. p. steam hoist good for 2,000', and 50-h. p. steam hoist good for 1,500'; a 25-drill Nordberg and 25-drill Rand air compressor, and 50 power drills. Electric power is used for practically everything except hoisting. There are about 20 buildings, which include the smelter, sinter plant, 2 engine rooms, change house, boiler room, concentrator, flotation plant, carpenter, machine and electric shops, sampling mill, laboratory and office building. The smelter building contains one 600-ton blast furnace and one 300-ton furnace with 3 basic lined converters. The sintering plant contains one 42" Dwight-Lloyd sintering machine. Concentrator is equipped with crushers, jigs, tables, etc., and flotation plant is equipped with tube mills and Janney flotation machines. The capacity of concentrator is 600 tons and of flotation plant 800 tons, the additional capacity of flotation plant to be used in reworking tailings.

The Pittsmont reduction plant is the only operating smelter in Butte and does a considerable amount of custom business, treating ore from several independent mines.

Operations compare as follows:

	1916	1915	1914	1913
Tons ore mined	258,899	150,911	72,853	105,071
Av. assay value	3.67%	4.28%	4.72%	5.16%
Cost min. per ton, incl. develop....	\$5.46	\$4.37	\$5.39	\$5.08
Tot. tons ore tr'd	336,057	181,063	110,992	186,813
Lbs. copper prod.....	18,340,713	12,542,058	9,175,579	14,401,108
Oz. silver prod.....	556,542	318,124	242,347	506,897
Oz. gold prod.....	3,844	2,696	2,219	8,803
Gross inc.....	\$5,523,688	\$2,753,587	\$1,453,454	\$2,645,568
Total costs	3,198,317	1,699,602	1,048,856	1,881,112
Balance	2,325,371	1,053,985	406,597	764,455
Less add. to equip., expl. & devel..	294,191	214,691	136,101	188,619
Net surplus	1,565,769	782,997	222,252	531,772
Price per lb. rec.....	28.1978c	19.3143c	13.5685c	15.085c
Cost prod. per lb.....	16.8878c	11.8538c	11.11c	11.04c

Average assay of ore mined in 1916 was 3.67% copper as compared with 4.28% in 1916. This is due to the fact that with increased metal prices, lower grade ore was mined.

Increased cost of production is due to abnormal labor and material charges which were 30% above normal in 1916.

Production for 11 months of 1917 totaled 17,749,348 lbs. copper, against 17,102,260 lbs. in that period of 1916. During July and August, 1917, the plant was closed for 6 weeks.

EAST BUTTE EXTENSION COPPER MINING CO. MONTANA

Idle. Office: 113 Hamilton St., Butte, Silver Bow Co., Mont.

Officers: Chas. J. Schatzlein, pres.; Philip A. Breen, v. p.; Frank H. Cooney, sec. and gen. mgr.; Dr. C. E. Blackburn, treas.; preceding, with Chas. N. Joyce, directors; A. F. Munroe, engr.

Inc. April 10, 1906, in Arizona. Cap., \$1,000,000; shares \$1 par; issued, \$550,000. Paid, Oct. 1, 1906, a 1% dividend, amounting to \$2,486.

Stock listed on Butte Exchange.

Property: various fractional claims, 4 acres, lying between the Belmont, Pennsylvania and Ground Squirrel mines of the Anaconda developed by 6 shafts, deepest the 250' two-compartment No. 6 shaft, begun 1909, with about 500' of crosscuts. The Westlake and Wall mines are said to have produced, under former ownership, about \$300,000 worth of ore. The two-compartment No. 1 shaft is 170' deep, and the 200' No. 2 shaft shows ore assaying up to 13% copper and 1 oz. silver per ton. No. 3, formerly known as the Westlake, has a small precipitation plant.

Lessees shipments of 40 tons daily, with net smelter returns of \$37,-360.21, yielded the company a net royalty of \$12,881.83 in 1907. Company also owns a divided one-half interest in the Centerville claim, and undivided interests as follows: one-half in Malone; eleven-sixteenths in Little Evelyn; one-sixth in Valley Forge; one-half in Gregory; one-fourth in Simon; one-eighth in Eureka First; three-fortieths in Lost Fraction, and three-fortieths in Katy T.

Leasers operating in 1916 shipped several carloads of 8% copper ore from the 200' level. East Butte Extension is reported to receive 15% royalty on all ore shipments.

ELM ORLU MINING CO.

MONTANA

Office: Miner Bldg., Butte, Mont. W. A. Clark, Jr., pres. and gen. mgr.; W. A. Clark, v. p., owners; W. D. Mangam, sec.-treas.; J. C. Pyle, cons. engr.

Inc. 1907. Cap., \$100,000; shares \$10 par. Statements filed with Assessor of Silver Bow County for years ending May 31:

	Ore Tons	Value per Ton	Costs			Net Profit
			Mining	Const.	Trans. Reduct.	
1917....	175,236	\$22.65	\$846,568	\$199,439	\$492,375	\$1,563,745
1916....	200,752	18.52	1,011,537	18,029	408,823	1,783,352

Company owns the Elm Orlu mine and claim of that name adjoining the Butte & Superior holdings, the Badger State mine of the Anaconda Copper Co. and the Pilot Butte mine, all in the N. E. section of the Butte district. The Poser claim is owned by a separate company.

The Elm Orlu covers part of the Rainbow lode and several other veins containing large bodies of copper ore and immense bodies of zinc ore. Copper occurs as copper glance both in secondary fault veins and in veins of the Rainbow lode, and also as chalcopryrite mixed with zinc ore. The mine has a 2,100' shaft and several miles of workings, principally below the 900' level.

The output of the mine is handled in the mill of the Timber Butte Milling Co. (which see), also owned by Senator and W. A. Clark, Jr.; zinc concentrates go to the National Zinc Co.'s plants at Bartlesville, Okla., and Springfield, Ill. The copper ore is shipped direct to the Anaconda smelter, the mine yielding from 50 to 100 tons a day during, 1915.

The apex controversy with the Butte & Superior Co. was decided by the U. S. District Court in favor of the Elm Orlu Co., giving this company the westernmost 301' along the vein and Butte & Superior all rights to the Rainbow lode east of the point where it enters the Black Rock claim (B. & S. Co.); subject, however, to the prior rights of the Pyle vein of the Elm Orlu Co. below its junction with the Rainbow.

Timber Butte Milling Co.

Affiliation of Elm Orlu Mining Co., Butte, Mont. Owners: W. A. Clark, Jr., pres. and gen. mgr.; W. A. Clark, v. p.; W. D. Mangam, sec.; J. K. Heslet and A. J. Johnston, directors; W. N. Rosenberg, supt.

Cap., 1,000 shares; \$100 par. A close corporation.

The mill was erected to concentrate zinc ores of the Elm Orlu mine. Capacity 750 to 1,000 tons daily. Process, gravity separation and flotation. Crushing is by rolls and Hardinge mills; separation by tables and Mineral Separation, Ltd., flotation machines. Electric power is supplied by the Montana Power Co. Mill began operations about May 1, 1914. Recovery over 93% and concentrates average 52% zinc.

FARRELL COPPER CO.

MONTANA

Idle. Mine at Butte, Mont.

Officers: W. C. Lewis, pres.; Carlton H. Hand, v. p.; J. D. Slemons, sec.-treas.; above, with A. T. Morgan, Walter C. Lewis, Donald Campbell, W. H. Hall and Daniel Tewey, directors.

Inc. July 24, 1906, in Montana. Cap., \$1,000,000; shares \$2.50 par.

Property: 17 acres, in the S. E. part of the Butte district, has a 200' shaft, sunk jointly with the Alliance Copper Co. Crosscut on the 200' level shows a little ore carrying copper, lead, zinc and silver values.

GIRARD COPPER CO.

MONTANA

Idle. Officers: George J. Kirby, pres., Willimantic, Conn.; Geo. R. Grantham, sec., Kimball Bldg., Boston, Mass.; E. C. Denton, supt., Warm Springs, Mont.

Inc. 1912, in South Dakota. Cap., \$10,000,000; shares \$10 par; 601,120 issued; 501,000 shares pooled. Admitted to quotation on Boston curb, for 91,020 shares, Jan., 1913. Annual meeting in Jan. First Nat'l. Bank, Boston, registrar; Ex. Trust Co., Boston, transfer agents.

Property: 20 claims, partly patented, 400 acres, 5 miles from Warm Springs and 10 miles N. W. of Butte. Ore occurs as a sulphide in 3' fissure-quartz vein, between monzonite and aplite, assaying 4-8% copper, 6 oz. silver and 2 oz. gold.

Development: by 60' Jack Pot shaft and 150' tunnel. Assessment work only done.

GREAT BUTTE COPPER CO.

MONTANA

(Successor of Butte & Bacorn Copper Co.)

Address: 53 Silver Bow Block, Butte, Mont.

Officers: F. W. Bacon, pres.; H. H. Robinson, sec.; C. Hyde, treas.; the

above (excepting C. Hyde) with J. B. Finley, W. B. Schiller, C. W. Brown, Henry Fownes, R. C. Patterson and C. G. McIlvain, directors.

Inc. 1916, in Montana. **Cap.**, \$1,000,000; shares \$1 par; 850,000 outstanding; non-assessable.

Is a reorganization of the Butte & Bacorn Copper Co. The Great Butte took over the property in July, 1916, paying 400,000 shares of its own stock, and liquidating the Butte & Bacorn debts.

Property: 23 patented claims, one mile N. of the Butte & Superior mine. Holds under option the Calumet, Moonlight, and Jasper Lode claims of 46 acres. Shallow workings said to show profitable copper ore. Veins are large and numerous.

Development: on 1,500' level is now underway. Company has enough cash to do 5,000' of horizontal work.

GREENDALE EXPLORATION CO.

MONTANA

See Butte & London Copper Dev. Co.

Controlled by Rainbow Lode Development Co. When the Rainbow Lode Dev. Co. wished to acquire the Butte & London property at Butte, Mont., several years ago, it was not practicable to recall a majority of the outstanding stock of that company; the Greendale Exploration Co. was organized to meet the emergency. The property of the Butte & London was transferred to this company, the Rainbow Lode Dev. Co. receiving 51% of the stock in return for certain development work (see Rainbow Lode Dev. Co.); the remaining 49% is held by Butte & London Copper Dev. Co.

MINES OPERATING CO.

MONTANA

Office: H. A. Franck, sec., Daly Bank Bldg., Butte, Mont.

Officers: Alfred Frank, pres. and gen. mgr.; C. W. Whitely, v. p.; with John MacGinniss, and E. L. Newhouse, Jr., directors; G. D. Deshler, supt.

Inc. 1916, in Delaware. **Cap.**, \$100,000; shares \$1,000 par.

Operating the Butte-Duluth and Bullwhacker mines on E. side of Butte, under bond and lease. Ores average about 1.4% copper, and are treated by acid leaching at rate of 300 tons daily. See Butte-Duluth Mining Co.

NORTH BUTTE EXTENSION DEVELOPMENT CO.

MONTANA

Office: 25 Broad St., New York. **Mine office:** O'Rourke Estate Bldg., Butte, Mont.

Officers: H. G. Bell, pres.; A. J. Ronaghan, sec., with I. A. Heilbronner, N. Bruce MacKelvie, Elbridge L. Adams, David Angus and C. W. Peters, directors.

Inc. Oct. 10, 1908, in Maine. **Cap.**, \$1,500,000; shares \$1 par; issued, \$1,349,036. Is a reconstruction of the North Butte Extension Copper Mng. Co., which was a reorganization of the North Butte Extension Mng. Co. A controlling stock interest of \$800,000 was sold, March, 1910, to the Butte & Superior Mng. Co. Annual meeting in September.

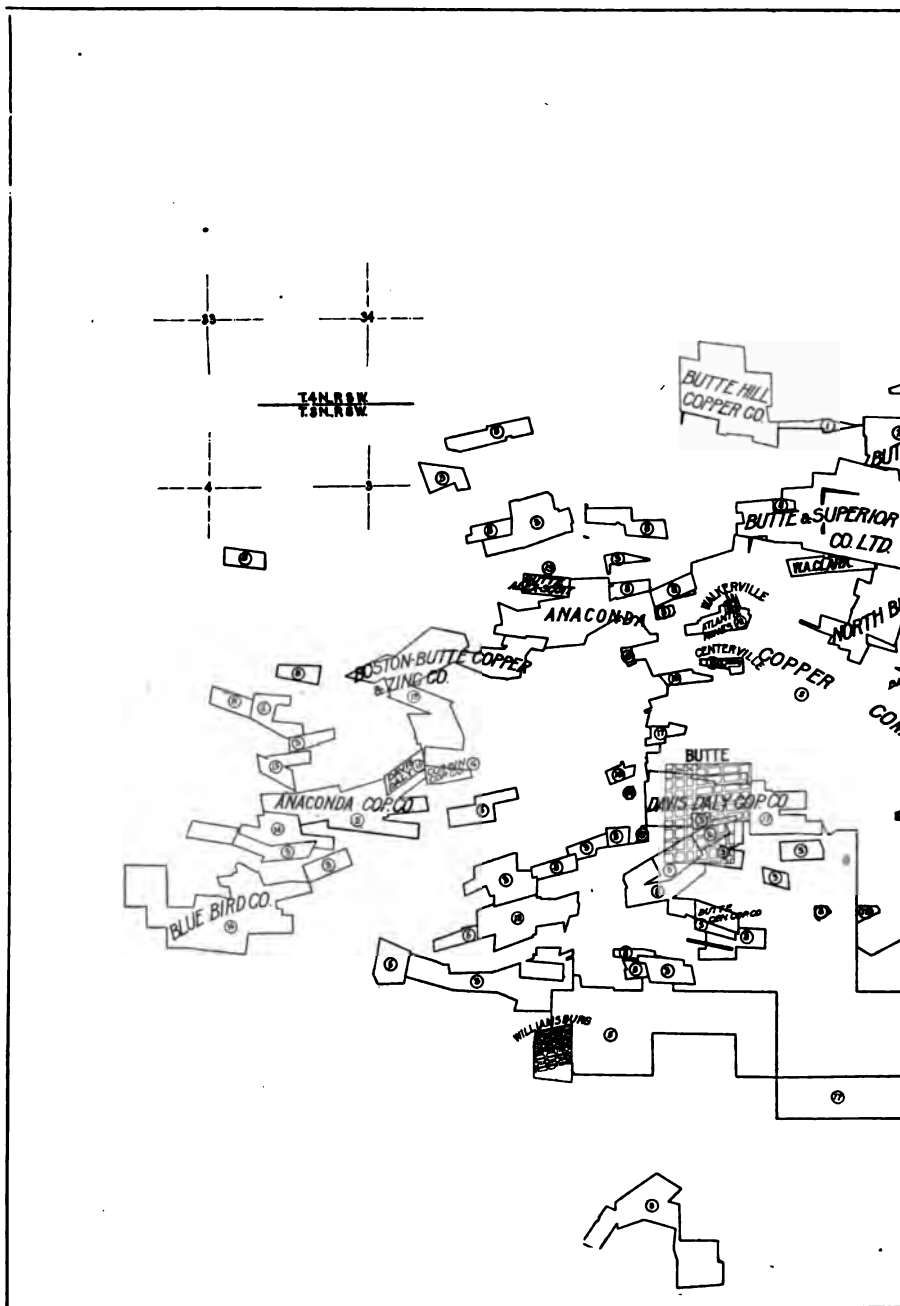
Suit was instituted by the Butte & Superior interests against the promoters of the North Butte Extension Development Co. to recover shares of stock claimed to have been illegally issued and a proposal to return 50,000 shares was made and accepted by the company.

Apparently the company's only present property is the Overman claim, the Black Crow fractional claim of 2½ acres and the Clipper and Assay mill sites.

Development: by a 700' shaft, planned to be deepened to 1,000'.

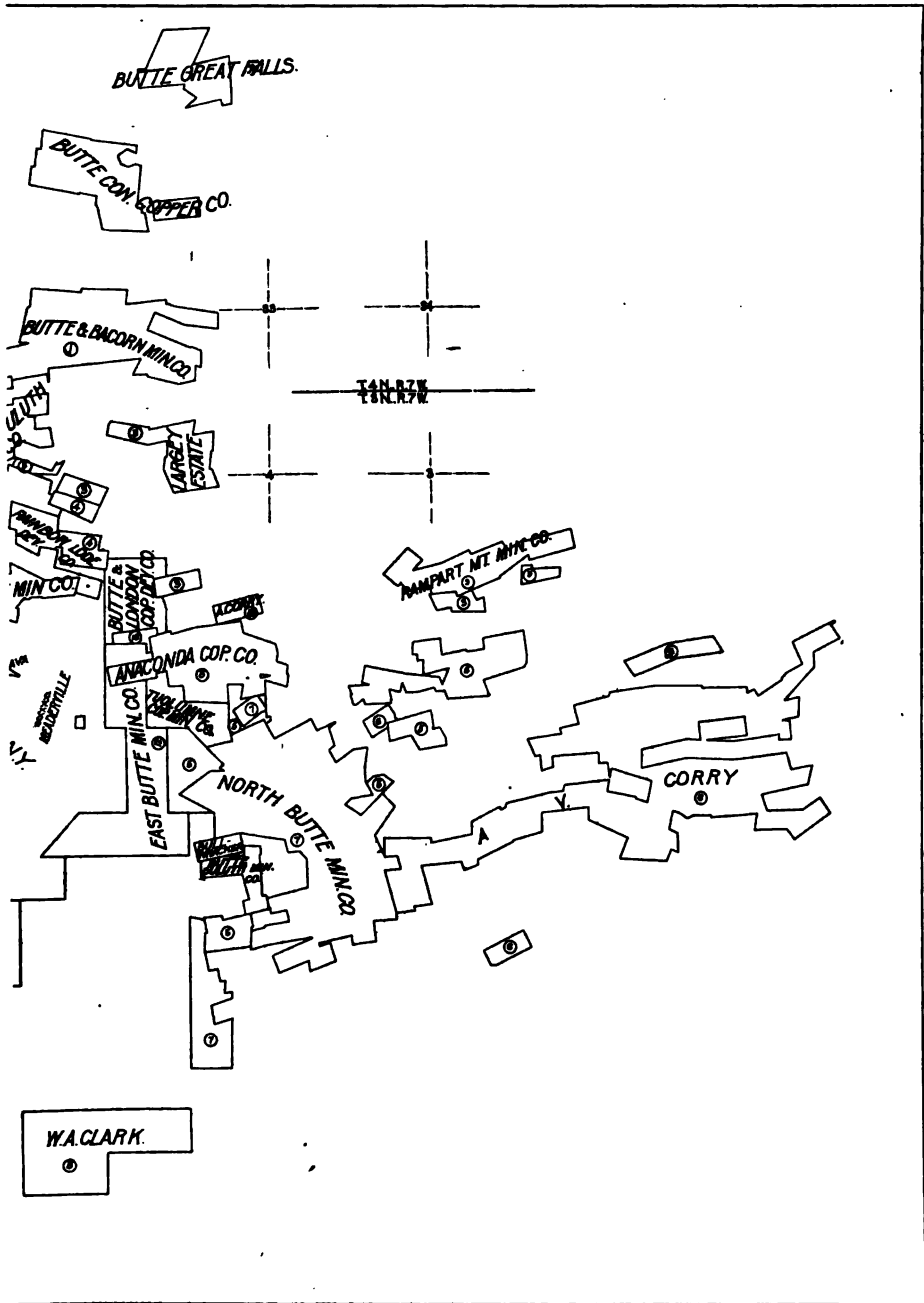
Most of the ground on which the various North Butte Extension companies were organized was held only under options which were forfeited. The Occidental claim was developed by a long crosscut from the Butte & Superior shaft, but nothing of importance was found and after payments of \$90,000 the claim was abandoned. Much of the original ground held by the company is now owned by the Rainbow Development and Butte & Superior companies.

According to the contract with the Butte & Superior, the latter company drove a crosscut on the 1,200' level through the Four Johns claim



PROPERTY MAP OF

- Holdings are as follows: (1) Butte & Bacorn; (2) Butte Duluth; (3) Largey Estate; (4) Rainbow Lode Development; (5) Anaconda; (6) A. V. Corry; (7) North Butte; (8) W. A. Clark; (9) Rampart Mountain; (10) A. V. Corry; (12) East Butte; (13) Butte Alex-Scott; (14) Blue Bird; (15) Davis-Daly; (16) Corbin Copper; (17) Davis-Daly; (18) Atlantic and Raven; (19) Boston-Butte.



BUTTE, MONTANA

Metal production of Butte to the end of 1917 is approximately as follows: copper, 7,150,000,000 lb. worth \$1,020,000,000; gold, 1,600,000 oz. worth \$32,000,000; lead, 40,000,000 lb. worth \$2,000,000; silver, 310,000,000 oz. worth \$220,000,000; and zinc 610,000,000 lbs. worth \$65,000,000; the total value being \$1,342,000,000.

and through the entire length of the Overman claim belonging to the North Butte Extension Co. The total exploration E. of the 1,221' crosscut of the Butte & Superior was 3,318', after which work was abandoned at the property.

NORTH BUTTE MINING CO.**MONTANA**

Business office: Suite 3300, 120 Broadway, New York. **Statutory office:** 1500 Alworth Bldg., Duluth, Minn. **Mine office:** 14 West Granite St., Butte, Mont.

Officers: Thomas F. Cole, pres.; Robert Linton, 1st v. p.; Joseph B. Cotton, 2nd v. p. and gen. solicitor; Frederic R. Kennedy, sec.-treas.; Henry B. Paull, auditor; Norman B. Braly, gen. mgr.; Leslie D. Frink, supt. **Directors:** Robert Linton, Francis DeC. Sullivan, William D. Thornton, Joseph B. Cotton, William F. Bartholomew, G. Ashley Tomlinson, Thomas F. Cole, Henry B. Paull and Frederic R. Kennedy. Transfer agent: American Trust Co., Boston. Registrar: Old Colony Trust Co., Boston. Stock is listed on Boston Stock Exchange.

Inc. April 5, 1905, in Minnesota. **Cap.**, \$9,000,000; shares \$15 par; 430,000 issued.

Comparative General Balance Sheet:

Assets:						
	Property	Gr. Mt. Shaft	Invest.	Metals On Hand	Other Current	Total
1916.....	\$8,980,470	\$231,765	\$9,600	\$2,766,435	\$733,317	\$12,721,587
1915.....	8,986,265	256,945	9,600	1,569,643	259,032	11,063,485
1914.....	8,921,783	228,239	9,600	1,074,819	88,357	10,322,798
Liabilities:						
	Capital Stock	Current	Surplus Reserve	Total		
1916.....	\$6,450,000	\$984,575	5,287,013	\$12,721,588		
1915.....	6,450,000	731,067	3,882,418	11,063,485		
1914.....	6,450,000	731,027	3,141,771	10,322,798		

Comparative Income Account:

	Revenue	Operating Expenses	Net Income	Dividends	Surplus	Total Surplus
1916...	\$7,121,259	\$4,640,664	\$2,479,595	\$1,075,000	\$1,404,595	\$5,287,018
1915...	4,155,522	3,027,875	1,127,646	387,000	740,646	3,882,417
1914...	3,084,774	2,726,559	358,215	635,000	(d) 276,785	3,141,771
1913...	5,182,674	3,744,897	1,437,777	820,000	617,777	3,418,556

(d) Deficit.

Dividends paid since organization of company per share: \$1.25 in 1905; \$7.25 in 1906; \$6 in 1907; \$3 in 1908; \$4 in 1909; \$1.10 in 1910; \$1.20 in 1911; \$1.70 in 1912; \$2 in 1913; \$1.50 in 1914; 90c in 1915; \$2.50 in 1916, and \$2.50 to Oct. 30, 1917; total \$34.90 per share, or \$14,226,500. Dividends reduced to 25c quarterly, Oct., 1917.

Property: consists of two groups of claims, one of about 220 acres on Butte Hill and the other about 790 acres on the Butte East Side mineral area.

Also owns a smelter site consisting of 1,376 acres, and water rights about 20 miles from Butte, 8 miles from Anaconda and near the tracks of the C. M. & St. P. Railway and Northern Pacific Railroad.

In order to give a more regular outline to the company's property and to avoid controversies over extralateral rights, exchanges of acreages have been made between the North Butte and Anaconda companies and agreements have been made between the N. B. and Tuolumne companies covering the ownership and rights to certain parts of the Jessie vein. An undivided one-half interest in the Granite Mountain claim was acquired from the Lewisohns, the company to sink at its own expense the existing shaft from the 500' to the 2,000' level and make certain connections and explorations, the title to the shaft remaining with the North Butte company. During 1912 and 1913 company purchased by cash payments and 20,000 shares of the company's stock, the entire and undivided interest in the lode claims

located in the Butte East Side mineral area. This area lies about 2 miles east of Anaconda hill, between the bed of Silver Bow Creek and the Continental Divide, and is adjacent to the A. C. M. Co.'s Tropic mine and the Pittsmtont mine of the East Butte Company. Development is now in progress on the property by shafts and tunnels.

The Speculator group, or Butte Hill property is traversed by a number of fault veins, mostly belonging to the Blue vein series. These veins carry high-grade ores in shoots, which have thus far been remarkably persistent in depth. The ores carry much primary chalcocite, frequently massive, with considerable quantities of enargite and smaller proportions of other sulphides. All ores carry silver and lesser gold values. The veins are "heavy," requiring close attention and timbering with square sets, monthly timber used being about 1,000,000' board measure. No waste is hoisted, all being used for dry-filling. Waste is largely low-grade ore, a portion of which may be available for smelting at some future date and which can be extracted easily.

The exploration of the vein system has shown the necessity of thorough drifting along the veins at considerable depth and development on all levels down to the 3,000' has opened up profitable orebodies.

The principal ore supply comes from the following veins, named in their order of occurrence from the south boundary of the mine northward: Speculator, Adirondack, Edith May, Hancock, Jessie, Gem, South Croesus, North Croesus, Snowball and Berlin. Of these 9 veins the Speculator, Adirondack, South Croesus and Snowball belong to the older vein system, the Hancock possibly so, and the others are well known members of the Blue vein, or Northwest fault vein series. The Edith May and the Jessie were the principal ore producers of the North Butte in the early operations of the company.

The Edith May is 18' to 42' in width above the 2,600' level, opened at 200' intervals from the 800' level downward. Below the 2,000' level the width of ore in the vein is 8' to 12'. The vein was of little value until the 1,200' level was reached, after which there was a marked improvement, culminating in the 1,800' level, which developed a vein up to 42' wide, carrying a phenomenally high-grade ore, many of its stopes being practically all first-class ore for a distance of about 1,000' along the floor. The 2,000' level showed a slight decrease in average value, as well as in the length of the ore shoot.

Work on the 2,400' level has disclosed a 6' footwall band of 4.25% ore for 525'. Besides this the vein has a fine hanging-wall orebody which, on the 2,600' and 2,800' levels, shows $4\frac{1}{2}'$ of 4 to 4.5% ore for several hundred feet. On the 3,000' level the hanging-wall side of the vein has been developed for 365', ore averaging 5' in width and assaying 5.1% copper. The footwall side is about $3\frac{1}{2}'$ in width, assaying about 3.7% copper. The Edith May vein divides east of the shaft, showing no commercial ore in the south branch, but these branches unite some distance west of the shaft. On the 2,000' and 2,200' levels there are 2 fault planes, defining the limits of the better grade of ore, these faults diverging in their downward course.

The Jessie vein ranks next to the Edith May in production and promise. Where opened on the 700' level in the Gem crosscut, the Jessie showed a vein of about 10' width with bunches of 6% ore. The ore shoot found on the 1,200' and 2,200' level was high grade, 8' wide and nearly 1,000' long, changing in character below this depth and showing considerable sphalerite in the drifts to the west. On the 2,200' level, the vein is about 12' wide, showing some ore up to 5% in copper tenor, but averaging materially lower than the ore in the workings above. The west drift on the 2,000' level opened a 150' ore shoot, 6' wide, carrying 6% copper and 7.3 oz. silver. The 2,200' level shows low-grade ore only. The 2,600' drift west showed 4' of 3.5% ore displaced by a fault 15' from the crosscut and not yet recovered, while 300' of drifting east disclosed small bunches of high-grade ore. On the 2,800' level, vein where cut by a crosscut from the Granite Mt. shaft showed a total width of 6', with 3' high-grade ore assaying 11% copper and 10 oz. silver per ton.

The North Croesus vein is opened by drifts on all levels from the 1,600' to the 2,600', developing a large and important orebody. On the 1,800' level the ore shoot is $8\frac{1}{2}'$ wide, averaging 3% copper and 8 oz. silver per ton; on the 2,000' level the shoot is 300' long, averaging 10' thick, 3% copper, and 6 oz. silver. This shoot has been developed down to 2,200', and on the 2,400' level another shoot, 300' east of the one just mentioned, shows 2' of 3% ore with 7 oz. silver per ton. This shoot has been opened on the 2,600' level for a length of 400', varying in width from 3' to 5', and averaging $3\frac{1}{2}\%$ copper. The vein also contains considerable quantities of zinc ore from which shipments are being made regularly.

The South Croesus vein has been mined from the 1,600' to the 2,400' level, with the best showing at 2,200'. Here two shoots are developed, one 270' in length with an average width of 3', the ore containing 5.5% copper and 5.5 oz. silver; the other, 240' long, averaging $3\frac{1}{2}'$ in width and assaying 3.2% copper and 4 oz. silver. On the 2,400' level a 3' body of ore has been driven on for 200', averaging $2\frac{1}{2}\%$ copper.

The Gem vein showed no ore of commercial importance above the 1,600' level, and the 1,800' level had about 6' of 4.5% ore. It is developed to a small extent on the 18th, 20th, 26th and 28th levels, both value and width increasing with depth, the 2,800' level showing 12' of 5.3% ore carrying 2.2 oz. silver per ton. The vein is irregular in size and grade and where developed has been broken by cross faults.

Adirondack vein, like the Gem, shows no commercial ore above the 1,600' level, but has been mined from this point down to 2,800'. On the 2,400' level the ore has been opened for 600', varying in width from 2' to 12', and averaging 4% copper. On the 2,600' level the shoot is over 200' long, varying in width from 4' to 7' and containing 3% copper. On the 2,800' level there is a width of 4', averaging 3% copper. About 500' west on the 2,000' level a new shoot has recently been opened, which has been opened for 119', showing an average width of 5' of ore, assaying 4% copper and 2.1 oz. silver.

The Snowball vein has characteristically high silver contents. It was first cut on the 18th level in 1910, since which time it has been developed and worked from the 1,400' down to the 2,600' level. The shoot varies in length from about 800' to over 2,000'. On the 2,200' level it has been worked for a length of over 2,000', of which 740' averaged 5' of ore assaying 8% copper. On the 2,600' level the shoot is over 1,000' in length, varying in width from 2' to 4' and averaging about 4% copper.

A new ore shoot was opened in the Berlin vein in 1916 and has been developed on the 1,800', 2,000', 2,200' and 2,400' levels. On the 2,200' level the shoot is 400' long, averaging 4' of ore which assays 6.7% copper and 12 oz. silver per ton. On the 2,400' level the vein encountered in the crosscut shows 2' of ore assaying 9.2% copper and 30 oz. silver per ton.

Development: is extensive, aggregating many miles of workings. New development for 1916 amounted to 21,694', compared with 15,333' in 1915. The four-compartment Granite Mountain shaft, the principal working shaft, is 3,700' deep, and crosscuts have been started on the 3,200', 3,400' and 3,600' levels. A new electric hoist was put in operation in 1915; it is the largest electrically driven hoist in America, designed to handle 200 tons per hour from a depth of 4,000'.

Early in June, 1917, a disastrous fire occurred at the Granite Mountain shaft, starting at a depth of 2,400'. The cause was accidental, but the result was a terrible loss, as 162 men were killed and immense damage done. In Sept. work was begun lining it with steel and concrete from 3,000' depth to surface. Expected to be completed by Christmas, 1917.

The Speculator, the other operating shaft, has been deepened to 2,800' with levels at 200' intervals, from and below the 1,400' point, developing all the veins worked in the mine. The Speculator shaft has a 128' steel head-gear standing on a 41'x60' concrete foundation, equipped with self-dumping skips and pockets, with daily capacity of 1,500 tons of ore, no waste being hoisted, as it is used for underground filling.

The 500' Jessie and 500' Adirondack shafts are idle, and of no present

value. The Gem shaft, 1,600' deep, is used as a ventilating shaft, and a connection has also been made with the Rainbow shaft on the 2,000' level, for purposes of ventilation. These two shafts, as well as the Speculator shaft, are provided with reversible fans.

Hoisting from 350 to 400 tons of ore daily through the Speculator shaft, Nov., 1917.

Equipment: the main machinery plant and buildings are at the Speculator shaft. The engine house has a 20-ton traveling crane, and a 32"x72" Nordberg Corliss duplex-cylinder hoist, operating 2 cages in counterbalance, with two 8-ton Kimberly skips swung under, and good for depth of 3,500'. An 18"x36" duplex cylinder auxiliary hoist operates a double-deck cage, in a third compartment, for handling men, material and timber, and the shaft has a fourth compartment for ladders and pipes.

The compressor house has an air compressor with piston efficiency of 3,482' of free air per minute reduced to a pressure of 70 lbs. per sq. inch capable of operating 40 to 50 rock drills; also a 4,000 cu. ft. compressor. The boiler house has two 500-h. p. and five 100-h. p. boilers. Miscellaneous buildings include a machine shop, smithy, carpenter shop, planing mill and a plate shop for repairing skips.

Employed an average of 1,160 men in 1916. The North Butte ore is smelted by the Washoe works of the Anaconda under a contract by which the company pays the smelter charges to the Anaconda Co. and the copper is turned over to the North Butte Co. and sold by the United Metals Selling Co. for its account.

	Production:		Silver Oz.	Gold Oz.	Copper per Lb.	
	Ore Tons	Copper Lbs.			Net Cost	Sell. Pr.
1916.....	560,673	24,498,181	1,049,574	1,712	15.57c	23.29c
1915.....	378,161	19,235,283	940,632	1,122	13.12c	16.70c
1914.....	337,372	18,421,761	1,092,300	1,107	11.50c	13.74c
1913.....	454,984	28,318,321	1,602,164	1,567	9.76c	15.08c
1912.....	425,248	26,480,123	1,377,468	1,367	9.65c	16.37c
1911.....	410,694	24,816,669	1,134,300	1,281	9.97c	12.56c
1910.....	408,528	25,267,092	988,190	1,196	10.36c	12.77c

Zinc production in 1916: 1,652 tons of ore for 412,953 lbs. spelter.

Although the grade of the ore mined is lower than that produced in the early years of the company's operations, the total amount of copper produced in 1916 was nevertheless little below the record year. The high price of copper made it possible to mine ores of a grade much lower than in previous years, and these ores will be continued to be mined as long as the price of copper will justify it, although by so doing the average grade of ore is obviously lowered and the cost of production raised.

PILOT BUTTE MINING CO.

MONTANA

Office: Daly Bank Bldg., Butte, Mont.

Property: sold to Anaconda Copper Mining Co. for \$1,125,000 in 1916, and cash distributed to stockholders. Company dissolved. Fully described in Vol. XI, Copper Handbook, p. 715.

PITTSMONT COPPER CO.

MONTANA

Controlled by East Butte Copper Co., through ownership of all the preferred and 4/5 of common stock.

Office: 1126 Farmers Bank Bldg., Pittsburgh, Pa. **Mine office:** Butte, Mont.

Officers: R. H. Gross, pres.; J. H. Reed, v. p.; F. Ward Paine, sec.-treas.; R. T. Rossell, asst. sec.-treas.; Oscar Rohn, gen. mgr.; preceding with Wm. A. Paine, directors.

Inc. April 21, 1906, in West Virginia, as Pittsburg & Western Copper Co., and changed name, Jan. 21, 1908, to present title. Cap., \$6,000,000; par value \$5, divided into 1,000,000 shares common stock and 200,000 shares 6% cumulative preferred stock, all issued.

The East Butte Copper Co. owns \$4,002,800 of the common and all the preferred stock. \$910,716 bonds outstanding Dec. 31, 1915, were retired, Feb., 1917. Annual meeting, 1st Monday in April, at Pittsburgh.

The 1916 report showed \$136 cash; \$911,730 accounts receivable; supplies, \$265,388.

Company acquired the property of the Pittsburg & Montana Copper Co., under foreclosure proceedings, July, 1909, selling it to the East Butte Copper Mining Co., which agreed to purchase bonds enough of the Pittsmont Copper Co., to fund its floating debt, aggregating at that time \$2,300,000, and also agreed, until these bonds were fully paid for, to advance all funds necessary for development and operation of the property and interest on the company's indebtedness. In consideration of this agreement the Pittsmont Copper Co. contributed \$4,000,000 of its common stock to the East Butte Copper Mining Co., the latter purchasing \$1,000,000 of Pittsmont preferred stock and \$110,000 of demand notes, issuing its own stock therefor.

Under this agreement made April 8, 1909, and renewed subsequently the East Butte Copper Mining Co. operates the company's property and the net proceeds have been paid as rentals to apply, deducting interest, in payment of the outstanding Pittsmont Copper Co. bond issue. This debt is now entirely paid. See East Butte Copper Co.

RAINBOW LODE DEVELOPMENT CO.

MONTANA

Office: 807 Lonsdale Bldg., Duluth, Minn. Mine office: 14 West Granite St., Butte, Mont.

Officers: Edward C. Congdon, pres.; G. A. Tomlinson, v. p.; James Wanless, sec.-treas.; preceding with Thomas F. Cole, Walter B. Congdon, directors. John D. Pope, gen. mgr.

Inc. Nov. 9, 1912, in Delaware. Cap., \$1,500,000, increased June 1, 1915, from \$800,000; shares \$10 par, issued \$800,000. Bonds: \$400,000, 1st mortgage 5-year convertible 6% due June 1, 1920, convertible into stock at par, and \$80,000 2nd mortgage authorized, \$47,000 issued. Annual meeting, 1st Tuesday in June.

Property: 10 claims, including the Third Sphinx, Michigander, Moral, Valley Queen, Carn Brea, Sarah, Wedge, Hidden Treasure and Wanda claims, with fractional interest in the Lone Star Claim. The group lies east of the Butte & Superior property and is supposed to carry an extension of the Rainbow lode.

Equipment: at Rainbow shaft includes a 300-h. p. double drum hoist good for 2,500', 2 electric hoists, air compressors, combined capacity of 1,650 cu. ft. per min., one 400 gals. and one 200 gals. pump, blacksmith shop, carpenter shop, change house and office.

During 1916 the company completed its Butte & London contract and now owns 51% of the Greendale Exploration Co. stock, which latter company owns the Greendale Placer claim and the Six O'Clock claim immediately south. It paid for this stock according to the contract by sinking the Butte & London shaft to 1,600' and crosscutting to the north and south boundaries of the Greendale Placer claim on the 1,500' level.

The crosscut at the 1,500' level of the Rainbow shaft was extended to the north boundary and a few feet of drifting done from it along veins which looked promising. The drainage drift on that level from the North Butte was completed.

While favorable indications of the possible proximity of ore chutes were found, according to the statement of engineers familiar with Butte camp, no ore of any commercial grade was discovered. The indications above mentioned consisted of quartz filled veins of various dimensions and in several parts of both the Rainbow and Butte & London cuts which gave trifling assays of gold, copper and zinc, nowhere running over 8% zinc or 2% copper or an ounce or so of silver.

In order to complete the Butte & London contract, it was found necessary to raise more money than was provided for in the first mortgage. Consequently, the second mortgage was authorized, and the amount outstanding on it, viz.; \$47,000, was advanced by two of the large stockholders so that the contract might be completed and the Rainbow company get control of the Glendale Placer claim.

The company is now idle, as it seemed best to await possible developments in the neighborhood of its property which might renew the interest of the stockholders of the company to an extent which would lead them to assist in further necessary financing.

While developments have been disappointing in that no ore has been found to a depth of 1,500' on the Rainbow group and 1,600' on the Greendale Placer claim, nevertheless, the officers seem to feel that still deeper development will reveal pay ore.

RAMPART MOUNTAIN MINING CO.

MONTANA

Office: 821 Security Bldg., St. Louis, Mo.

Officers: H. D. Laughlin, pres.; Felix Costa, v. p.; J. P. Meyer, sec-treas.

Cap., \$500,000; shares \$1 par; \$250,000 outstanding.

Property: 10 patented claims, 125 acres, in Park Canyon, Silver Bow Co., Mont., about 4 miles east of Butte, said to show fissure veins in granite. Ore contains gold-silver-copper values. The Rocky Mtn. claim is reported to show a vein about 100' wide, supposedly the continuation of the "Spread Delight" vein of the Main Range.

Development: by 1,500' of workings to depth of 400'. Tunnel said to show copper ore assaying up to 7% with high silver values.

RAVEN COPPER CO.

MONTANA

Property sold, Aug., 1915, to the Anaconda Copper Co., for \$65,000, and company is in process of liquidation. Fully described in Vol. XI, Copper Handbook.

RELIANCE MINING & MILLING CO.

MONTANA

Officers: D. M. Adams, pres.; Box 386, Butte, Mont.; Frank Eichelberger, v. p.; P. H. Kenny, sec.; preceding, with J. C. Lane and J. W. Higgins, directors.

Inc. April 17, 1913, in Mont. Cap., \$150,000; shares 10c par; non-assessable; 1,325,000 issued. Control reported in hands of John C. Norvell, in 1916.

Property: 3 claims, in the Moose Creek section, Silver Bow County, 18 miles south of Butte, show a vein of copper-silver-lead-zinc ore in carboniferous limestone, opened by a 180' shaft. Has produced 22 tons to date; net returns, \$2,611. Plans to deepen shaft and crosscut on 175' level.

SMOKEHOUSE MINING CO.

MONTANA

Subsidiary of the Davis-Daly Copper Co., Butte, Mont.

SOUTH BUTTE MINING CO.

MONTANA

Butte, Mont. John G. Williams, M. E. Riley and Arthur Howell, directors, at last accounts.

Inc. May 25, 1906, in Minnesota. Cap., \$500,000; shares \$100 par. Company was organized by the Great Northern railway interests and has had much litigation, with various individuals and corporations, including the Butte Central Copper Co., East Butte Mining Co., P. D. Morgan and others, winning practically all of the suits. Property was leased to the Montana Consolidated Mining Co., but nothing of particular value was developed, and the latter-named company was liquidated.

Lands: include the Surprise placer claim, but company's chief asset consists of mineral rights to a narrow strip along the Great Northern right-of-way. Idle.

SYNDICATE COPPER CO.

MONTANA

Controlled by Tuolumne Copper Mining Co., Hirbour Block, Butte, Mont.

Officers: W. W. McDowell, pres.; G. W. Stapleton, v. p.; W. E. Reynolds, sec.-treas.; with J. W. Pratt and P. A. Gow, directors.

Cap., \$100,000; shares \$5 par; non-assessable; 9,800 shares held by Colusa-Leonard Extension Copper Mining Co., and 10,200 shares held in escrow for Tuolumne Copper Mining Co., for delivery as work progresses.

Property: 42 acres in Butte district, Mont.

TICON MINING CO.

MONTANA

Idle. Controlled by Jas. A. Murray and the estate of Silas F. King, of Butte, Mont.

Property: 1 fractional claim, about 2 acres, lying between the Bell and Wild Bill mines of the Anaconda and the Speculator and Edith May claims of the North Butte. Mine has a 700' incline shaft on the vein with levels opened at 300', 500', 550' and 600', said to show 4' of good ore in the bottom. Work was stopped by an injunction, secured by the Anaconda Copper Mining Co. in 1908.

TUOLUMNE COPPER MINING CO.

MONTANA

Mine office: 73 Hirbour Bldg., Butte, Mont.

Officers: Ed. Hickey, pres.; W. P. Jahn and Ed. J. Hickey, v. p's.; J. J. Harrington, sec.; P. A. Gow, mgr.; with T. E. Murray and J. A. Canty, directors. L. S. Roscow, treas. Walter Harvey Weed, cons. engr.

Inc. June 4, 1906, in Arizona. **Cap.**, \$800,000; shares \$1 par, of which \$400,000 in stock was given for the property, and 210,000 shares were sold on the Butte market at par, increased May, 1916, to \$2,500,000; \$1 par. Shares are listed on the New York Curb, Boston, Spokane and Butte stock exchanges. State St. Trust Co., Boston, transfer office. Beacon Trust Co., Boston, registrar. Annual meeting, June 20.

Balance sheet: as of Dec. 31, 1916, shows assets of \$2,114,053; this includes, Tuolumne property and equipment, \$826,118; current, \$190,183; investments (capital stock "trust" exchanged and cash paid for Butte Main Range and Colusa-Leonard Extension, stocks, under options, etc.), \$192,846; Butte Main Range and Syndicate Copper stocks received and due for development done under options, etc., \$154,006; Butte Main Range and Syndicate Copper properties under options, etc., for which 500,900 shares of Tuolumne is still held in trust for further development and acquirement of these properties, \$750,900. Liabilities include capital outstanding, \$2,000,000; current, \$31,991; reserve, \$47,451; and suspense, \$31,460.

Profit and loss statement: for year ended Dec. 31, 1916, shows \$220,239 gross smelter returns, and a loss of \$17 for the period. There was \$47,451 placed to reserve for depreciation. The previous deficit of \$35,000 was wiped out.

Dividends: 15c per share in 1911; none in 1912, and two 10c dividends in 1913.

Property: the Tuolumne mine and a controlling interest in the Colusa-Leonard extension and Butte Main Range companies. Under terms of the agreement Tuolumne must do development work estimated at \$500,000. This work includes sinking the Colusa-Leonard shaft from 800' to 1,600' depth and crosscutting to the side lines of the claim about 1,500'.

Under the Colusa-Leonard Extension contract, the property of this company has been deeded to the Syndicate Copper Mining Co., and 51% of this stock is held in trust for delivery to Tuolumne as the prescribed development is done. Assets of Colusa-Leonard consist of 49% of the capital of Syndicate Copper. Main Range and Colusa-Leonard Extension mines were examined by W. H. Weed in March, 1917.

The Tuolumne mine contains the Jessie vein with large oreshoots. The mine has a main 3,000' shaft, developing an orebody of 12 to 15' width, which carried ore ranging from 5 to 12% copper with an average of about 7% down to 2,000', but in the lower levels the vein consists mainly of pyrite, with low copper values. In 1916-17 all development was confined to the 2,400' level, and mining done on the 800', 2,000', 2,200' and 2,400' levels.

Production: from the old Tuolumne mine in 1916 came from the Jessie vein above the 2,000', 2,200', 2,400' and 2,600' levels, and from filling in old stopes above 1,400'. The old levels were reopened and repaired. All ore has been extracted between 2,400' and 1,800'. Ore at 2,600' is bunchy, though of good grade, and better than at 2,400'. Eighteen to thirty-six inches of good ore was opened at 1,200'. The Jessie vein is being developed at 2,800' and 3,000' from the 2,600' winze. In Sept., 1917, 15' of 16.6 oz. silver ore was reported as having been cut on the 700' level.

Equipment: includes a steam plant with six 150-h. p. Erie City boilers delivering steam at 150 lbs. pressure per square inch. There is a powerful Nordberg hoist, good for 3,600' depth and a 20-drill compressor.

Comparative Statement of Production.

	Tons 1st Class Ore	Tons 2nd Class Ore	Lbs. Copper	Ounces Silver	Av. % Copper	Av. oz. Silver
1909.....	1,713.9	1,334.7	475,439	10,728.05	7.80	3.52
1910.....	33,699.6	1,070.1	6,545,241	117,367.90	9.41	3.38
1911.....	24,935.4	4,905.7	4,261,705	96,373.20	7.16	3.24
1912.....	14,011.4	32,671.6	4,716,047	131,867.40	5.05	2.83
1913.....	930.0	33,346.5	1,880,514	77,571.00	3.84	3.20
1914.....	24,283		1,945,286	113,355.78	4.10	*...*
1915(a).....		9,698.0	532,959	32,688.00	2.75	3.37
1916.....	55.0	25,319.0	1,403,999	76,245.00	2.76	3.01

(a) Last 5 mos. *Not reported.

The east holdings of the company embrace 10 claims, 80 acres, covered largely by wash, but containing several strong veins, proven by development work from the Sinbad and the Colusa-Leonard shafts to contain commercial orebodies. Moreover, the tract lies in line with the extension across the valley bottom of several of the known productive veins of the North Butte and Anaconda holdings, and the claims lie west of the big displacement known as the Continental fault. (See pages following.)

This tract is very favorably regarded, and development has already disclosed a large and profitable orebody.

With its new ground the company has started on an active campaign of development which will, it is believed, make it an important producer and dividend payer.

Butte Main Range Copper Mining Co.

Office: Hirbour Bldg., Butte, Mont.

Officers: J. J. Harrington, pres.; A. F. Rice, v. p.; Frank X. Giard, treas.; Geo. E. Palmer, sec.; with Chas. R. Leonard, Lyman J. Roscow, J. W. Pratt, C. C. Willis and P. J. Brophy, directors.

Inc. Aug., 1912, in Montana. Cap., \$1,500,000; shares \$1 par; 666,461 issued, divided as follows: Butte Main Range Copper Mining Co., stockholders, 292,953 shares; Tuolumne Copper Mining Co., 373,461 shares; set aside for T. C. M. Co. for delivery as work progresses, 833,586 shares.

In May, 1916, 2/3 of the stock of the company was optioned to the Tuolumne Copper Co. for \$650,000, to be spent in deep development of the company's property. The company therefore becomes a subsidiary of the Tuolumne, which at the same time takes over 51% of the Colusa-Leonard Extension. Under this contract 180,000 shares of Butte Main Range stock have been put in the Tuolumne treasury for \$92,173 advanced up to Dec. 31, 1916, which with 193,461 shares acquired by exchange of stock makes the Tuolumne Co. the owner of 56% or 666,461 shares of the Butte Main Range capitalization.

Property: 37 acres, includes the Sinbad Lode, Tentpeg, Spread Delight, Rory O'More, Kingstella and larger fractional part of the Lillie claim, at the mouth of Horse Canyon, Butte, Mont.

Work was begun June 1, 1916, the power and surface equipment being remodeled and the Sinbad shaft unwatered, retimbered and enlarged to a standard 3-compartment shaft. The 500', 600' and 700' levels were cleaned out and the 334' crosscut on the 700' level extended south, cutting the Spread Delight lode at 654' from the shaft. The lode is 125' across, showing a north or hanging-wall vein, 18' wide, containing 3½% of commercial ore, that is separated by 30' of altered mineralized "vein granite" from the main vein of the lode. This main vein is 30' wide and carried 3½% copper, with 6 oz. silver per ton across its entire width in the crosscut walls. Beyond this, the main vein of the lode, there is 39' of vein granite, carrying low copper and silver values, before fresh granite is reached.

The Spread Delight vein has been opened for 250' along its course by drifts from the crosscut and by stopes above it, where the ore has been mined 10' to 25' wide, the ore averaging 3½% copper, and 9 oz. silver per ton. This great vein resembles the Leonard of the Anaconda properties and is believed to ensure a long and profitable life to the mine.

The 700' crosscut, 1,151' long on April 5, 1917, is being extended southward to the property line, has already cut two small veins and should cut the Torrid and another large vein. The development work shows that the Main Range holdings include a length of 1,450' on the Spread Delight vein.

The cutting of these veins confirms the opinion expressed by both W. H. Weed and Paul A. Gow, that the Main Range tract is crossed by extensions of the Butte vein system and that the veins carry pay ore.

Shipments for 1916 amounted to 446 tons, dry weight, which contained 22,101 lbs. copper, 2,346 oz. silver, and 3,323 oz. gold.

Colusa-Leonard Extension Copper Mining Co.

Office: 73 Hirbour Bldg., Butte, Mont.

Cap., \$5,000,000; shares \$5 par; 930,280 issued, held as follows: 281,000 by Tuolumne Copper Mining Co., and 649,280 by Colusa-Leonard shareholders. Company holds 9,800 shares of Syndicate Copper Co., valued at \$49,000, Colusa-Leonard's total assets.

Property: adjoining Butte Main Range group on west. Examined in March, 1917, by W. H. Weed.

Development: by shaft, being sunk from 700' to 1,600', where N. and S. crosscuts will be driven to the property side lines. Mine was unwatered by April, 1917, the work being done by the Tuolumne Copper Mining Co.

WASHOE REDUCTION WORKS.

MONTANA

Owned by Anaconda Copper Mining Co., at Anaconda, Mont., and described under that title, with names of head officials of the operating staff.

The following list gives the names of the departmental heads:

Department.	Superintendent.
Conv. & Cast.....	Pat Dalton
Carpenter Shop	R. E. Howe, asst.
Boiler Shop	Carl Johnson
Blacksmith	John Casey
Laboratory	J. A. McDonald
Sampling Mill	J. A. Root
Local Trm. & Wg.....	Rod Munn
Concentrator	W. H. Nutting
Blast	W. A. Estabrook
Surface	P. Barker
Power House	G. Brolin, asst.
Arsenic Plant	W. C. Cadwell
Foundry	M. M. Adams
Testing Dept.	P. J. Grush, asst.
Research	E. M. Dunn
Stock Bins	H. N. Blake
Leaching Plant	C. D. Demond
Reverberatory	F. F. Frick
Briquette	Thos. Marron
Oil Flotation and Regrinding.....	H. T. Maguire
Acid Mill	Ed. O'Brien
Masons	H. S. Ware
Roaster No. 2 and McDougall.....	B. S. Morrow
Coal Dust	M. R. Hoyt
Zinc Concentr.	A. N. Jette
Brick Plant	J. K. Murphy
Electric Department	H. I. Silvester
Machine Shop	S. S. Rodgers
Pipe Shop	H. H. Coe
Paint Shop	L. E. Jones
Lead Burning	Clarence Bardon
Water Works and Street Ry.....	John Bills
Chief Clerk	James Sweeney
	G. C. Detrich
	H. M. Johnson
	Geo. C. Jackson

The Washoe reduction works at Anaconda will have an increasingly varied output in future years. Besides copper, zinc and arsenic, it has an experimental bismuth plant; the sulphuric acid plant turns out 150 tons of 60° acid per day, since July, 1916, part of it to be used in the new dynamite factory under construction at Browns Gulch and the rest for the zinc and copper leaching units of the Washoe plant itself, this output being insufficient to meet the outside demand.

Phosphoric acid will be manufactured from phosphate rock brought from the company's land near Melrose, if the experimental plant to be started in 1916 proves successful; superphosphate could be made but will not stand railway freight charges, whereas the phosphoric acid could go into eastern markets. The building and fire brick plants have already been mentioned.

In the treatment of tailings from the concentration plant, leaching has proven a trifle cheaper than flotation methods, owing to the fact that leaching tailings carry about 0.08% copper as compared with 0.13% in the flotation tailings. The difference, though it is only a pound of copper per ton, is important where 10,000 tons a day are treated.

CASCADE COUNTY

BIG SEVEN MINING CO.

MONTANA

Address: Neihart, Mont.

Officers: D. L. S. Neihart, pres., treas., mgr.; Violet Barker, v. p.; L. S. Barker, sec., with John Clover, directors.

Inc. 1893. Cap., \$3,000; shares \$2 par; assessable; all outstanding. Annual meeting March 10th. Gross earnings for 1916 amounted to \$12,497 and operating expenses totaled \$19,259.

Property: the Big Seven mine, an old-time producer, near Neihart, Cascade Co., Mont., which shows a fissure vein, 2' to 2' wide, in granite porphyry, said to carry high values in gold and silver.

Development: 3,600' tunnel.

Equipment: includes compressor and steam power. Total production to date, \$1,500,000. Management plans advancing tunnel and further development in 1917.

GREAT FALLS-BARKER MINING CO.

MONTANA

Address: Hughesville, Mont.

Officers: S. R. Jensen, pres.; H. H. Roberts, sec. and mgr.; W. M. Johnson, treas.

Inc. 1916 in Montana. Cap., \$250,000; shares \$1 par.

Property: Liberty group of claims in Barker district, Cascade Co., Mont., with past yield of \$30,000.

Ore: contains lead, zinc, gold, and silver values. Flotation plant is to be erected.

CHOUTEAU COUNTY

KING & QUEEN MINING CO.

MONTANA

Mine near Keystone (formerly known as Carter), Chouteau Co., Mont.

Officers: G. T. McCullough, v. p.; John F. Hinckley, sec.; H. A. Spangler, treas.; C. H. McHeffry, supt. in charge.

Inc. Feb. 22, 1905, in Montana, practically as a reconstruction of the Montana Mining & Development Co. Cap., \$1,000,000; shares \$1 par.

Property: 15 claims, partly patented, 188 acres and a 20-acre millsite, well timbered, 3½ miles from Keystone the nearest rail point, in the Spring Gulch district, 9 miles N. W. from Superior. Property carries limestone, quartzite and shale with contact deposits between quartzite and limestone. The deposit under development, of 8' estimated average width, shows copper, lead and silver ore with malachite, chalcocite, chalcopyrite and galena, reported to average 4.5% copper and 12 oz. silver per ton with gold content ranging up to 8 oz. per ton.

Development: by 1,200' crosscut tunnel opening up 4' of 4.6% copper ore that carries 9 oz. silver and 11% lead. This tunnel, planned to be

driven 1,600', has cut the vein 460' below the old workings and intersects several veins. A 200' raise gives ventilation with the upper workings now abandoned. The main workings total 5,000'.

Equipment: includes an 80-h. p. boiler, 25-h. p. hoist and 6-drill duplex air compressor. There are several small mine buildings and a sawmill. About 40 men are employed.

Production: in 1913 was 40 to 50 tons daily, shipped to Utah smelters. A new 125-ton lead-silver concentrator erected, 1914, and development work in progress, 1916-17.

DEER LODGE COUNTY

BOSTON & MONTANA DEV. CO. MONTANA

See same title under Beaverhead County.

BUTTE-CABLE COPPER & GOLD MINING CO. MONTANA

Idle.

Officers: Louis Feldman, pres.; Nicholas Bossonitz, v. p.; preceding officers, Wm. Henthorne, John Strasser, J. G. Kimball and Dan Kowsky, directors. G. W. Peterson, Anaconda, sec.

Inc. Nov. 21, 1906, in Montana. **Cap.**, \$1,000,000, shares \$1 par.

Property: 6 claims, 4 patented, 15 miles west of Anaconda, near Cable Consolidated Mining Co., show a 3 to 4' vein carrying about 2' of commercial ore, giving assays of 11.9% copper, 156 oz. silver and 0.6 oz. gold per ton. Property closed down. Sullivan & Peterson, of Anaconda, offered stock at 15 cts. a share, Feb., 1913, to raise money for patenting claims.

CABLE CONSOLIDATED MINING CO. MONTANA

Office: 52 Silver Bow Blk., Butte, Mont. **Mine office:** Cable, Deer Lodge Co., Mont.

Officers: I. M. Fickeisen, H. Terheyden and S. Robinson, directors; Pittsburgh, Pa.

Property: 700 acres, 15 miles west of Anaconda, include the Cable gold mine, in vicinity of the Southern Cross mine. The Cable mine, worked since 1870, with varying success, has produced about \$4,000,000 worth of ore, with values mainly in gold, but has auriferous copper ore on the tunnel level.

Equipment: includes steam power, air compressor and a 30-stamp mill. In process of reorganization, successor will be Cable Mining Corp'n.

FERGUS COUNTY

ST. PAUL MONTANA MINING CO. MONTANA

Office: Maiden, Fergus Co., Mont.

Officers: O. L. Taylor, pres.; Chas. W. Ames, v. p.; D. W. Taylor, sec.; W. K. Braden, treas.; with L. P. Ordway and E. B. Coolidge, gen. mgr., directors.

Inc. in Arizona. **Cap.**, \$50,000; shares \$100 par; 500 issued.

Property: 2 patented claims, at Maiden, said to show gold ore in contact deposits between porphyry and limestone. Developed by a 450' vertical shaft, with 5,000' of underground workings. Ore claimed to assay \$4 to \$30 per ton and property is said to have produced \$4,000,000. Has recently been under lease.

Equipment: includes hoist, air-compressor, and 50-ton cyanide mill in full operation.

FLATHEAD COUNTY

COMET MINING & MILLING CO. MONTANA

Office: Cocur d'Alene, Idaho. **Mine:** near Whitefish, Flathead Co., Mont.

Officers: Dr. Max A. Dorland, pres.; Fred Eppinger, v. p.; J. H. Wiggert, sec.; at last accounts.

Inc. 1909. **Cap.**, 1,000,000 shares. Developed by a short tunnel. Presumably idle.

FLATHEAD DEVELOPMENT CO. MONTANA

Address: Gen. Chas. S. Warren, 73 Hirbour Blk., Butte, Mont. **Mine:** at Coram, Mont.

Officers: L. O. Evans and John M. Murphy of Butte, Fred Oliver and V. D. Williamson of Spokane. Dr. W. H. Campbell and A. Ingraham of Kalispell, organizers.

Property: Big Copper, Nos. 1, 2, 3 and 4 and Noble Copper claims covering veins 10' to 20' wide, on Felix Creek, a tributary of South Flathead River, 30 miles south of Coram, a station on the G. N. R. R.

Claims practically abandoned in 1917, because of the great distance from a railroad and the high cost of opening up the property.

GREAT NORTHERN COPPER CO. MONTANA

Owens the Great Northern mine, 1 mile north of Tava, Flathead Co., Mont.

Developed: by several tunnels, 200' to 500' long, on the strike of the vein.

Ore: principally gold and copper.

LUPFER MINING CO. MONTANA

Whitefish, Flathead Co., Mont.

Officers: George Hoffman, pres. and mgr.; Mike Sullivan, v. p.; Pete Hoffman, sec.; with E. Boettcher and John Roeder, directors.

Inc. 1906 in Montana. **Cap.**, 500,000 shares; par value 15c; 250,000 issued.

Property: 160 acres, about 14 miles W. of Whitefish. Developed by 150' shaft; showing a well defined vein of copper ore, 3' wide in porphyry and limestone, said to assay 2% copper, 3 oz. silver with a trace of gold. Has a small steam hoist and air compressor. Idle since 1911 owing to lack of funds.

GALLATIN COUNTY

INTERNATIONAL MINING CO. MONTANA

Office: Bozeman, Gallatin Co., Mont.

Officers: J. W. Wilcox, pres.; S. J. V. B. Henderson, v. p. and treas.; Samuel F. Walker, sec. and gen. mgr.; preceding officers, Harvey M. Farris and A. Badgley, directors, all of Bozeman, Mont.

Inc. Oct. 2, 1902, in Montana. **Cap.**, \$600,000; shares \$100 par, fully paid and non-assessable.

Property: 12 claims, 240 acres, well timbered, in Springhill mining district, Gallatin Co., Mont., said to show gneiss, quartzite and shale, fissure and contact veins, opened by 380' to 1,800' tunnels, and 5 shafts of 80' to 800', showing sulphide ores.

Company developing an ore shoot, at last accounts, said to carry 26% lead, 8 oz. silver, and \$8 to \$67 gold per ton. The Lone Star group adjoining the International is practically under the same ownership. Letters neither answered nor returned, so it is safe to say company's affairs are not prosperous.

GRANITE COUNTY

BUENA VISTA MINES CO. MONTANA

Officers: G. F. Russell, bus. mgr., 1303 Dean St., Spokane, Wash.; J. L. Magney, opr. mgr.; identified with the organization are W. P. Russell, J. D. Chickering, F. Leslie, J. Millsbaugh, G. P. Larson, J. P. Boyd, G. F. Russell, D. K. McDonald, V. Rapp, Wm. Coleman.

Property: 3 patented claims, known as Buena Vista mine, Maxville, Granite Co., Mont. Has been idle for 20 years until present company secured bond and lease. Principal values in silver.

BUTTE & ANACONDA CONSOLIDATED M. & M. CO. MONTANA

Office: P. O. Box 138, Anaconda, Mont.

Officers: J. C. Keppler, pres.; J. Winterhalter, v. p.; Andrew Flieger, sec.; John J. Wegener, treas.; with W. R. Allen, directors.

Inc. 1908, in Montana. **Cap.**, \$1,500,000; shares \$1 par; assessable; 900,015 shares outstanding. Company is a consolidation of the Flint Creek Mining Co., and the Golden Eagle M. & M. Co.

Property: 9 patented quartz claims, 3 unpatented placer claims and 2 millsites, about 240 acres, in Flint Creek Gulch, Granite Co., Mont., 3 miles from a railroad. Claims show quartz veins with gold-silver values in part as tellurides. Average assays said to run \$25 per ton. Developed to depth of 450' by 2 shafts and 2 tunnels, 900' long. Idle, owing to lack of necessary working capital.

GRANITE BI-METALLIC CONSOLIDATED MNG. CO. MONTANA

Office: 821 Security Bldg., St. Louis, Mo. **Mine office:** Philipsburg, Mont.

Officers: J. P. Meyer, pres.; E. S. Orr, v. p.; F. D. Fusz, sec.; G. J. Tansey, treas., with C. G. Ewing, J. P. Hartnett, C. D. McLure, L. M. Rumsey, Jr.; A. L. Shapleigh, W. C. Uhri, and F. Whitaker, directors. T. B. Holmes, supt.

Inc. April 6, 1898, in Montana. **Cap.**, \$10,000,000; shares \$10 par; non-assessable.

Property: over 2,500 acres at Philipsburg, Granite Co., Mont. Is a consolidation of the Philipsburg and Granite Bi-Metallic properties, which yielded over 4,000,000 oz. silver per annum in early days, total output being \$50,000,000, of which \$14,000,000 was distributed as dividends. Decline in price of silver resulted in practical suspension of work.

Geology: gold, silver, copper deposit in granite, overlying large area of limestone near west end. Best ore-shoot is said to be 4,400' long. Ore is mostly sulphide.

Development: by 3 shafts to 1,800' depth, and 2 tunnels, longest 8,800'. Greatest depth of workings, 2,250'. Considerable work contemplated for 1917.

Equipment: old mill dismantled and 300-ton plant proposed. Callow flotation system being tried.

Is a large property with good chances.

NANCY HANKS-MONTANA MINING CO. MONTANA

Office: H. A. Bellows, 62 Broadway, New York. **Mine office:** P. M. McCree, supt., Garnet, Mont.

Officers: C. G. Grossman, pres.; J. O. Delamater and J. T. Thatcher, directors; W. E. Gourlay, sec.; H. A. Bellows, treas.

Inc. Oct. 28, 1916, in Maine. **Cap.**, \$1,000,000; shares \$1 par; non-assessable; 954,009 issued.

Property: 8 claims, 3 patented, at Garnet, Granite Co., Mont., 12 miles from Bearmouth.

Geology: quartz vein in granite, from 1' to 8' wide, said to carry an oreshoot from 100' to 130' long. Ore has gold, silver and copper values, and is reported to average \$68 per ton, partly in free gold and partly as telluride of gold, associated with pyrite, etc.

Development: by 100' and 500' shafts. Total workings of 2,500' to 3,000'.

Or reserves: estimated at 1,500 tons blocked out and 3,000 tons expected between No. 5 and 7 levels, all high-grade ore.

Equipment: 2 cylinder Anaconda hoist, 3-drill compressor, pumps, etc. Proposed to erect a 20-ton mill and machinery for 1,500' depth.

Production: The Nancy Hanks mine was opened 20 years ago, and yielded \$500,000 from workings to depth of 80'. After an 18 years' shut-down, a new company secured a lease and option on a large block of stock, sunk the shaft to a depth of 400', and mined ore yielding between \$150,000 and \$200,000. The present company purchased the lease and option on stock, Nov., 1916, sunk 100' deeper, extracted \$45,000, and expects to get \$300,000 more. At end of May, 1917, bins contained 425 tons of high-grade ore. In Jan., 285 tons yielded \$20,000. Total output is about \$700,000. Costs are \$15 per ton.

OLYMPIA MINING CO.**MONTANA**

Office: Princeton, Granite Co., Mont.

Property: Owns Lillian and Banner claims in the Philipsburg district. Tunnel said to cut 3 veins, one 20' wide, carrying galena, silver and gold values.

Developing: 1917.

PHILIPSBURG MINING CO.**MONTANA**

Office: 821 Security Bldg., St. Louis, Mo. Mine office: Philipsburg, Granite Co., Mont.

Officers: John P. Meyer, pres.; John H. Dieckman, v. p.; Jos. P. Hartnett, sec.; F. D. Fusz, treas.; with John J. Taussig, Max Kotany, L. M. Rumsey, Jr., H. S. Rumsey, E. S. Orr, A. L. Shapleigh, Edw. Barklage, directors.

Inc. 1910 in Missouri. Cap., \$50,000; shares \$1 par; all outstanding. Annual meeting, 4th Friday in March.

Property: 450 acres at Philipsburg, said to show ore in contact deposit and quartz fissure veins between limestone and granite. Ore carries gold, silver, copper, zinc, lead and manganese. Company is largest producer of manganese ore in Montana.

Development: by several shafts, deepest 500', and a number of tunnels.

Company is successor to Hope Mining Co., one of the earliest companies formed in Montana. Mine is credited with past production of \$4,000,000 in silver. Also has a deposit of copper ore, but faulted segment has not yet been located.

Production: shipping about 100 tons of manganese ore daily, 1917.

ROYAL BASIN MINING CO.**MONTANA**

Office: Makeever Bros., 170 Broadway, New York, and Journal Bldg., Boston, Mass. Mine office: Maxville, Granite Co., Mont. Walter Neal, mgr.

Cap., \$2,000,000; shares \$1 par; fully paid and non-assessable. The Montana Phosphate Co., formed in 1915 to treat phosphate beds near Maxville, is controlled by same interests as Royal Basin.

Property: the North Star mine of 2 lode claims, 90 acres, in Wymans Gulch, within the Missoula forest reserve and 3 miles east of the Drummond branch of the N. P. R. R. Also owns the Northern Bell mine, a silver property near Princeton. Claims show a fissure vein 15' to 40' wide, in 3 upper tunnels, 100' vertically apart. A new lower tunnel is being driven which cut the vein 800' in and at a depth of 700'. At this point the vein carries concentrating ore 12' wide with a paystreak of sulphide ore, assaying 7½% copper, and 5 to 70 oz. silver, per ton. The smelter returns for over 1,100 tons shipped showed 5.14% copper.

Mine is equipped with a leaching plant using sulphuric acid to get the copper into solution and depositing electrolytic copper as cathode plates in tanks direct from the solution, by electric current. This plant was designed by J. D. Fields, who built a similar plant for Capt. A. B. Wolvin at the Butte-Duluth mine in Butte, Mont; also one, a failure, in Arizona.

While we have no details of this plant, the process, though simple and doing all that is claimed for it in the production of electrolytic copper, is not a cheap one when acid and electric power have to be purchased. Property considered promising, but advertising matter of fiscal agents is not favorably regarded.

Reported leased for 5 years, from April, 1916, to Northwest Cons. Mines Co., Spokane, Wash., and shipping in July, 1916.

In July, 1917, owners refused to give any information, considering our remarks in Vol. XII unjustified.

SWASTIKA MINING CO.**MONTANA**

Address: Philipsburg, Granite Co., Mont. W. W. Williams, mgr.

Officers: W. I. Power, pres.; F. R. Andrus, v. p.; C. E. Hansen, sec.; W. W. Kroger, treas.; the officers are the directors.

Inc. April, 1913, in Montana. Cap., \$500,000; shares \$1 par; 407,043 outstanding.

Property: 3 claims, 1 patented, known as the old Basin mine, and held under long term option, shows a 4' vein of argentiferous copper ore, oxidized to carbonates near the surface, exposed for 100' on the 150' level.

Development: consists of a 190' shaft, and 200' of drifts. Ore averages 4% in copper, 1½ oz. silver, 50c gold per ton.

Equipment: includes electric hoist good for 500', compressor and Cameron pump.

Mine was closed down in 1914, but efforts were being made at last accounts to increase capitalization and resume operations.

WASA (or Hollander) GROUP. MONTANA

Is a property promoted by Makeever Bros., 170 Broadway, New York City, and Journal Bldg., Boston, Mass.

The public was asked to subscribe to shares in an Exploration Syndicate at \$1 a share, with bonus of 4 shares of pooled stock of a corporation to be formed to take over the Hollander, or Wasa group of claims near Hall, Granite Co., Mont.

In April, 1917, Walter Neal, chief engr., advised that he could not recommend further expenditure in developing the mine and it has presumably been relinquished.

See Mine Exploration Syndicate.

JEFFERSON COUNTY

ANGELICA MINING & DEVELOPMENT CO. MONTANA

Address: Wickes, Montana.

Officers: C. d'Autremont, Jr., Duluth, Minn., pres.; Chas. D. Horton, v. p.; C. M. d'Autremont, sec.-treas.; preceding officers, T. T. Hudson and Geo. W. Wilson, directors. Geo. W. Wilson, mgr. Chas. D. Horton, supt.

Inc. Jan., 1915, in Montana. Cap., \$200,000; shares \$10 par; non-assessable; outstanding. August, 1917, 14,320 shares.

Earnings: Gross income from ore sales in 1916 was \$49,556; operating expenses \$64,714.

Property: 6 claims, 110 acres, in Colorado mining district, 2 miles west of Wickes, Jefferson Co., show a contact vein in andesite and rhyolite, strike N. 80° W., dip 75° N. The ore, sulphides below the 400' level, contains lead, silver and gold, occurring in shoots 100' to 300' long, with average width of 3'. Average assay of shipping ore, \$20.00.

Property has been examined and reported on by E. J. Collins, T. F. Field and Reno Sales.

Development: 3,050' tunnel and levels at every 100' to 800' level; total underground workings, 5,100'.

Equipment: includes air compressor, capacity of 360 cu. ft. Work planned for construction of a 200-ton concentrating mill. Production in 1917 amounted to 6,711 tons, containing 1,012,176 lbs. lead, 65,526 oz. silver, 983 oz. gold.

The property was closed down June 1916, but operations were resumed March, 1917.

BALKAN BUTTE COPPER MINING CO. MONTANA

Office: 13 N. Wyoming St., Butte, Mont.

Officers: Chas. Steele, pres.; Paul Germolgez, v. p.; Thos Tomich, sec.-treas.

Inc. Jan. 26, 1907, in Montana. Cap., \$450,000; shares \$1 par.

Property: 4 patented claims, 80 acres, in Elk Park, Jefferson Co., Mont., shows gold, silver, copper, lead ore. Idle.

BALTIMORE COPPER MINING CO. MONTANA

Office: 49 W. Park St., Butte, Mont.

Officers: R. L. Clinton, pres.; J. Maher, v. p.; T. J. Fenlon, sec.-treas.; the preceding with B. E. Calkins, D. J. Charles, P. H. Regan and E. H. Renisch, directors.

Inc. in Montana. Cap., \$2,500,000; shares \$5 par; assessable; 197,520 shares outstanding. No bonds.

Property: five patented claims in Boomerang Gulch, near Boulder, Mont., showing an ore zone 40' wide, with silver-lead ore in lenticular shoots. Ore said to contain about 3% copper, 20 oz. silver, 12% lead and \$2 in gold. Recent shipments reported to have averaged \$20 per ton.

Development: by 5 tunnels, 100' vertically apart, longest 700'. Property under lease, yielded \$1,560 from royalties in 1916, with operating expenses of \$307.

BERNICE RED ROCK MINING CO.

MONTANA

Address: Bernice, via Basin, Mont.

Officers: H. D. Fagon, v. p.; N. B. Lewis, sec.-treas.; J. B. Anderson, agt., 1924 13th St., Washington, D. C.

Property: 4 claims located in Sec. 10, T. 6, N. R. 6 W., 3 miles from Bernice station on Gr. Northern Ry. 26 miles from Butte, shows a large vein with scattered mineralization of lead carbonate and sulphide ore, but low average values, containing gold, \$0.40 to \$1.60, silver 2 to 7 oz., 0.5% copper, lead 2%, and zinc 5%. Course of vein is N. 70° W. with dip 70° S., and where exposed has a width of 8' in the upper tunnel, and 23' in lower tunnel.

Development: 2 tunnels, upper one 150' long, the other 100' vertically below the upper, cut the vein at a distance of 200' from the portal. A 20' winze was sunk on the vein from the lower level. The ore can be cheaply mined and is capable of flotation, but value is low. Company officers and stockholders are all colored men.

BETTY ALDEN MINING CO.

MONTANA

Closed down and company probably dissolved. Fully described, Vols. XI-XII.

BIG FOOT MINING CO.

MONTANA

Inc. Sept., 1917, in Montana. Cap., \$3,000,000; shares \$5 par.

Property: a group of 7 claims in the Big Foot district, Jefferson Co., Mont., about 12 miles from Boulder. Claims said to show ore carrying silver, lead and zinc values.

Development: by several shafts from 50' to 200' deep, all under water.

Mine has been closed down for many years and is now being de-watered and reopened.

BLUE BIRD-CORBIN GOLD, SILVER & COPPER M. CO.

MONTANA

Idle. **Address:** Wickes, Jefferson Co., Mont.

Officers: Wm. Q. Ranit, owner and mgr. John W. Johns, supt.

Property: about 4 miles west of Wickes, is one of the old mines of the district, taken over in 1911 together with the Penn Yan claim. Claims show 2 veins of 4' to 14' in width, carrying ore shoots averaging 5% copper, 5% lead, 25 oz. silver, and \$1.50 gold, per ton. Ore occurs in a tourmalinized vein in andesite tuffs and diorite along a contact with a 50' wide dacite dike that forms the footwall.

Developed: by 2,248' tunnel and 225' shaft, with levels at 100' and 200'. Equipped with electrical power. No recent returns secured.

BOSTON & ALTA COPPER CO.

MONTANA

Address: care Geo. H. Hill, Helena, Mont. **Mine:** near Corbin, Jefferson Co., Mont.

Officers: John Joyce, pres.; Marcus L. Hewett, v. p. and gen. mgr.; Chas. H. Innes, sec.-treas.; above with Walter Callender, Warren Curtis, Sr., Jas. G. Gregg, Archibald S. Spriggs, Wm. Tatham and Chas. B. Van Nostrand, directors; Richard M. Atwater, Jr., cons. engr.

Inc. Nov., 1909, in West Virginia. Cap., \$3,000,000; shares \$10 par; as successor of Alta-Montana Copper Co. to take over and work the Alta mine, whose output of \$32,000,000 has made it one of the big mines of the world.

The Alta mine, passing from the original owners to the Hudson Mining & Reduction Co., was shut down, 1903. The Alta Montana Co., Kelly Mining & Reduction Co., Alta-Montana Copper Co., and Boston & Alta Copper Co., owned property successively. The New Mexican holdings of

the Kelly Smelting & Refining Co. were segregated holdings of present company being exclusively in Montana.

Property: 640 acres, including the Alta group of 8 claims, carrying about 7,000' of Alta or mother lode of the Corbin camp.

Property under bond and lease to Max W. Atwater, Basin, Mont., and is being reopened, 1917. Fully described in Vol. XII.

BOSTON & CORBIN MINING CO.

MONTANA

Office: 67 Milk St., Boston, Mass.; C. R. Jeffers, sec.-treas. **Mine office:** Corbin, Jefferson Co., Mont.

Officers: Harry M. Stonemetz, pres.; R. C. Grew, v. p.; preceding officers, Chas. H. Cole, E. S. Goulston, Ellis L. Dresel and Wm. M. Bradley, directors. Dan J. Courtney, mgr.

Inc. Aug., 1913, in Maine. Cap., \$1,000,000; shares \$5 par; non-assessable; issued, 198,042 shares. State Street Trust Co., Boston, registrar; Boston Safe Deposit & Trust Co., transfer agent.

Company was formed to take over the property of the Boston & Corbin Copper & Silver Mng. Co. and shares of the new company were exchanged for securities of the old company on basis of 75,200 shares for \$200,000 6% convertible bonds and 100,000 shares exchanged share for share upon payment of a subscription of \$1.50 per share for the old stock.

Balance sheet, Aug., 1916, showed: current assets, \$36,841; current liabilities, \$14,424. The first profit from operations in October when \$3,400 was made. Profits have been about \$2,000 monthly since.

Mine was closed down from Nov., 1913, to Jan., 1916. Expenses during shut-down were \$13,525 and cost of reopening property was \$12,483.

Property: the Bertha mine and 12 patented claims aggregating 157 acres, about 1 mile west of Corbin, having about 4,500' of the strike of the Bertha vein.

Geology: country rock is granite with intrusive porphyry rocks, carrying a vein system consisting of a number of parallel fissures. The geological conditions are often called similar to those of Butte, but ore is mainly chalcopyrite, instead of chalcocite, as in Butte, with some enargite and a little bornite of good grade, all argentiferous and slightly auriferous. Lands said to have 16 veins, of which 3 are under development. The Bertha vein is a well-defined, but narrow fissure in granite, varying from 2' to 5' wide with strong walls. The concentrating ore is pyritic and low grade, the concentrates running up to 7% copper, 8.6 oz. of silver per ton with \$2.38 for excess iron; a total value of nearly \$20 per ton. Former estimates proved too optimistic as to values, development being disappointing. Property examined by Frank H. Probert in March, 1913.

Development: mine is developed to a depth of 1,200' and has 15,000' of workings, not including 4 short discovery tunnels, the Boston Fraction crosscut tunnel, 1,500' Corbin crosscut tunnel and 880' Bertha drift tunnel.

An agreement was made with the Chicago & Alta Extension Mining Co., by which company will develop at depth the vein shown on the Corbin claim. Work was begun, November, 1916, on the 1,200' level.

A 200-ton concentrator, costing \$125,000, was finished and put in operation March, 1913, but operations of mine and mill were suspended Nov. 10, 1913, on account of the low grade of ore. Results obtained during the period the mill was operated are as follows: tons ore treated, 30,346; copper assay, 1.85% per ton; silver assay, 2.4 oz. per ton; cost per ton, mining, \$2.87; cost per ton, concentrating, \$1.11; production, 611,924 lbs. copper and 45,950 oz. silver. The mill should never have been built, as development of the mine did not warrant it, but directors acted on advice of their engineers and managers.

Results were unsatisfactory, only half the copper values being extracted. In 1916 the company made tests with the flotation process and in August a 100-ton unit was put into operation.

Ore reserves: at time of closing down were figured at 10,712 tons of presumably the same value as the ore milled.

Equipment: includes an electric hoist, capable of raising 5-ton loads

from a depth of 2,000', at the rate of 900' per minute, and a 15-drill Ingersoll-Rand air compressor, direct-connected to a 150-h. p. motor. Power is bought from the Montana Power Co. at a considerable saving over steam. There are 19 buildings, including a boiler house, engine house, compressor house, bunk house, boarding house, changing house, warehouse, office, laboratory, smithy and dwellings. Cost of wagon freight to railway is 75 cts. per ton on concentrates.

Production: for year ending July 31, 1917, amounted to 36,910 tons, yielding 8,945 tons concentrates, containing 810,877 lbs. copper and 48,254 oz. silver. Cost was 25.564c per lb. copper, and selling price was 29.512c per lb.

With present high price of copper and an 80% recovery of the metal contents of the ore, company should be able to make a fair profit.

BUTTE & BOULDER MINE. MONTANA

See Shields & Ironsides Mining Co.

BUTTE CONSOLIDATED COPPER MINING CO. MONTANA

Mine: at Corbin, Mont. Idle and apparently waiting for developments in the Bertha mine of the Boston-Corbin Co. to prove this property. See Vol. XI, Copper Handbook.

BUTTE & CORBIN CONS. COPPER MINING CO. MONTANA

Idle.

Officers: J. L. Templeman, pres.; Lewisohn Block, Butte, Mont.; Lee Williams, v. p.; J. B. Fitzpatrick, sec.-treas.; at last accounts.

Inc. May 1, 1907, in Montana. **Cap.**, \$700,000; shares \$1 par; non-assessable; issued \$469,000. Annual meeting Feb. 4.

Property: 5 claims, 82 acres; also 10 acres timber lands in the Corbin, or Colorado district, on the eastern side of Valparaiso mountain. The ore is a complex mixture of lead, copper and zinc, occurring in short shoots in fissure veins in granite. Vein reported by company to average 8' 4" in width, and to carry 4% copper, 6% lead, 2% zinc, 8 oz. silver, and \$1 gold, per ton.

Development: by shaft and the 500' Rarus tunnel, which cut a 10' vein at 165' from the portal, assaying 2.5% copper, with paystreak carrying covellite, averaging 6% copper, 8 oz. silver, and \$6 gold per ton. A body of rich ore was reported found in June, 1912, and the Great Northern railroad asked to put a siding on this property. Amount of ore on dump, 7,000 tons of \$10 value, according to Ropes & McIntyre, of Helena, Mont., who reported on property.

CHICAGO & ALTA EXTENSION MINING CO. MONTANA

Office: H. P. Skiles, pres.; 22 N. State St., Chicago, Ill. F. I. Foote, mgr., Helena, Mont. **Mine:** at Corbin, Mont.

Officers: Dr. H. P. Skiles, pres.; H. H. Ebert, sec.; Helena, Mont.; Sheldon Leavitt, treas.; with F. I. Foote, J. E. Smith, E. F. Rinear and Arthur Dole, directors.

Inc. Oct., 1907, in Montana. **Cap.**, \$600,000; \$1 par; \$10,000 in treasury.

Property: 2 claims, 36 acres, at Corbin, Jefferson Co., adjoining the Boston & Corbin Mng. Co. property on the E., shows fissure veins in granite. The veins are from 1' to 10' thick, averaging about 4', and carry lenticular shoots of copper, silver and lead ore, reported to assay \$48 per ton, as shipped.

Development: by 900' shaft with crosscuts and drifts cutting 4 ledges on 900' level. Also has a 1,200' tunnel. Underground workings total 2,000'. Has 50-h. p. electric hoist and compressor.

All work is being done through the Boston & Corbin shaft, crosscutting the entire claim and reported, Oct., 1917, to have cut 5 ledges and to have started drifting. Ore is milled in the B. & C. concentrator and flotation plant under contract with this company.

Property examined by L. S. Ropes.

CORBIN COPPER CO. MONTANA

Office: 60 Congress St., Boston, Mass. **Mine office:** Butte, Mont.

Officers: R. M. Edwards, pres. and gen. mgr.; Henry Tolman, treas., Newton, Mass.; with S. L. Powers, Jos. C. Walker and H. B. Byrne, directors.; A. L. Wyman, sec.

Inc. Dec. 24, 1908, in Michigan. **Cap.**, \$3,750,000; shares \$25 par; assessable; amount issued, 130,000 shares; amount outstanding, 26,000 shares; amount in treasury, 124,000 shares; \$8 per share paid in. Company sold 15,000 shares of treasury stock, early 1910, at \$10. Federal Trust Co., Boston, registrar; American Trust Co., Boston, transfer agt. Stock is listed on the Boston Curb. Annual meeting, third Tuesday in April.

Three assessments levied: \$65,000 due Feb. 11, \$65,000 due April 22, \$130,000 due Nov. 14, 1913. Poor response was made to these and the company was forced to borrow \$95,000 on its notes, giving, as guarantee, the unpaid assessments. Owing to lack of funds all work was stopped on Corbin property early in 1914.

Property: company owns 57 mining claims, 45 patented, near Corbin in Jefferson County, explored under lease and bond, 6 claims at Rochester, Madison County, and the Gambrinus, Belcher and Welch claims at Butte, Mont.; \$150,000 was paid for the Butte claims.

The Corbin group lies at the head of Clancy Creek, a few miles west of Corbin, on the western side of an andesite hill across from the Boston & Corbin mine. This property carries several strong fissure veins in andesite on which considerable exploration work has been done with disappointing results. A vein opened for 800' in the Rosalie tunnel carries up to 20 oz. silver and 7% copper, but is only 18" wide.

The Montana tunnel shows a pyritized conglomerate with andesite, dacite and aplite cobbles, the matrix containing small silver values in the upper tunnel, while the winze in the lower tunnel shows considerable pyrite. The Bonanza tunnel is driven on a tourmalinized granite dike in andesite, and in places the tourmaline rock carries galena and chacopyrite with small amounts of zinc-blende and pyrite. The Corbin property is not considered favorably.

Equipment: includes steam and electric power, commercial current being taken from the Missouri River Power Co. Buildings include a general office, laboratory, warehouse, three smithies, barn, boarding house, 6 bunk houses and 6 dwellings.

A 100-ton mill, near the portal of the Bonanza tunnel, at Wickes, planned as the first unit of a larger mill, was completed July, 1910, and is idle for lack of ore.

The Butte property lies about 800' west of the Gagnon shaft of the Anaconda Co. and is believed to carry the extension of the vein worked in that mine. A shaft, sunk on the Gambrinus, was 345' deep when the work was stopped in 1914. At a depth of 85', a crosscut was driven south 45' to prove the apex of the vein and found it to consist of 2' of quartz and 10' of vein matter, carrying silver-lead ore. On the 200' level N. and S. crosscuts were run. The south crosscuts cut the vein 7' wide here, 70' from the shaft. Better assays were obtained here than on the 80' level. The north crosscut at 180' from the shaft cut a 5' vein, which showed lead, zinc and copper. About 400' of drifting and crosscutting were done in the mine.

The Rochester group shows a strong quartz outcrop, the vein being developed by a 523' shaft in which a crosscut at the bottom level has encountered 2 parallel veins, 15' apart, that assay 3 to 7% copper. Property is locally known as the Blowout mine. No work has been done here for about two years. The company's most promising asset is the Butte property.

In 1917 it is reported that the company will sink the shaft to a greater depth as soon as the necessary funds are available.

CORBIN-COPPER KING MINING CO.

MONTANA

Office: State Savings Bank, Butte, Mont. **Mine address:** Corbin, Jefferson Co., Mont.

Officers: W. H. Hall, pres.; W. D. Gibson, v. p.; R. M. Depeu, sec.-

treas.; preceding officers, I. A. Heilbronner, Wm. Gemmell and M. H. Schultze, directors.

Inc. 1911, in Montana, as successor to the Montana-Corbin Copper Co. **Cap.**, \$1,000,000; shares \$5 par; issued, 199,994 shares. Stockholders of the Montana-Corbin Co. received a new share for old on payment of 25 cts. a share.

Property: 2 claims, 26 acres, about 1 mile from Corbin, in Picnic Gulch, shows 4 well-defined veins carrying bornite and chalcopryite averaging about 10% copper, 20 oz. silver and 50 cts. gold per ton.

Development: consists of a 2-compartment shaft, 400' deep, with about 500' of workings on the Hidden Treasure claim, and several pits and shallow shafts on the Copper King claim. There are also several short tunnels.

Equipment: includes two 60 h. p. boilers, a 15 h. p. hoist, a 5-drill electric air compressor. Idle since organization.

A full report on this property was made, 1911, by Alfred Frank, E. M., supplementing earlier reports by E. P. Jennings, E. M., and L. S. Ropes.

CORBIN METAL MINING CO.

MONTANA

Office: Pittston, Pa. **Mine office:** Corbin, Jefferson Co., Mont.

Officers: J. H. Foye, pres.; John Hoy, v. p.; and gen. mgr.; Thos. McLaughlin, sec.; M. W. O'Boyle, treas.; at last accounts.

Inc. 1907 in Montana, as Corbin-Montana Copper Co., changing name, Jan., 1910, to present title. **Cap.**, \$1,000,000; shares \$1 par; non-assessable; issued, \$400,000. Company apparently is a twin of the Jefferson-Montana Copper Mines Co. Windsor Trust Co., New York, registrar and transfer agt. Annual meeting, second Tuesday in April.

Property: 11 claims, 176 acres, known formerly as the Baldwin mine, 2 miles S. E. of Corbin, in the Colorado district, shows 5 fissure veins ranging from a few inches to about 8' in width, cutting granite. Ores carry chalcopryite, bornite and galena, estimated by company to average 4% copper, 8% lead, 5 oz. silver, and \$2 gold per ton.

Development: by 500' 2-compartment incline shaft with considerable drifting on 500' level, cutting a small orebody carrying lead-zinc-copper sulphides, and by several short tunnels.

Equipment: includes electric hoist, good for 1,000' depth, and a 10-drill air compressor, taking current from the Missouri River Power Co. There are 6 buildings, including carpenter shop, smithy and change house. Idle several years.

CORBIN-VALPARAISO COPPER MINING CO.

MONTANA

Presumably defunct. See Vol. XI, Copper Handbook.

DAILEY COPPER MINING & SMELTING CO.

MONTANA

Idle. Address: Wickes, Jefferson Co., Mont. Wm. W. Dailey, pres.; A. R. Robertson, v. p.; C. H. Dailey, sec.

Inc. Feb., 1907, in Montana. **Cap.**, \$1,500,000, shares \$1 par; issued, \$870,000, of which amount \$800,000 is intact.

Property: the Atlas group of 4 claims, patented, 25 acres in town of Wickes, said to show well-defined fissure vein in andesite. Vein runs E.-W. and is of 12' estimated average width, carrying lenses of ore showing chalcopryite, bornite and chalcocite, estimated by management to average 3% copper, 12 oz. silver, and \$1 gold per ton, 20% iron, 18% sulphur and 50% silica, without lead or zinc.

Development: a 340' shaft, with 2,000' of workings on vein, said to show 70,000 tons of ore blocked out.

Former owners shipped about \$30,000 worth of ore. An independent source estimates ore to average about 3% copper, 7 oz. silver and 80 cts. gold per ton. No shipments have been made for several years and management claims it needs a larger surface equipment and a concentrator.

Idle for several years, owing to inability to finance the erection of a concentrator.

Reports made and property endorsed by F. L. Sizer, and Potter, Bickman & McKenzie.

ELKHORN QUEEN MINING CO.**MONTANA**

Under lease, 1917, and shipping to East Helena smelter. Mine at Elkhorn, Jefferson Co., Mont., was idle many years.

Leasers are stoping ore from a drift on the 300' level; paystreak said to be 30' wide.

EVA MAY MINE**MONTANA**

Basin, Mont. Owned by Betty Alden Mng. Co., which see.

GOLDEN CURRY MINE**MONTANA**

Reported under option, 1917, to and operated by the Guggenheim interests, price being about \$160,000.

Property: the Sour Dough group, 9 claims, 162 acres, near Elkhorn, Jefferson Co., Mont. Orebody 100' wide is oxidized, lying between limestone and granite and dipping at 45°. Claims said to show 5 orebodies, 2 being developed. Ore is iron oxide carrying low values in gold and copper. It contains chalcopyrite and tenorite, such ore assaying 1.9% copper, 4 oz. silver and 0.35 oz. gold per ton, with 48% excess iron.

Development: by open cuts and tunnels, total underground work said to be 8,200'. Ore blocked out estimated at 20,000 tons; probable ore 100,000 tons. Average cost of mining \$2.20, smelting charges \$2.10. Mine was operated in 1917, shipping 100 tons daily.

Geology and history of property given in Bull. No. 527, U. S. G. S., "Helena Mining Region," by Adolph Knopf, pp. 136 to 139.

IRONSIDE MINE**MONTANA**

Owned by Sheils & Ironside Mining & Milling Co., which see.

JEFFERSON MONTANA COPPER MINES CO.**MONTANA**

Corbin, Jefferson Co., Mont. C. K. McCormick, pres.; P. A. Bell, supt.

Property: 16 patented claims, in Colorado mining district, 3 miles from Corbin, shows fissure veins, 3-5' wide in granite. The course of the orebody is N. E.-S. W., with dip of 60-70°. Developed to depth of 540' by vertical shaft. Electric power was installed in 1916.

No recent information available.

KING SOLOMON MINING CO.**MONTANA**

Clancey, Jefferson Co., Mont. S. N. Moreland, pres.; I. S. Moreland, mgr. and supt.

Property: on Clancey creek, 2 miles W. of Clancey, shows granite with aplite cut by a dacite porphyry dike that forms the hanging-wall of the lode. This lode or shear zone is 25' wide, consisting of slabs of rock alternating with bands 1½" to 3" thick of sulphides, mainly gray copper, (tetrahedrite) galena and zinc blende with chalcedonic quartz.

Development: consists of a 300' inclined shaft being sunk to 700', with levels at 100', 200' and 300' W. of shaft.

Equipment: includes hoist, skip and air compressor. Is a small silver property, which is not considered likely to become a dividend payer.

MONTANA CONSOLIDATED COPPER CO.**MONTANA**

Office: 31 Wall St., New York.

Officers: E. P. J. Burgess, pres.; E. P. Haas, v. p.; W. E. Doyle, sec.; T. F. Lee, treas.

Inc. 1906, in Maine. Cap., \$1,000,000; shares \$1 par; all issued.

Property: includes the Comet and Grey Eagle mines, Deerlodge and various placers, millsites, etc., comprising 699.73 acres. The first named mines about 7 miles N. W. of Boulder, Jefferson Co., Mont., have been idle several years, except for work done by lessees.

Ores: are mainly galena and sphalerite with associated pyrite and chalcopyrite, and the Comet is popularly credited with having yielded a gross output of \$13,000,000. **Ore reserves:** said to be 1,350,000 tons, averaging \$20 per ton.

In 1915 M. K. Rogers, of Los Angeles, Cal., took an option on 75% of the capital stock and began an active rehabilitation of the mine and mill. Soon afterwards the New York brokerage firm of Baruch & Co., since dissolved (bankrupt), acquired minority holdings and began advertising the venture; they succeeded in driving the stock up to nearly \$2 a

share, in the belief that Rogers stock was securely escrowed, when suddenly a large block of stock was thrown on the market and quotations dropped to negligible levels.

Canet mine was being unwatered, 1917, and company said to be prepared to spend \$100,000 in mine development. Crosscuts from the 976' shaft have never been driven far enough to reach the main vein on the lower levels. The mill, now remodeled, is working steadily on the tailings.

The vein is a large one and the property promising enough to warrant deep development. Clark, Dodge & Co. are said to be interested in the property, but have publicly disclaimed any interest whatsoever in the stock on the market.

The company's holdings were acquired and exploration undertaken in 1907 on the report of A. A. Blow, in which the hope was expressed that copper ores in paying quantity would be found in depth. The present activity is the result of the abnormal price of zinc, and work at the mine is subordinated to the retreatment of the 100,000 tons of tailings from the old mill, for extraction of their zinc content. The geology is described in Bull. 527, U. S. G. S., p. 114, 1913.

The property has a speculative value as a mine, but the minority stock cannot be recommended as either an investment or a hopeful speculation.

Property produced mill concentrates throughout 1916-17, working old dumps and tailings and parts of the mine above water level.

MONTANA STATES MINING CORPORATION MONTANA

Office: William Muth, sec.-treas., Bailey Blk., Helena, Mont. Mine office: Alhambra, Jefferson Co., Mont.

Officers: R. A. Bell, pres, and gen. mgr.; R. Horsky, v. p.

Inc. May, 1911, in Montana. Cap., \$5,000,000; shares \$5 par; issued, 120,000 shares.

Property: 38 claims, partly patented, 700 acres, in the Warm Springs district, 6 miles from a railroad. Country rock is a quartz monzonite of the Boulder batholith, cut by rhyolite dikes and showing quartz veins with mineralization along the walls.

Development: by numerous shallow shafts, and short tunnels, with about 2,300' of openings. Ores are mainly galena, sphalerite and tetrahedrite, with a chalcadonic quartz gangue reported by management to carry up to 22% copper, 10% lead, 8% zinc, 16 oz. silver and \$16 gold per ton.

Long crosscut tunnel being driven to cut veins at depth, late in 1917.

MT. THOMPSON GOLD MINING & MILLING CO. MONTANA

Address: 56 East Broadway, Butte, Mont., care Western Mining Supply Co.

Officers: Dr. E. S. Rinehart, pres.; John W. Franks, v. p.; C. L. Franks, sec.-treas., with W. H. Rager and Jos. Hunter, directors.

Inc. 1916, in Mont. Cap., \$1,000,000; \$1 par.

Property: 10 claims, in tract 6,000' long, situated on Cataract Creek, 4½ miles from Basin, on the Great Northern R. R., Jefferson Co., Mont.

Ore: carries silver-lead and copper, with some zinc in a complex mixture of galena, pyrite, a little chalcopryrite and much sphalerite. Ore occurs in small shoots in an E.-W. fissure vein in granite. The ledge is said to be 12' to 25' wide, almost vertical and is a typical quartz tourmaline vein.

Development: by 1,000' Copper Hill tunnel, with 35' crosscut 300' in, exposing main ledge.

Equipment: 14-h. p. gasoline engine, small compressor, etc.

Company claims 200,000 tons of ore blocked out that samples \$32 for 500'. Plans erection of mill 1917-18, run by water power. Not favorably regarded, as vein is lean, and orebodies small.

NEW YORK & MONTANA COPPER MINING CO. MONTANA

Address: c/o E. J. Mathews, 1007 Hoge Bldg., Seattle, Wash. Mine near Corbin, Jefferson Co., Mont.

Inc. 1903, in Delaware. Cap., \$1,000,000; shares \$1 par.

Lands: about 250 acres, including the Erickson, Scioto and Copper

Gulch groups, opened by 3 two-compartment shafts, said to make a good showing of medium-grade ore.

Reported in October, 1916, that a plant costing \$30,000 was to be erected to treat mine and custom ores.

NORTHERN VALLEY MINING CO.

MONTANA

Officers: S. F. Mallette, pres.; Godfrey, Ill.; Walter K. Mallette, v. p., Anaconda, Mont.; H. W. Wilson, sec.-treas., Twin Falls, Idaho.

Inc. 1912, in Arizona. **Cap.**, \$1,000,000; shares \$1 par; 600,000 shares issued. Controlled by the American Metal Mining Ass'n of Arizona.

Property: consists of the holdings, of the defunct Amazon-Montana Development Co. in Amazon district, Jefferson Co., Mont. Idle and no work contemplated in near future.

PRICKLY PEAR MINING CO.

MONTANA

Office: care J. C. Murray, pres., Helena, Mont. Mine P. O.: Jefferson City, Jefferson Co., Mont.

Officers: J. C. Murray, pres.; Lee Dever, v. p.; H. M. Brooks, sec.-treas.

Property: the Prickly Pear mine, 2 miles from Jefferson, opened by a 350' tunnel, showing gold and silver-bearing copper ore. Has no power equipment. Production not reported.

ROBERT EMMET COPPER CO.

MONTANA

Idle. Mine at Amazon, Jefferson Co., Mont. Wm. Q. Ranft, pres.; at last reports; John J. Schmitt, sec.-treas.

Cap., \$3,000,000; shares \$5 par.

Lands: 6 claims, patented, 90 acres, carrying veins in granite, not far from the andesite contact. The main vein has a generally N.-E. strike, developed by a 500' shaft, showing a shoot of ore on the 350' level. A 1,200' tunnel having about 1,000' of laterals shows a 10' vein carrying copper, silver and lead ore.

Equipment: includes 10-drill air compressor, electric plant, with transformers, for 60,000-volt current, taken from the Montana Power Co., the Robert Emmet Co. furnishing power to the Comet mine.

SHEILS & IRONSIDE MINING & MILLING CO.

MONTANA

Office: Dr. F. A. Ironside, 16 North Main St., Butte, Mont.

Officers: John Sheils, pres.; Stanley Ironside, v. p.; F. A. Ironside, sec.-treas.

Inc. 1913, in Montana. **Cap.**, \$500,000; shares \$1 par; 446,000 issued.

Property: 6 claims, 2 patented, 120 acres, situated 13 miles N. E. of Butte, and an equal distance from Boulder, Jefferson Co., Montana. Claims show a fissure-vein with ore shoots 250' and 90' long occurring in granite. This granite is cut by an almost vertical dike, greatly altered and mineralized, having a maximum width of over 50'. The ore occurs entirely in the dike, not as a segregation, but in quartz veins running with the dike, within it or at its margin. Orebody is 3' to 5' wide and carries silver, lead, copper, zinc and some gold values.

Reported on by W. L. Creden, H. D. Morse, C. J. Stone; also by H. S. Morris, in Aug., 1917.

Development: by 3 tunnels, main one 1,850' long, with several stopes, and a 50' winze with 200' of drifting at the bottom.

Equipment: includes hoist, 3 drills, electric power, and a 100-ton concentrating mill.

Ore reserves: 5,000 tons of milling ore on dump.

Production: for 1915-16 amounted to 476 tons averaging 4.3% copper, 26.6 oz. silver, and \$4.40 gold.

Shipping about 40 tons of concentrates monthly, 1917.

WAR EAGLE GOLD & COPPER MINING CO.

MONTANA

Property: 3 claims, 7 miles from Alhambra, in Warm Springs gulch, Jefferson Co., Mont., shows strong fissure veins in granite. Mineralization is in paystreaks in soft altered granite, the ore consisting of pyrite and a little chalcopryite, whose value is mainly in gold.

Development: by a 300' tunnel, planned to intersect the vein at about 1,500' and give a back of about 500'. Presumably idle.

WASHINGTON MINE**MONTANA**

See Angelica Mining Co.

WESTERN RESERVE MINING CO.**MONTANA****Office:** Youngstown, O. **Mine office:** Basin, Mont.**Officers:** F. S. Merwin, pres.; C. Livingston, v. p.; H. F. Duesinc, sec.-treas.; the foregoing and C. J. Burns, J. E. Richardson, A. F. Schontz, E. C. Welch, J. W. Kuhns, directors. J. H. Hildebrand, supt.**Inc.** in Ohio. **Cap.**, \$100,000; shares \$1 par; non-assessable; no bonded indebtedness; annual meeting, February 1. **Transfer office:** Youngstown, O.**Property:** 3 claims, at Basin, Jefferson County, being developed for gold, silver, lead and copper. The quartz veins in granite strike E. W. and dip N. Pay ore occurs in large and small bodies as shoots and streaks showing sulphides.**Development:** by 2,700' tunnel, greatest depth being 660'.**Equipment:** includes a steam compressor. Future work includes driving 100' tunnel and erection of concentration plant. Developing in 1916 and 1917.**WHITEHALL MINING, MILLING & DEV. CO.****MONTANA****Idle. Address:** Whitehall, Mont.**Officers:** T. T. Gates, pres.; N. D. Root, v. p.; C. W. Hatch, sec.; with Edw. Ryan, Jesse Johnson, L. B. Knight, R. Edwards, J. M. Borden and Jas. Ryan directors.**Inc.** June, 1914, at Whitehall, Mont. **Cap.**, \$500,000; shares \$1 par; 200,000 shares in treasury; 250,000 shares were given for the mining property.**Property:** 5 claims, about 3 miles N. E. of Whitehall, Jefferson County, is reported to have an orebody 36' wide from which shipments have averaged \$16 per ton.**WICKES-CORBIN COPPER MINING CO.****MONTANA****Office:** 21-25 Union Bank Bldg., Helena.**Officers:** S. A. Balliet, pres.; A. Major, v. p.; L. C. Henry, sec.-treas.; foregoing with N. Salvail and T. A. Grimes, directors.**Inc.** July 9, 1907, in Montana. **Cap.**, 5,000,000 shares; 10c par; non-assessable; outstanding 3,633,900. Annual meeting, 3rd Tuesday in June.**Property:** 7 claims, 3 patented, 140 acres, 20 miles S. of Helena, and a half mile S. of Wickes, Mont. The claims show N.-S. and E.-W. fissure veins cutting granite, aplite, andesite and dacite. Ores carry gold, silver, copper and zinc.**Development:** by Bunkerhill tunnel, 1,030' long and Tulare tunnel, 700'; also 220' shaft. Total workings, about 2,500', greatest depth, 350'.**Production:** test lot of 31 tons in 1917 returned 4.87% copper, 17.6 oz. silver, and 0.01 oz. gold, equal to \$24.94 per ton. The cost was \$4 per ton.*LEWIS & CLARK COUNTY***ARKANSAS COPPER CO.****MONTANA**

Mine, on Ten Mile creek, near Helena, Mont., and about 2 miles west of the summit of Mount Helena, is developed by a 200' shaft.

Property: shows a 30' vein in diorite, traceable 800', carrying some copper ore with small gold and silver values. Was in hands of lessees early 1915, but now inactive.**BARNES-KING DEVELOPMENT CO.****MONTANA****Address:** Butte, Mont. **Mine office:** Kendall, Fergus Co., and Marysville, Lewis & Clark Co., Mont.**Officers:** C. W. Goodale, pres.; A. J. Davis, v. p.; J. E. Corette, sec.; C. C. Swinborne, treas.; preceding officers, C. R. Leonard, F. L. Melcher, I. A. Heilbronner, T. A. Marlow, directors. Geo. P. McGee, mgr.; Jerome Place, Helena, Mont.; I. H. McCormick, supt. Piegan-Gloster; W. R. Price, supt. Shannon mine.**Inc.** 1907, in Montana. **Cap.**, 400,000 shares, \$5 par; all issued. Security Transfer & Registrar Co., New York City, transfer agt. Annual meeting, 1st Wednesday in March. Stock listed on Butte Exchange.

Balance sheet Dec. 31, 1916, shows assets of \$2,464,292, which includes properties and options, \$2,299,707; buildings, supplies and bullion in process, \$54,802; bullion in transit, \$74,395; accounts receivable, \$663; cash, \$34,726; liabilities include a surplus of \$324,825.

Dividends: 7½ cts. a share was paid March, 1916, and June, 1916. A 10c dividend was declared payable November 15, 1917. Total to date is \$100,000.

Net profits have been as follows: in 1913, \$24,700; in 1914, \$150,419; in 1915, \$147,968; in 1916, \$96,338; \$337,488 for 9 months ended Sept. 30, 1917. Operating profits of the North Mocassin property were \$40,255 in 1916, and \$35,971 for 9 months of 1917; of the Shannon property, in 1916, \$96,071, and \$178,268 for 9 months of 1917; the Piegan-Gloster property operated at a loss of \$22,362 in 1916 and earned \$25,391 to Oct. 1, 1917.

Property: originally owned and operated by the company, consisted of the Barnes-King group of claims at Kendall, developed by the Barnes-King mine.

In 1912, after working spasmodically for several years and spending considerable time and money in an unsuccessful search for new orebodies, the mine was closed permanently, with about \$300,000 left in the treasury. The management now determined to acquire a good property for the company. In 1912 the North Mocassin property, covering about 2,000' in length along the ore-bearing formation adjoining the Barnes-King on the north and the Kendall on the south, was purchased for \$150,000; \$5,000 cash, and the remainder to be paid from net working profits in no prescribed time. In addition a working option was obtained on the Piegan-Gloster property, located near Marysville, Lewis & Clark Co., Mont. Title to this property was obtained in 1913; purchase price paid for it was \$100,000, with an additional cost of \$8,200 for 5 adjoining claims. The Gloster mine had been worked from 1880 to 1888, when the pumps were pulled. It is credited with a production of several million dollars of gold and silver bullion.

In 1915 the company bought all the property of the Kendall Gold Mng. Co., adjoining the North Mocassin on the south, for \$100,000, and an option was taken on the Shannon mine, 2½ miles southwest of Marysville; purchase price is \$228,574, payable from mine profits. Final payment was made during third quarter of 1917.

At the end of 1916 the company owned, or had under option, the following properties: At Kendall, the Barnes-King group, 23 claims, 286 acres; North Mocassin group, 6 claims, 67 acres; Kendall group, 21 claims, 266 acres; total, 50 claims, 619 acres; at Marysville, the Piegan-Gloster group, 34 claims, 391 acres, and the Shannon group, 6 claims, 92 acres, exclusive of 2 claims purchased late in 1915. In Jan., 1916, the company took an option and lease on 2 claims, known as the Parker-Brownlow group, in the Rimini district, 22 miles from Helena. After spending \$20,495 and exhausting the shipping ore, the option was relinquished in Sept., 1916. The orebodies at Kendall are irregular replacement deposits in limestone, dipping 25°. The ores are mostly soft and well oxidized.

Development: the North Mocassin group was first worked through the Barnes-King shaft; later the Santiago shaft was completed to the 500' level and it is now the main working shaft. Orebodies have been opened up on different levels to a depth of nearly 800'. In 1916 underground work totaled 6,600'. The Kendall mine was closed by former owners in 1913, after having exhausted all known orebodies to a depth of 560'.

The old Gloster mine had been opened by a vertical shaft to a depth of 500', and a winze sunk 300' below the 500' level. The Piegan claim had been developed by tunnels. The B. K. Co. has unwatered the Gloster mine to the 800' level and opened up the Piegan orebody above water level. The Norman tunnel, connecting the No. 4 Piegan tunnel and Gloster workings with the tramway to the mill, was driven 900'. All ore mined in 1916 from the Piegan-Gloster and Shannon ground averaged \$9.48 per ton.

The Shannon mine, previous to the time of its being taken over by the B. K. Co., was opened by a tunnel with 2,000' of underground workings.

chiefly on the vein which, in the tunnel, is 300' long, from 4 to 10' wide, and averages \$15 in gold per ton. The B. K. Co. has sunk a 215' winze on the vein, dip 70°, and opened up the 200' level for a distance of 400' to the W. and 122' to the E. The vein is in slate, and where crosscut on the 100' level is said to have a width of 15'. Ore taken out in drifting amounted to 800 tons of ore, assaying \$16 per ton. The Shannon mine is 13,400' from the Gloster mill, with which it is connected by an aerial tramway.

Equipment: at the North Moccasin there is a double drum electric hoist, compressor, and a 1,400' electric tramway from mine to mill, which is on the original B. K. group, and has a nominal daily capacity of 200 tons, allowing a 10-days leaching period. There is also a small oil fired roaster for treating the black unoxidized ore found in the eastern ore shoot. There is a 500-ton cyanide plant on the recently acquired Kendall property. The Piegan-Gloster equipment includes a double drum electric hoist, 100-h. p. motor and compressor at the Gloster shaft. The old Gloster 60-stamp mill has been equipped with a N. 5 Symons disc crusher, three 10' Chilean mills, 2 Wilfley tables and a cyanide plant. The mill is to be connected to an all-slime treatment plant with a daily capacity of 150 tons. The Shannon mine has a 75-h. p. electric driven compressor.

Power: the purchase of the Kendall property included a 400-h. p. hydro-electric plant on Warm Springs creek, 6 miles from the mine. This plant furnishes power for the Kendall properties, and also supplies the towns of Hilger and Kendall with lighting facilities. The Piegan-Gloster and Shannon properties obtain power from the Montana Power Co.

Production: North Moccasin—

	Tons Milled		Assay per Ton	Rec.	% KCN.	Lbs. Cons. per Ton			Total Costs per Ton	Net Profits per Ton
						Zn.	Lime			
1916.....	33,715		\$8.65	86.5	0.46	0.38	7.5	\$4.08	\$2.80	
1915.....	47,038		9.80	89.7	0.40	0.43	4.0	4.65	4.28	
1914.....	51,471		8.92	93.8	0.27	0.46	3.2	4.40	3.84	
1913.....	49,726		8.89	90.58	0.32	0.34	2.7	5.05	3.29	

Piegan-Gloster—Shannon mines—

1916.....	35,536		\$9.48	....	0.78	1.03	10.12	\$1.46	....
1915.....	14,956		7.34	85.2	....	....	....	6.94	\$1.07

Earnings in September, 1917, show a decrease from August of \$18,226, the September earnings from all properties being \$98,774 against \$117,000 in August. The original property of the company, known as the Barnes-King mine, is not being worked. An adjoining property, the North Moccasin, purchased by the company and paid for out of its own earnings, yielded \$22,204 from 2,476 tons of ore in September, while the Gloster and Shannon mines, near Helena, yielded a total of \$76,569 from 4,676 tons of ore. Both the Gloster and Shannon were also purchased and paid for out of their own earnings.

During third quarter of 1917, the North Moccasin yielded \$53,739 from 5,408 tons and \$18,838 profit; \$48,587 from 4,484 tons and \$6,726 profit at the Piegan-Gloster; and \$177,071 from 8,460 tons and \$129,243 profit at the Shannon.

\$100,933 was paid for the Kendall property in 1916 and \$15,920 net was spent on the Woodrow Wilson claim.

The results thus far in 1917 have been more favorable.

CARBON HILL MINING & MILLING CO.

MONTANA

F. S. Earnest, Spokane, chief owner.

Property: 9 claims, in the Grass Valley section, 1 mile north and west of Fort Harrison, Helena, shows a vein for 2,300'.

Development: by 250' incline shaft showing 5½' of carbonate ore and galena, said to assay \$48 per ton. Value is chiefly in the gold content. A 15' shaft with 20' drift, shows a 9' vein of carbonate ore said to assay from \$23 to \$111 per ton.

Two carload shipments yielded \$23 and \$11 per ton respectively. Employs 3 men. Has a 6-h. p. gasoline hoist.

CRUSE CONSOLIDATED MINING CO.**MONTANA**

Address: Marysville, Mont. R. A. Weisner, sec.; Jas. J. Cruse pres.; E. D. Phelan, v. p.

Cap., \$1,500,000; shares, \$1 par.

Property: several mines in the Marysville district, and in Grass Valley, near Helena, Mont., including the Looby and Rock Rose mines. Ores contain lead, silver, and copper. The Looby vein is parallel to the Rock Rose. The Rock Rose mine has 200' shaft showing 6'-8' vein with 2' paystreak running 35% lead, 31 oz. silver, the ore averaging \$32 per ton. The Looby incline shaft is 160' deep and shows lead-silver ore of unknown extent.

CUPRITE COPPER MINING CO.**MONTANA**

Mine near Marysville, Lewis & Clark Co., Mont.

Officers: P. L. Reece, pres. and mgr., Helena, Mont.; J. B. Waltz, v. p.; F. J. Rixon, sec.-treas.; preceding officers, P. B. Moss, Geo. M. Siple, directors.

Cap., \$300,000; shares, \$1 par; non-assessable.

Property: 10 claims, about midway between Helena and Marysville. Two well-defined veins on property; one, a gold-silver-lead vein, 4' to 20' wide, the other, a gold vein of promise. The unpatented claims have been surveyed for patent.

Development: by 200' shaft, 100' of drifting on this level, and a winze 100' deep, with 340' of drifting on the 300' level, which will cut the quartz vein at depth of 340'.

Equipment: includes a steam hoist and air compressor.

EASTERN BELLE MINING CO.**MONTANA**

Address: Helena, Mont.

Officers: Geo. Huffaker, pres.; S. T. Hill, v. p.; Geo. H. Hill, sec.-treas.

Inc. 1916. Cap., \$100,000; shares \$1 par. Bought the Eastern Belle mine from Helena Bureau of Mines.

Property: 2 claims, 40 acres, in the Scratch Gravel camp, near Helena. Claims show quartz, carrying free gold.

Present management plans to sink incline shaft several hundred feet.

ECONOMY GOLD MINES CO.**MONTANA**

Address: East Helena, Mont.

Officers: J. L. Kessner, pres.; S. Rosenfield, v. p.; I. Rosenfield, sec.; E. J. Hyman, treas.; directors.

Inc. in Montana. Cap., \$1,500,000; shares \$1 par; 280,000 issued.

Property: 180 acres, patented, 6 miles from East Helena, shows 15 fissure veins in diorite, andesite and granite. Chief vein has an E.-W. strike, with 75° dip. Ore, containing gold, silver and copper, occurs in shoots said to average 3' in width and from 35' to 150' in length.

Development: by 2 shafts about 300' deep.

Equipment: includes boilers, 3 gasoline hoists, two 75-h. p. compressors and complete electric equipment installed, 1917, and an 8-stamp mill.

Ore: developed on 300' level is same shoot of high-grade ore stoped on the 100' but wider and varying from \$10 to \$235 per ton.

FRANKLIN MINING CO.**MONTANA**

Address: Helena, Mont.

Inc. 1915, in Montana. Cap., \$1,000,000; shares \$1 par. Owned by estate of Thos. Cruse.

Property: in the Scratch Gravel district near Helena, Lewis & Clark Co., Mont., adjoins the property of the Scratch Gravel Gold Mining Co., on the W. The mine is said to have made total profits from April, 1914, to June, 1916, of \$196,498.

Claims show 2 veins, crossing, one carrying high-grade gold ore, with free gold, the other silver ore. The gold vein is developed eastward and passes into the lands of the Scratch Gravel Co. Values are chiefly in gold. Employs 50 men.

FURNACE CREEK OXIDE COPPER CO.**MONTANA**

Office: c/o John E. Corrette, sec., Hennessy Blk., Butte, Mont. Alex. Burrell, mgr., Argo mine, Canyon Ferry, Lewis & Clark Co., Mont.

Officers: Chas. W. Goodale, pres.; John D. Haines, v. p., with A. H. Jones and R. C. Monahan, directors.

Inc. Oct. 23, 1906, in Arizona. **Cap.**, \$5,000,000; shares \$5 par; 170,325 in treasury, Jan. 1, 1917.

Company was organized to operate in the Death Valley district, Inyo Co., Cal., but abandoned original holdings after unsuccessful attempts to locate commercial orebodies. In 1916 acquired 51% of Argo mine in Hell Gate canyon, about 30 miles E. of Helena, Montana. Property was formerly owned by the Eclipse-Argo Co., producing 2,000,000 lbs. of copper, 1903-1916. In 1916 was bought by Castleton Copper Co.

Property: 5 claims, 2 patented, held on bond and lease for \$245,000. Mine has a well defined fissure vein, 13" thick, traversing shale and limestone, with dip of 75-80°. Ore occurs as massive chalcopyrite assaying 25% copper and is mineable and clean.

Ore reserves: estimated October, 1916, at 2,060 tons of 25% ore in sight. Mine fully equipped. Reported on in 1916 by F. A. Linforth.

Shipments by former owners to Washoe Reduction Works, up to July, 1916, said to have netted \$114,071.

Operations for 1916-17 are satisfactory and bond will be taken up. Shipments, 19 miles by wagon to Louisville on the N. P. R. R. to August 1, 1916, amount to 720 tons of ore that assayed 24.75% copper, or 356,400 lbs.

Property small, but excellent and management competent.

HELENA MINING BUREAU, INC. MONTANA

Address: L. M. Rheem, sec.-treas. and mgr., Helena, Mont.

Officers: S. A. Balliet, pres.; M. H. Gerry, Jr., v. p.; preceding with E. N. Brandegec, F. M. Smith, J. P. Bahnsen, C. E. Dalton and T. O. Hammond, all of Helena, directors.

Inc. April, 1914, in Montana. **Cap.**, \$100,000; shares \$5 par; 8,000 shares outstanding. Annual meeting 2nd Monday in January.

Bureau was formed for the purpose of advertising and creating a renewed interest in mining industries in the Helena district. Each citizen, who wished to do so, subscribed \$5 a month, receiving a share of stock for each subscription for the term of three years or longer. This public enterprise has been most beneficial to the mining industry of the section. It has created great mining interest all over the country in the Helena district and many newcomers have taken advantage of the mining opportunities.

In January, 1917, the Helena Mining Bureau took over the operation of the Helena mine, located in Grass Valley district. This mine is fully equipped with a 300' shaft and is making regular shipments.

Ore: lead, silver and gold with a net smelter return around \$23 per ton.

Production: averages 3-4 cars monthly which it is expected will soon be increased.

MADDEN SCRATCH GRAVEL MINES CO. MONTANA

Address: Helena, Mont.

Officers: Jas. Madden, pres.; Peter Scharenbroich, v. p.; Wm. Muth, sec.-treas.; above, with Theo. Sarter, L. P. Wells and E. Edwards, directors.

Inc. March 16, 1916, in Montana. **Cap.**, \$300,000; shares \$1 par; outstanding \$170,000. Annual meeting, 3rd Monday in June.

Property: 3 patented claims, 50 acres known as the Jacquemin group, in the Scratch Gravel Hills, 8 miles from Helena, said to show gold ore in fissure veins in granite. The claims are said to have been worked in a haphazard manner by Jacquemin.

Development: 160' incline shaft, and 340' tunnel. Present management intends to develop the property. Fair results were reported in 1916.

MARYSVILLE GOLD MINING CO. MONTANA

Address: A. B. Wolvin, Duluth, Minn. **Mine office:** Marysville, Mont.

Officers: Geo. O. Freeman, pres.; Ted E. Collin, sec.-treas.; L. S. Ropes, supt.-cons. engr.

Inc. 1911, in Montana. **Cap.**, \$1,000,000; shares, \$1 par; 527,000 issued.

Property: 30 claims, 430 acres, in Marysville district, 20 miles from

Helena, Mont. This region was practically dead for years, but is reviving through the efforts of the Barnes-King, St. Louis, and other companies. Marysville Co.'s principal mine is the Blue Bird-Hickey.

Development: mainly by tunnels. About \$120,000 said to have been spent in recent exploration.

Ore reserves: estimated by company at 200,000 tons of \$10 ore. Because the 500' level of the Shannon mine of the Barnes-King Co., adjacent to the Marysville Co.'s mine, shows rich gold ore, the Marysville Co. claims indicated reserves of several millions, which is an unsafe assumption.

Milling expected to commence at end of 1917. Is considered a meritorious property.

MONTANA COPPER-SILVER CO.

MONTANA

Idle. Address: E. R. Purnell, supt., Helena, Mont.

Mine in Scratch Gravel hills, Lewis & Clark Co., Mont., 8 miles from Helena, shows quartz veins in quartz-monzonite, carrying ores with pyrite and chalcopryrite and gold-silver values.

Development: by shaft and drifts. Equipped with hoist. Is not favorably regarded.

NEW COPPER SILVER CO.

MONTANA

Address: Helena, Mont.

Officers: W. C. Bardon, pres.; Z. B. Melborn, v. p.; J. R. Wine, sec-treas. Company acquired the holdings of the defunct Copper-Silver Montana Mining Company at receiver's sale in 1914.

Property: 7 claims, 130 acres, adjoining the Lexington and Sacajewea, in the Scratch Gravel district, 1 mile from Great Northern railway, and 5 miles north of Helena. Claims show granite and monzonite, reported to carry numerous fissure veins, dipping N. W. and S. E. All veins are reported mineralized at surface, carrying melaconite, azurite and malachite. Mine has a 500' shaft, cutting at 300', a vein estimated to average 4.5% copper, 12 to 100 oz. silver, and \$1 to \$55 gold per ton.

Equipment: includes a 30-h. p. steam hoist and a gasoline engine. Operations have not yet been resumed by this company.

NORTHWESTERN METALS CO.

MONTANA

Shared the fate of all Marcus L. Hewitt promotions. Bankrupt. Entire property reported sold by court for \$22,000, July, 1916. Fully described Vol. XI, Copper Handbook.

O. & M. MINES CO.

MONTANA

Office: W. W. Tolman, sec., Old Natl. Bank Bldg., Spokane, Wash.

Officers: M. C. Banfield, pres.; Frederick Keffer, v. p.; Rich. Martin, Jr., treas.; Henry Johns, mgr., Hutton Block, Spokane.

Inc. in Montana. Cap., \$1,000,000; shares \$1 par; 900,000 issued. 150,000 shares were offered the public, April, 1917, at 50c each. Final payment of \$100,000 on lease and bond, due Sept., 1917.

Reported Sept. 24, 1917, that the company had insufficient funds to make the payment due on the Mike Horse group and forfeited the property. Failure was result of inability to cut fuel owing to severity of winter weather, early in 1917, and consequent inability to earn the bond money.

Property: 9 claims held under bond and 14 claims located by company, unpatented, known as the Mike Horse Group, 40 miles north of Helena, in the Silverton camp, Lewis & Clark Co., Mont. Mine was worked 20 years ago for its high-grade silver lead ore, but the ore becoming base with depth it was abandoned.

Development: by tunnels aggregating 3,400', has proven up 5 veins. the main, or Mike Horse vein, estimated to contain 55,000 tons of positive ore with average assays of 15% lead, 10 oz. silver, 12.5% zinc, 1% copper and .03 gold per ton. A new tunnel, 130' lower, is being driven to cut the veins at depth.

Equipment: includes 100-ton concentrator.

Production: during 1916 totaled 325 tons of silver-lead concentrates. netting about \$12,700.

Haulage charges of \$14 per ton were paid, 1916.

PORPHYRY DYKE GOLD MINING CO. MONTANA

Address: James Breen, gen. mgr., Helena, Mont. Operating the Porphyry Dyke gold mine at Rimini, Lewis & Clark Co., Mont.

Mill being remodeled, Sept., 1917. S. R. Brown, mill supt.

ROCK ROSE MINING & MILLING CO. MONTANA

Officers: J. M. Nilan, pres., Helena, Mont.; H. C. Krug, v. p.-treas., Butler, Pa.; Andrew Weisner, sec., Helena, Mont.; R. A. Weisner, asst. sec.; L. S. Ropes, cons. engr.

Inc. in Montana.

Property: 6 claims, 3 patented, adjoining Fort Harrison on east, near Helena, Mont., and 3 claims under option. Dandy claim has 117' shaft with 300' drift and crosscut exposes 2 veins, one of silver-lead, the other of gold ore. Galena vein is 6" to 4½" wide, averaging 2½'.

Ore: silver lead carrying \$14.07 to \$57.79 per ton. A total of 196 tons of ore shipped in July, 1906, June, 1907, July, 1908, yielded \$4,234 smelter returns.

Development: by 300' shaft with a 125' drift, exposing ore for 75', in part lead and in part copper ore that carries 4½ to 10% copper. The gold vein is 2-3' wide and reported to average \$25 per ton, though none has been shipped. The vein is traceable by 6-7 pits for 378' across the claim.

Stated in Aug., 1917, that good ore was opened at 200'. The ground is traversed by many veins and porphyry dikes.

Equipment: 80-h. p. boiler, compressor, etc., complete. Buildings include engine house, ore sorting house, boarding and bunk houses. The freight rate is but \$1 per ton for team, R. R. and loading. Water is handled by 1-2 hours pumping each day.

Property adjoins and is east of Helena Mine & Christmas Gift. Although lessees only shipped 190 tons hand picked ore in 2 years, the mine is shallow and worthy of development.

District is an old one, but ore-shoots heretofore developed have faded out in depth.

SACAJEWEA GOLD & COPPER MINING CO. MONTANA

Office: 11 Broadway, New York. Mine near Helena, Mont. Col. Henry Altman, pres. and gen. mgr.; W. J. Anson, sec.

Cap., \$5,000,000; shares \$10 par.

Property: 47 claims in the Scratch Gravel district, adjoining the Copper-Silver Montana Mining Co. Idle some years, but work resumed 1916.

ST. LOUIS MINING & MILLING CO. MONTANA

Address: Marysville, Mont.

Property: the famous Drumlummon mine, now yielding 100 tons of silver ore daily with gold values.

Equipment: 25-stamp mill and cyanide plant.

SCRATCH GRAVEL GOLD MINING CO. MONTANA

Address: Helena, Mont.

Officers: W. E. Cullen, pres., Spokane, Wash.; H. I. Wilson, v. p.; John MacGinnis, treas.; T. B. Miller, sec.; above with E. M. Hall, directors. Walter Larson, supt.

Inc. Nov. 5, 1915, in Montana. Cap., \$1,000,000; shares \$1 par; \$910,500 outstanding, Jan. 10, 1916; Security Transfer & Registrar Co., New York, transfer office and registrar. Listed on New York Curb.

Operating statement for period Oct. 1, 1915, to Aug. 31, 1916, shows: income from ore sales, \$119,947 net, from 2,847 tons.

Property: known as the Head property, 34.7 acres, lies 2 miles N. W. of Helena. Located on same fissure vein as the Franklin mine belonging to the Cruse estate.

Development: to 500' depth, by 3 incline shafts, 90', 50' and 500', with 800' of drifting. Only high-grade ore is being shipped, the low-grade being stored for the mill which was constructed from a plant erected by another company nearby.

Ore reserves: estimated in Jan., 1917, by C. E. Fryburger, E. M., as \$944,509 in ore blocked out and \$1,939,311 probable above 500' and down to 600' depth. In Aug., 1917, rich ore was being sent to the smelter.

UNITED SMELTING & REFINING CO. MONTANA

Is controlled by American Smelting & Refining Co.

Property: the East Helena, Mont., silver-lead smelting plant.

VALLEY FORGE MINING CO. MONTANA

Address: S. A. Mendenhall, mgr., Rimini, Mont.

Company operates gold, silver, lead, zinc property in Ten-Mile district, 14 miles W. of Helena, but at present only dumps are being treated by the New York Montana Engineering & Testing Co., at its plant at Helena. Shipments are 80 tons daily.

WHITLATCH MINE. MONTANA

Owned by C. W. Young, Chicago, Ill. Worked since 1912 under lease by Sherman Bros. (H. C., A. R. & Wm.), of Helena, Mont.

The mine, $3\frac{1}{2}$ miles south of Helena, Mont., located in 1864 and operated intermittently to date, has been a good and profitable gold producer. The veins carry silicious gold ore, containing small silver value, developed by a 500' shaft; recent work is mostly between the 400' and 500' levels.

Equipment: includes tramway, compressor, pump and hoist. Only 5 stamps of the 20-stamp mill and cyanide plant were at work in 1916, treating both Whitlatch and custom ores. In Sept., 1917, ore from the 400' level was being crushed.

LINCOLN COUNTY**BANNER & BANGLE MINING CO. MONTANA**

Address: Leo Greenough, Old Natl. Bank Bldg., Spokane, Wash.

Property: Mine 5 miles from Troy, Lincoln Co., Montana, said to have an ore shoot 1,000' long, developed by 5 tunnels over a vertical height of 2,500', with commercial ore on each level. Ore contains lead and zinc.

Company owns a water right which will be utilized for developing electric power; dam now under construction. A railroad will be built from Troy to the mine and a 250-ton mill was erected 2 miles from Troy. Employs 300 men at present. Improvements estimated to cost \$500,000.

Under lease and bond to Snowstorm Mines Cons., which see.

BEAR CREEK PLACER CO. MONTANA

Address: E. G. Mellander, agent, Libby, Lincoln Co., Mont.

Property: Company paid \$150,000 for Libby Placer Mining Co. and \$40,000 for Comet Placer Co.'s properties. Now owns 10 miles of gravel flats along Libby Creek, beginning 18 miles above the town.

Installing a \$410,000 dredging plant, 1917, and will prospect ground thoroughly before beginning operations.

MONTANA MORNING MINING CO. MONTANA

Address: Troy, Mont.

Officers: W. Hogan, pres.; G. W. Stannard, v. p.; S. T. Wood, sec-treas.; with G. B. Harrington, J. Rosslow, E. S. Williamson and D. T. Wood, directors.

Cap., \$300,000; shares 20c par.

Property: 12 claims at Troy, Lincoln Co., Mont., reported to show 3 well defined veins, partly developed by shafts. Ore opened assays high in lead, zinc, and silver. Present work consists of driving on the contact veins. Compressor installed.

MONTANA SILVER-LEAD MINING CO. MONTANA

Address: 605 Dekum Bldg., Portland, Oregon.

Officers: H. G. Lougee, pres. and treas.; R. Naylor, v. p.; O. E. Heintz, sec.; with J. Bingham and C. B. Roosa, directors.

Inc. Oct. 17, 1906, in Washington. Cap., \$1,000,000; shares \$1 par; non-assessable; 900,000 issued.

Property: 6 claims, 120 acres, in the Cabinet range, near Libby, Lincoln Co., Mont., 16 miles from railroad.

Geology: contact vein in quartzite and slate. Orebody said to be from 2' to 20' wide, and pay-shoot on surface 600' long. Ore is a sulphide, assaying upwards of 5% lead, 5 oz. silver, \$2 gold and 4% zinc.

Development: by 2 tunnels, 750' and 1,300' long, reaching depth of 1,100' with total workings of 2,050'. Lower tunnel being extended to cut ore opened above.

ROSE CONSOLIDATED MINING CO.**MONTANA****Address:** Libby, Lincoln Co., Mont.**Officers:** H. H. Phipps, pres.; Sidney Shonts, v. p.; with H. Childs, Oscar Nordquist and P. S. Rose, directors.**Property:** a gold-tungsten mine near Libby, equipped with mill, was reopened Aug., 1916.**Production:** over \$15,000 up to May, 1917.**SNOWSTORM MINES CONSOLIDATED.****MONTANA****Officers:** Leo Greenough, pres. and gen. mgr., Old Natl. Bank Bldg., Spokane, Wash.; J. W. Greenough, v. p.; W. J. Beaton, sec.-treas.; with M. D. Hall, James Broad, H. E. Chaney and R. E. Walters, asst. gen. mgr., directors.**Inc. in 1916. Cap., 2,500,000 shares; 25c par.****Property:** Company organized to take over the Snowstorm Mining Co. and to acquire under bond and lease the Banner and Bangle claims, at Troy, Lincoln Co., Mont., which see. Of the capital stock, 1,500,000 shares were issued to Snowstorm Mining Co. stockholders in full payment for the corporation's assets. Proceeds of sale of 1,000,000 shares stock not transferred to the former Snowstorm Co. stockholders, has been devoted to developing and equipping the Banner and Bangle property. Reports from the Banner and Bangle mine announced that 6 tunnels are all in ore and 300 men employed. The work blocks out 400,000 tons of ore, averaging 7.5% lead; 8.5% zinc, and 4 to 5 ounces silver per ton. It looks as if the Snowstorm stockholders had acquired an excellent property, which should soon put the stock on a dividend basis. New concentrator started work in May, 1917, and was treating 250 tons daily in August.**MADISON COUNTY****BEAR GULCH MINING CO.****MONTANA****Office:** care of Alex. Johnston, Clark Brothers' Bank, Butte, Mont.**Mine:** at Twin Bridges, Madison Co., Mont.**Property:** the Montana View group, carrying auriferous and argentiferous copper ores, opened by tunnel about 3,000' long. Has steam power and air compressor. Property has little ore and is not on the contact zone; its chief value is for a tunnel site for the Moffat claims, which adjoin it, and are being worked, 1917, by Charles J. Stone, former manager of the Alex Scott Mine at Butte. The Moffat Mine has developed a granite lime contact with basic carrying magnetite that varies from 5' wide for 1,000' along the tunnel, to 100' wide near the face. This ore, averaging 2.1% copper, was shipped (1916) to the East Butte smelter. Trimming to R. R. costs \$2.00, railroad freight \$1.75 and smelting charge \$3.75 per ton.**B. & H. MINES & MILLING CO. (not inc.)****MONTANA****Owners:** N. J. Bielenberg and W. I. Higgins, Deer Lodge, Mont. H. F. Widdicombe, engr. and supt.**Property:** known as the Bielenberg-Higgins, consists of 20 claims, 10 patented, 360 acres, 3 patented millsites and 1 unpatented tunnel site, in Bear Gulch, 14 miles from Twin Bridges, Madison Co., Mont., on a branch line of the N. P. R. R.**Ore:** complex sulphides, occurs in porphyry and altered granite. There are 9 known veins, said to be traceable for 4,000' and to contain gold, silver, lead, iron and copper values. Veins strike E. W. with dip of 38°, becoming flatter as work progresses; 4 veins have been extensively developed and proven to be from 7' to 105' wide and continuous at depth, containing ore of commercial value, said to average \$4 per ton. Ores are treated by wet concentration, making a recovery of 90%. Concentrates run \$54 to \$80 gold, 11 oz. silver, 25% lead, 2% zinc, and 0.5% copper. Ore reserves are estimated approximately at 200,000 tons of \$4 to \$10 ore.

Development: a 7'x7' crosscut tunnel, 900' long, drifts, raises and winzes, underground workings, totaling 2,000'.

Equipment: 100-ton mill, 2 air hoists, pumps, wet concentration plant and compressor, 640 cu. ft. capacity.

Property: has been in development stage for several years. Management now plans adding electric power, driving the tunnel to 3,000' and increasing daily capacity of the mill to 300 tons.

CALAMONT COPPER CO.

MONTANA

Idle. **Office:** 263 Twelfth St., Oakland, Cal. **Mine office:** Norris, Madison Co., Mont.

Officers: Walter V. Harrington, pres.; Wm. F. Davis, v. p.; Mark E. Davis, managing director; Hugh J. Leonard, sec.; Thos. F. Hogan, treas.; preceding officers, Jas. Keller and F. G. Crist, directors.

Inc. Nov., 1909, in Arizona. Cap., \$5,000,000; shares \$10 par; non-assessable. Apparently is connected in management with the Montana-Hecla Mining Co.

Property: 22 claims 380 acres, include the Old Colony group, adjoining the Montana-Hecla, 5 miles southeast of Norris, carrying auriferous and argentiferous copper ore.

Development: includes several shallow shafts, with an old 100' 2-compartment shaft on the Big Jack claim, and a 160' tunnel, with about 900' of workings. Not regarded favorably by late H. J. Stevens. A report on the property made by Reeves Davis, E. M., Sept., 1911, recommended development of 2 surface outcrops. Mark Davis, former manager, reported to be protecting the property with a view to refinancing the company.

CONREY PLACER MINING CO.

MONTANA

Address: Hennen Jennings, cons. engr., 2221 Massachusetts Ave., Washington, D. C. **Office:** Ruby, Mont.

Inc. in 1898.

Property: extensive placer claims in the Alder Gulch district, Madison Co., Mont.; about 80 miles by rail from Butte. Described in detail in Bull 121 of U. S. Bureau of Mines, 1916.

Equipment: up to 1916 has cost \$1,200,000, advanced largely by the late Gordon MacKay and a few shareholders. There were 3 steam and 4 electric dredges, but the latter are now the only ones operated. A few details are as follows:

	No. 1	No. 2	No. 3	No. 4
Year built	1908	1908	1906	1911
Monthly capacity, cubic yards.....	96,270	62,709	82,415	300,000
Power consumed, h. p.....	380	380	460	1,235
Depth of digging below water, feet..	30	35	45	55
Capacity of buckets, cubic feet.....	7½	7½	9½	16 to 17
Gold-saving area, square feet.....	1,231	1,231	1,264	3,000
Cost of boat.....	\$108,000	\$128,000	\$198,999	\$296,000

No. 4 boat has dug as much as 411,000 yards in a month. It weighs 2,000 tons.

Power is supplied by the Madison River power plant, 26 miles away. Over \$50,000 has been spent on a machine drop, and over \$60,000 of spares are kept on hand. On the dredges 36 men are employed; while 49 are employed in other departments.

Production: from 1899 to 1916 a total of 37,000,000 yards had been dug, yielding 16c per yard, or \$5,920,000. From 1906 to July 31, 1915, the quantity moved was 31,379,890 yards, at a total cost of 6.96c per yard.

This is one of the most profitable dredging enterprises in America. Many dredge improvements, now generally in use, have been devised by the Conrey Company. By the will of Gordon MacKay, Harvard University benefits largely from the profits made at Alder Gulch.

GRAND VIEW MINING & DEVELOPING CO.

MONTANA

Address: Twin Bridges, Madison Co., Mont. Digitized by Google

Property: molybdenum-bearing claims, 11 miles E. of Twin Bridges, said to show a vein of porous and well-crystallized cerussite heavily impregnated with iron oxide, containing $\frac{1}{2}$ to 1% crystallized wulfenite (molybdate of lead). Ore also carries gold and silver values.

Development: little work done to date and commercial value of deposit not known. Concentration may be complicated.

HIGHLAND COPPER CO., LTD.

MONTANA

Office: 20 Riverside Ave., Spokane, Wash.

Officers: R. C. McCaffery, pres.; J. A. Anderson, v. p.; Homer Wylde, sec.-treas.; with N. J. Thomas and J. H. Marks, directors.

Inc. 1909 in Washington. **Cap.**, \$1,500,000; shares \$1 par; issued, 415,200.

Property: 5 claims, unpatented, 130 acres, in the Silver Star district of Madison Co., Mont., shows granite and limestone, carrying 5 contact deposits, with some work on each, there being 9 pits and shafts, of 45' and 80'. Main vein, estimated by company at 10' in width, shows copper carbonates at surface, with chalcocite and chalcopyrite at depth, ore having given average assays of 6% copper, 2 to 5 oz. silver, and \$19.78 gold, per ton.

Equipment: includes a 40-h. p. hoist, good for 1,000', and necessary mine buildings. Is a prospect.

Probably idle. No recent returns.

HIGGINS & BIELENBERG MINE (H. & B.)

MONTANA

See B. & H. Mines & Mill.

IOWA MONTANA DEVELOPMENT CO.

MONTANA

Address: Fraser, Iowa. **Mine address:** Jefferson Island, Madison Co., Mont.

Officers: T. J. McGinnis, pres.; F. H. Hoeffner, sec.; E. H. Daniels, treas.; all of Fraser, Iowa; and John Young, J. D. Morrison, F. Wood, directors. J. D. Morrison mgr., Butte, Mont.

Inc. June, 1915, in Iowa. **Cap.**, \$75,000; shares \$50 par. Is a leasing company. Company obtained a 3-year lease taking possession June 1, 1915, on the Bismark mine of the Montana-Illinois Copper Mining Co., which see for description.

LEVIATHAN GOLD MINING CO.

MONTANA

Address: Pony, Madison Co., Mont.

Property: carries copper ores, with values mainly in gold.

Equipment: includes a hydro-electric power plant, compressor, and 100-ton concentrator. No returns secured.

LITTLE GOLDIE MINE.

MONTANA

Address: M. R. Ostronick, Twin Bridges, Mont., owner and mgr.

Property: 3 claims, 54 acres, in Goodrich Gulch, Madison Co., Mont., said to show 2" to 18" fissure veins, running E.-W., and assaying as high as \$114 in gold, silver and lead. Ore occurs in gneiss and limestone formation.

Developed: by 200' tunnel, several drifts, and raises.

Equipped: with compressor.

Shipments: in 1915, reported to have averaged \$80 per ton, amounted to \$30,000. Owner estimated 6,000 tons of ore blocked out, March 19, 1916. No later returns.

MINES DEVELOPMENT CO.

MONTANA

Out of business. Had bond and lease 1915-16 on Moffit Group, which see. Fully described in Vol. XII, Mines Handbook.

MOFFIT GROUP.

MONTANA

Owner: J. W. Moffit.

Mine: 8 miles from Twin Bridges, Madison Co., Mont., was under bond and lease 1915-16 to Mines Development Co., now out of business.

Ore: said to average 2% copper. Over 600 tons have been shipped. Idle.

MONTANA-ILLINOIS COPPER MINING CO. MONTANA

Office: 450 Phoenix Bldg., Butte, Mont. **Mine address:** Jefferson Island, Madison Co., Mont.

Officers: J. W. Brown, pres.; Benj. W. Wilson, v. p. and sec.; W. G. McCormack, treas.; preceding, with L. H. Stanhope, Wm. Meyer, H. Sultzor and A. D. Clark, directors.

Inc. 1907 in Montana. **Cap.**, \$2,000,000; shares \$1 par; non-assessable; issued \$2,000,000.

Bonds: \$300,000 authorized, at 8%; issued, \$80,000. Annual meeting first Thursday in July.

Property: the Bismark mine, 20 miles south of Jefferson Island, in the Ruby mountains; 10 quartz claims, patented; three 5-acre millsites; a water right and 320 acres placer ground, contested by the Forest Reserve, total of 550 acres, including part of the former holdings of the Bismark Copper Mining Co. Claims show granite and gneiss carrying 3 fissure veins, under development, with N.-W. strike of about 4' average width. Veins carry chalcopryrite and bornite estimated by management to average about 5% copper, 2 oz. silver, and \$1 gold per ton. Flotation concentrates average 22% copper.

Development: by tunnels of 400', 200', 500' and 1,900', with about 3,000' of workings.

Equipment: includes a 5' Pelton wheel and a 10x12" six-drill air compressor. There are 12 mine buildings. A concentrator, completed in 1914, has a Blake crusher and a modern oil flotation plant.

In June, 1915, a 3-year lease on the property was taken by the Iowa Mont. Dev. Co. This company re-equipped the mill, installing a 100-ton flotation plant and started operations, but was soon compelled to shut down on account of insufficient water supply. Electric power is being installed. Company is producing.

WHITE CHIEF COPPER CO. MONTANA

Mine: near Jefferson Island, Madison Co., Mont.

Incorporators: Lewis Schmuck, Mrs. Helen Schmuck and Ben. W. Wilson.

Inc. Sept. 1913. **Cap.**, \$1,000,000; shares \$1 par.

Property: 7 claims, in the Whitehall district, developed by a 600' upper and 100' lower tunnel showing copper, silver, lead and gold ore. A drift at depth of 82' disclosed a 5' vein, assaying 13% lead and \$14 gold.

Development: has been hampered by lack of working capital.

WILLOW CREEK MINING CO. MONTANA

Address: P. H. McDermott, chief owner, Helena, Mont.

Property: Owns the Mountain Meadow Group, 4 miles from Pony, Madison Co., Mont., on Willow Creek. Mine shows a 12' fissure vein in granite carrying a free gold with pyrite and chalcopryrite, both with gold values, in quartz gangue. Has a small mill. Regarded as promising.

A small shipment was made in July, 1917.

MEAGHER COUNTY**DURANT MINING & SMELTING CO. MONTANA**

Address: Spring Gulch via Martinsdale, Meagher Co., Mont. C. M. Durant, supt.

Property: 14 miles from Martinsdale, shows fissure veins carrying copper sulphide ore with gold values.

Developed: by 200' 2-compartment shaft. No recent returns secured.

MINERAL-MISSOULA COUNTY**ALPENA COPPER MINING CO. MONTANA**

Office: Wallace, Idaho. **Mine office:** Saltese, Mineral Co., Mont.

Officers: C. W. Beale, pres.; A. H. Featherstone, sec.-treas.; preceding officers, Alex. Muir and A. P. Cochrane, directors.

Mine: in the St. Joe district, near the Monitor, and 2 miles from the Adair on the Milwaukee railroad, is developed by 2 long tunnels and shaft, showing a 2' vein of quartz with chalcopryrite. At last account face was 400' from ore shoot exposed on surface, which is goal of present work.

Equipment: includes several buildings. No recent returns secured.

AMAZON DIXIE MINING CO.

MONTANA

Property: at Sildix, Missoula Co., Mont., is really in Coeur d'Alene district, Idaho, and is described thereunder.

BEN HUR MINING CO., LTD.

MONTANA

Address: Saltese Supply Co. Saltese, Mineral Co., Mont.

Officers: D. S. Dickson, pres.; Frank H. Bell, v. p. and purch. agt.; Chas. J. Luedke, sec.; C. A. Keating, treas.; preceding officers, Peter Peterson and A. J. Matthiessen, directors.

Cap., \$1,500,000; shares \$1 par. Annual meeting, last Saturday in April.

Lands: 5 claims, adjoining the Last Chance mine, 3 miles from a railroad, showing a fissure vein, in quartzite, of 10' to 60' width at surface.

Development: by 3 crosscut tunnels, the lower, of 1,100' cutting a vein carrying silver lead and gray copper ores. Property considered a promising prospect.

No recent returns secured.

BIG ELK MINING CO.

MONTANA

Office: Wallace, Idaho. **Mine office:** Saltese, Mineral Co., Mont.

Officers: Peter Peterson, pres. and gen. mgr.; Carlton Fox, v. p.; A. H. Featherstone, sec.-treas.; preceding officers, Geo. K. Garrett and W. S. Brown, directors. C. F. O. Merriam, mg. eng.

Inc. April, 1909, in Idaho. **Cap.,** \$2,000,000; shares \$1 par; assessable; fully issued. Last assessment 1 mill per share, July 22, 1914.

Property: 15 claims, 300 acres, unpatented, on Bald Mountain, in the St. Joe district, showing 3 fissure veins in St. Regis quartzite, various trenches exposing veins with 4' thickness carrying streaks of chalcopryrite and spathic iron, in spar and quartzite. A carload shipment, to Helena, from an 18' prospect shaft, returned 28.7% copper, 28.9% iron, 15% sulphur, and 2 oz. silver, per ton. A 125' upper tunnel and a 200' lower diagonal crosscut tunnel show chalcopryrite and bornite, carrying small gold values. The C., M. & St. P. R. R. crosses property. Management considered good and property promising. Four men employed continuously.

BLACK TRAVELER COPPER MINING CO.

MONTANA

Office: Mullan, Idaho. **Mine:** near Saltese, Mineral Co., Mont.

Officers: Oliver Roof, pres. and gen. mgr.; Chas. Bryant, v. p.; Dr. J. R. Beau, sec.-treas.; with R. E. Seysler and F. J. Luedke, directors.

Cap., \$1,500,000; shares \$1 par; 746,000 issued; assessable; 5c per share called Dec., 1913.

Lands: 6 claims, 3 miles N. E. of Saltese, near the Saltese Cons. Copper M. & M. Co., show 2 parallel veins, 1, of about 6' width, having a strong gossan.

Development: by 2 crosscut tunnels, the upper cutting a vein of 12' estimated width, carrying copper ore, mainly chalcopryrite, giving assays of about 3%, with richer streaks assaying up to 32.4% copper and 15.8 oz. silver, with traces of gold. The 1,200' lower tunnel planned to be driven 1,800' to reach the vein, cut a vein, 1913, showing 30" of ore assaying 7.7% copper.

BOSTON-COLBY COPPER MINING CO.

MONTANA

Mine P. O.: Saltese, Mineral Co., Mont.

Officers: Peter Peterson, pres.; Hon. Andrew Flaig, 610 E. 27th St., Minneapolis, Minn., sec., gen. mgr. and principal owner.

Inc. Sept. 16, 1903, in Montana. **Cap.,** \$1,500,000; shares \$1 par; with 1,500,000 treasury shares, 200,000 still in treasury.

Property: 9 claims, unpatented, 180 acres, and a 5-acre millsite, lying next east of the Butte-Coeur d'Alene Copper Mining Co., immediately west of Saltese, in the East Coeur d'Alene, formerly known as St. Regis district.

Lands have 2 copper-bearing veins, No. 1 of about 40' width, showing a great iron capping, and No. 2, to the south, of about 3' width, carrying mainly chalcopyrite, with some bornite, of good average grade.

Development: by 2 crosscut tunnels, upper of 400', lower of 900' length with about 500' of drifting in both tunnels, said to show chalcopyrite streaks in blue hematite ore. Property crossed by C. M. & St. Paul railroad. Wood and water are abundant. Assessment work only has been done for several years owing to lack of funds.

CAPE NOME COPPER MINING CO.

MONTANA

Office: 1 Dixon Bldg., Missoula, Mont. **Mine office:** Clinton, Mont.

Officers: Edw. Donlan, pres.; F. H. Woody, v. p.; H. T. Wilkinson, sec.-treas. and gen. mgr.; preceding officers and A. L. Coffey, directors.

Inc. Nov., 1906, in Montana. Cap., \$1,000,000; shares \$1 par; issued, \$924,000. Annual meeting, first Monday in June.

Lands: 3 claims, patented, 40 acres, adjoining the Aladdin Mining Co., show 4 fissure veins in granite 1 of 8' average width, traceable 800', being opened by 500' double compartment, vertical shaft, and 4 crosscut and 5 drift tunnels, with 3,750' of workings.

Equipment: includes two 60-h. p. boilers, a 40-h. p. Lidgerwood hoist and a 12-drill Ingersoll air compressor. There are 6 buildings.

Property: considered promising, but has been idle for several years.

COEUR D'ALENE PACIFIC MINES CO.

MONTANA

Idle. Officers: Dr. Jas. Sutherland, pres., 212 Peyton Bldg., Spokane, Wash.; E. A. Patrick, v. p.; M. N. Stratton, sec.-treas.; preceding with J. A. Reinhardt and N. E. Jesseph, directors.

Inc. in Washington. Cap., \$1,000,000; shares \$1 par; non-assessable.

Property: 2 claims, 40 acres, near the Silver Cable mine, Mineral Co., Mont., giving fair surface indications of lead and copper ore, with a short tunnel.

COPPER AGE & EDISON MINING CO.

MONTANA

Idle. Officers: Chas. J. Heidenreich, Spokane, Wash., pres.; Morton Webster, Wallace, Idaho, sec.-treas.; L. N. Hyde, supt.

Inc. 1906, in Washington. Cap., \$250,000.

Property: 12 claims, 4 miles south of Saltese, is an eastern extension of the Richmond mines, carrying extension of copper-bearing outcrop of that mine, the vein paralleling the Monitor. The vein is exposed for some 700' in the tunnel just east of the divide; it averages 10' thick, is nearly vertical and carries a very little chalcopyrite and chalcocite in a siderite gangue.

Development: includes a main 1,160' crosscut tunnel, with back of 600' showing sulphide ore assaying up to 30% copper, and \$14 gold per ton.

COPPER HILL MINING CO., LTD.

MONTANA

Idle. Office: Wallace, Idaho. **Mine:** near Quartz, Missoula Co., Mont.

Officers: Morton Webster, pres.; A. T. Ryan, v. p.; P. L. Eberhardt, sec.-treas.; preceding, with Howard K. Welch and Jas. Howarth, directors.

Inc. March, 1908, in Montana. Cap., \$250,000; shares 25c par; non-assessable.

Property: 7 claims, 125 acres, in the Sunrise district, on the Montana side of the Montana-Idaho divide, showing an altered zone of highly silicious rocks of 25' to 50' width, carrying fine disseminations of copper carbonates and sulphides. Mine has a 75' tunnel, showing ore said to be somewhat similar to that of the Snowstorm, and assaying about 4% copper.

COPPERSMITH MINING & MILLING CO.

MONTANA

Idle. Mine: near Lothrop, Mont.

Inc. Jan. 23, 1909, in Idaho. Cap., \$3,000,000; shares \$1 par; non-assessable; issued, \$2,200,000.

Property: 8 claims, unpatented 160 acres, the CopperSmith group of 6 claims and the Inverness group of 2 claims, also a water right and millsite, about 6 miles up Petty Creek from Lothrop. Property carries some good timber. The CopperSmith claim shows limestone and quartzite for an

estimated width of about 400', and length of about one-half mile, with outcrops yielding 3 to 20% copper ore.

Development: by prospect shaft and crosscut tunnel, said by management to cut merely 300' of silicified limestone averaging 1% copper. Property also has a number of open cuts and pits, and a 50' shaft, bottomed in ore estimated to average better than 6% copper, with small gold and silver values. The Coppersmith was formerly reported to show 3 main veins, one reported to be over 100' wide at surface, giving ore assaying 2 to 3% copper. The Exty vein, parallel with and 500' from the Coppersmith, is reported as 15' wide.

The Inverness group, 3 miles from Lothrop, has a vein of 3' to 4' width, in quartzite and slate, carrying malachite, chalcopryrite and chalcocite, giving assays of 15 to 17% copper and \$10 to \$12 per ton in combined gold and silver values. Property has 4 buildings. Idle except for annual assessment work, and property not considered encouraging.

DARBY MINING AND MILLING CO. MONTANA

Address: S. C. Bean, mgr., Mullan, Ida.

Officers: S. C. Bean, pres. and mgr.; L. Fogel, v. p.; M. J. McHugh, sec.-treas.; above with J. A. Ghormley and W. W. Trumbull, directors.

Inc. March, 1907, in Idaho. Cap., \$1,000,000; shares \$1 par; 400,000 issued.

Property: 10 unpatented claims, 200 acres, near Keystone, Mineral Co., Mont., 4½ miles from a railroad. Said to show a fissure vein in quartzite carrying lead and silver values.

Development: by 3 tunnels, longest 600'.

Is a prospect.

DENNEMORA GOLD & COPPER MINING CO., LTD. MONTANA

Is a dormant corporation owning 6 lead and copper claims, one-half mile from N. P. R. R., near Taft, Mineral Co., Mont. Described Vol. X.

EAST COEUR D'ALENE MINING CO. MONTANA

Address: care Harry Hogan, pres.; Mullan, Idaho; T. A. Westervelt, sec.

Property: a group of claims a few miles north of Haugan, Mineral Co., shows a 30' vein carrying a 2' pay streak with some copper ore reported to carry 8% copper and good gold values.

Development: by short tunnels and drifts.

GOLD CROWN MINING CO., LTD. MONTANA

Probably dead. Described Vol. XII.

HAMILTON-MONTANA GOLD MINING CO. MONTANA

Office: Richard Daxon, mgr., Hamilton, Mont.

Property: Company owns group of claims in Mineral Co., Mont.

Developed: by 400' crosscut, driven to intercept a vein of copper and lead ore.

Idle at last accounts.

HEMLOCK SILVER-LEAD & MINING CO. MONTANA

Address: Saltese, Mineral Co., Mont. Walter J. Hughes, pres.

Inc. 1907, in Montana. Cap., \$150,000; shares 10c par.

Property: 3 claims, on Packer Creek, 1½ miles from Saltese, is an old prospect, worked by tunnels. Present management sank a shaft 150', and in 1914 crosscut 220' to the lode, which is claimed to be 60' wide and to carry silver and lead ore.

Development: Friction in the company is said to have delayed operations. At last accounts, Feb., 1916, the mine was being worked and shipments were supposed to start when the roads became passable; another assessment was then in sight.

No later returns. Probably closed down.

HIDDEN TREASURE GROUP. MONTANA

Sold, 1916. Peter Porter, mgr.

Property: near Clinton, Missoula Co., Mont., 9 patented claims in the Wallace district, said to show 5 veins with gray copper and bornite ores averaging 2 to 20% copper, \$2 to \$4 gold, and 2 to 20 oz. silver per ton, as sorted for shipments.

Development: mainly on Hidden Treasure and Cascade claims, includes 2 tunnels in a steep mountain side, uppermost 558' on vein claimed to be 50' wide. Ore cut 80' from portal and extends to face. Lower tunnel, 1,400' long, follows, the east vein, said to be 50' wide. Crosscuts develop 1 other vein of 13' width and drifts have opened up some rich spots and several hundred feet of concentrating ore. Total work 3,600'. Shipments began 1899 and ceased in 1907 and property has had but little development since.

HUGO GOLD & COPPER MINING CO.**MONTANA****Address:** Saltese, Mineral Co., Mont.**Officers:** Richard W. Seideman, pres.; A. G. Kearns, v. p.; A. G. Seideman, sec.-treas., with A. B. Atwater and Peter Weber, directors.**Inc.** 1907, in Idaho. **Cap.**, \$1,000,000; shares 10c par; assessable; 770,000 issued.

Property: 3 claims, carrying the extensions of the Boston-Colby vein system, next E. of the New York & Brooklyn mine, and one-half mile E. of Saltese. Claims carry 2 parallel veins, 300' apart, 1 about 15' wide, said to show copper carbonates, bornite and chalcophyrite, giving assays, from selected specimens of 2 to 57% copper. The second vein, proven by trenching, is said to be about 12' wide, carrying a 3' paystreak of ore assaying 12% copper, 6 oz. silver, and \$8 gold per ton.

Developed: by 2 drift tunnels, 1,350' long, that follow the vein. An overshot water wheel, taking water, under a 12' head, from the St. Regis river runs a 4-drill air compressor. Only assessment work done in 1916. Is a prospect.

INTERMOUNTAIN COPPER MINING CO.**MONTANA****Address:** Wallace, Idaho. **Mine office:** Iron Mountain, Mineral Co., Mont.**Officers:** Edward Evans, pres.; W. J. Griffith, v. p.; H. H. Phipps, sec.; H. M. Childs, treas.; with Oscar Nordquist, directors.**Inc.** 1915, in Montana, to take over the holdings of the Amador Copper and Gold Mining Co. **Cap.**, \$2,000,000; shares \$1 par.

Property: 6 patented and 6 unpatented claims on Cedar Creek, 10 miles S. of Iron Mountain, Mont., said to show a vein of copper and silver ore in quartzite, dipping 60° with E.-W. course. Shoots are from 2' to 11' wide. Average assay is 15% copper.

Development: 700' vertical, 3-compartment shaft, with levels at 200', 460' and 700', and long drifts on each level.

Ore reserves: estimated at 50,000 tons blocked out.

Equipment: includes a 2-mile flume and pipe line, delivering water under a 310' head, and steam power, with 2 hoists, compressor, pumps, saw-mill, and about 15 mine buildings. A 100-ton concentrator was constructed in 1915. Has a Callow flotation unit.

Future outlook is considered good, dividends being expected at an early date.

IRON MASK MINING CO.**MONTANA****Office:** St. Maries, Idaho. **Mine:** near Carter, Missoula Co., Mont.**Officers:** T. B. Huey, pres.; Leon Demers, v. p.; P. Martin, sec.-treas.; preceding, with F. Perrier, J. J. Bouchard, directors.**Inc.** May, 1908. **Cap.**, \$1,000,000; shares \$1 par; \$500,000 outstanding. Assessment No. 3 of 2 mills per share, levied June, 1913.

Property: 6 claims, well timbered and watered, 3 miles from a railroad are said to show a 10' vein of concentrating ore, with an 18" vein of smelting ore.

Development: by tunnel 1,700' long, with back of about 700', and 2,400' of drifting on the vein in the various tunnels. The workings show silver and lead ore of good average grade, with a small percentage of copper.

Equipment: includes gasoline power and necessary mine buildings.

Letters returned from St. Maries, Idaho. Apparently property is idle.

IRON MOUNTAIN TUNNEL CO.**MONTANA**

Purchased in July, 1915, by Federal Mining and Smelting Co., which see.

LAST CHANCE COPPER MINING CO.**MONTANA**

Address: W. H. Nichols, sec., 50 Broad St., New York.

Officers: Geo. Champagne, pres.; Dr. T. C. Witherspoon, treas., Murray Hospital, Butte, Mont.

Cap., \$1,200,000; shares \$1 par.

Property: 2 claims, patented, adjoining the Ben Hur mine, 4 miles north of Saltese, Mineral Co., Mont.

Mine: is developed by shallow shafts and a 2,300' tunnel, the workings said to show a 30' vein, faulted in the tunnel, but a winze shows an 18" streak of ore said to carry about \$100 per ton in values. Company reports past shipments of about \$150,000, one carload shipped giving returns of 13.6% copper, 394 oz. silver and \$12 gold per ton. Tunnel was driven in 1915-16 to reach the rich oreshoots from which shipments were made.

No later returns.

LEROY GOLD & COPPER MINING CO.**MONTANA**

Office: Wallace, Idaho. Mine office: Saltese, Mineral Co., Mont.

Officers: Hon. Herman J. Rossi, pres.; G. F. Dann, v. p.; C. E. Clark, sec.-treas., with Wm. Fissenger and Chas. Bollinger, directors.

Property: adjoins the Monitor mine, and survey for the extension of the Monitor tunnel runs through this property. Assessment of 2 mills per share called Aug., 1916, and development work resumed after several years of idleness.

RICHPOND MINING, MILLING & REDUCTION CO.**MONTANA**

Office: 404 Sherwood Bldg., Spokane, Wash.

Officers: J. E. Codd, pres.; Chas. Heidenreich and W. S. Norman, v. p's.; T. W. McGowan and P. T. Sweeney, directors. B. C. Redhead, sec. B. N. Sharp, mgr.

Inc. in Washington. Cap., \$1,000,000; shares \$1 par; 800,000 issued.

Cash assets on Oct. 31, 1917, totaled \$32,288; and current liabilities, \$7,403. Net earnings in October were \$30,000.

Property: on Idaho-Montana line, 6 miles from Saltese, Mineral Co., Mont., and 1½ miles from Adair, Idaho, connected with C., M. & St. P. R. R. by 8,800' aerial tram. Company owns 6 claims, 2 patented, and millsite.

Dividends: 2c per month, equal to \$16,800. Total to Oct., 1917, \$84,000. Dividend payment suspended in October.

Development: 2,200' of tunnels, 500' of shafts, 2,000' of drifts, and 600' of raises. Lowest depth is 370'. Vein shows on surface for 2,200', of which 400' is being developed. Reserves are estimated as sufficient for 50 tons daily for a year.

Equipment: hoist, compressor, 8,800' aerial tram of 240 tons daily capacity, etc.

Production: to July, 1917, \$100,000; since then 50 tons of ore daily worth about \$1,000, according to price of copper.

Property seems to make fair profits on small output and pays regular dividends.

ROYAL MINING CO.**MONTANA**

Address: Mohawk Bldg., Spokane, Wash. Mine office: Potomac, Missoula Co., Mont.

Officers: John H. Wourms, pres.; J. M. Long, v. p.; J. H. Pettitur, sec.; Dennis Reardon, treas.; with L. K. Church, directors.

Inc. Nov. 10, 1916, in Washington. Cap., \$1,000,000; shares \$1 par; 600,000 issued.

Property: 17 claims, 3 patented, 320 acres, 6 miles N. of Clinton on N. P. R. R. and 4 miles S. of Potomac, Mont., on C., M. & St. P. R. R. Formerly known as the Charcoal, which shipped \$18,000 worth of ore some 20 years ago.

Geology: quartz vein in granite, 4' wide, dipping 50° with N. S. course. Ore assays 150 oz. silver, 6% copper, 20% lead, and \$5 gold per ton.

Development: by 2-compartment shaft to 200' depth, and 800' tunnel. **Equipment:** includes 600' hoist, boiler, 225 cu. ft. compressor.

ST. JOE GOLD-COPPER M. & M. CO. MONTANA

Office: Wallace, Idaho.

Property: 9 claims, well timbered, on Kelly Creek, near Saltese, 3 miles west of the Monitor mine, and one-half mile from a railroad, showing 2 strong ledges.

Idle some years.

ST. REGIS COPPER MINING & MILLING CO. MONTANA

Office: Missoula, Mont. **Mine office:** St. Regis, Mineral Co., Mont.

Officers: S. J. Wilson, pres.; F. W. Wilson, sec.-treas.

Inc. May, 1901, in Montana. Cap., \$300,000; shares \$1 par; in half preferred and half common stock.

Property: 5 claims; also a 15-acre millsite and miscellaneous lands, 180 acres, on the Northern Pacific railway, shows quartzite and shale, with 2 orebodies under development of 6' estimated average width, carrying chalcopryrite ore said to give average assays of 8% copper, and \$1.50 gold, per ton.

Development: by tunnels of 60', 380' and 600'.

Presumably idle.

SALTESE MINING & MILLING CO. MONTANA

Office: 22 Symons Bldg., Spokane, Wash. **Mine:** near Saltese, Mineral Co., Mont.

Officers: J. C. Johnson, pres.; Wm. Dixon, v. p.; O. V. Manring, sec.-treas.; preceding, with J. B. Ward and G. A. Turner, directors.

Inc. March, 1911, as the successor of the Saltese Cons. Copper Mng. & Mlg. Co. Cap., \$1,500,000; shares \$1 par; assessable. Levied an assessment of .02c per share, Jan. 12, 1914.

Property: 12 claims, 240 acres, east of Mullan, near the National mine in the St. Regis district, about 8 miles N. W. of Saltese.

Development: by 2 tunnels aggregating 1,400'. The lower one, 655' in length, opens a 13' vein, probably the Black Traveler vein, at 460' from the portal, which is said to show 5' of high-grade copper ore. The tunnel is being extended to cut the big iron-capped vein seen on the surface.

Developing: with a small force, 1915-16. Property considered promising.

SILVER CABLE MINING CO. MONTANA

Address: Jas. Corbett, pres. and gen. mgr., Missoula, Mont.

Cap., \$1,250,000; shares \$1 par; assessable. Listed on Butte Exchange.

Property: 7 claims in east Coeur d'Alene district, just over the Montana line on the eastern slope of Bitter Root Mts., 5 miles from the Northern Pacific R. R., part of the land lies in Idaho. Said to have a large body of silver, lead and zinc ore; from 500' to 700' of stoping ground, proved for over 200' in length, and from 4' to 6' wide. Ore is said to average better than 15% zinc. Developed by tunnels.

Production: reported shipping in 1916.

TARBOX MINING CO. MONTANA

Office: 426 High St., Wallace, Idaho. **Mine office:** Saltese, Mineral Co., Mont.

Officers: Richard Daxon, pres., mgr. and treas.; W. J. Smith, v. p.; R. E. Seysler, sec.; preceding, with Dennis Reardon and T. H. Cotton, directors.

Cap., 1,500,000 shares; \$1 par; assessable; 500,000 shares in treasury. Listed on Butte Exchange.

Property: 12 claims on Packer Creek, 3 miles N. of Saltese, Missoula Co., Mont. Ore carries silver and lead, mostly concentrating grade. Vein at surface is 10' to 30' wide and filling is quartz and siderite.

Development: Machinery has recently been added for deepening the

shaft to 800'. In April, 1917, 12% ore was opened on 600' level, the shoot being wide. In July a 150-ton flotation mill was ordered.

TRIANGLE MINING & DEVELOPMENT CO. MONTANA

Office: 8 Allen Blk., Missoula, Mont. **Mine office:** Clinton, Mont.

Officers: R. B. Hughes, pres. and gen. mgr.; Oliver Blood, v. p.; H. Y. Gephart, sec.-treas.; with David C. Smith, E. C. Mulrone, F. C. Robb and Geo. E. Sullinger, directors. Henry E. Kuphal, engr.

Inc. Aug. 25, 1906, in Montana. Cap., \$500,000; increased later to \$1,200,000; shares \$1 par, non-assessable; issued \$665,000. Debentures, \$150,000 6%, \$38,000 issued. Annual meeting third Monday in February.

Property: 13 claims, 10 unpatented, 230 acres, well-watered and partly timbered in the Wallace district, 2½ miles from a railway, in 3 groups, known as the Triangle group of 8 claims, and the Hill Group of 5 claims, 2 miles N. E. of Clinton and 17 miles E. of Missoula. The company also owns land in the town of Clinton.

The claims contain fissure veins cutting granite and altered sedimentary rocks near the contact with a large batholith of granite. The veins show chalcocopyrite and bornite associated with hematite, siderite, and quartz in altered granite. The Triangle group shows a 16' vein, opened by a 540' tunnel with back of 450'. At the face the vein is 14' wide and assays 2% copper, ½ oz. silver and 40 cts. gold, while an 8" streak averages 15.04% copper, 3.20 oz. silver and 24 oz. gold, and a 4' footwall streak averages 4.65% copper, 1.2 oz. silver and 80 cts. gold.

Development: by a 140' crosscut and 540' drift tunnels and 40' shaft, estimated to block out 25,000 tons ore. The Grass Widow claim has 513' of crosscutting and 300', 75' and 100' drifts. The Hill group has a 300' drift tunnel.

Equipment: includes a 40 h. p. boiler and an Ingersoll-Rand air-compressor, besides several mine buildings. Idle.

WILSON MINING & SMELTING CO. MONTANA

Address: William Burke, pres. and mgr., Saltese, Mont.

Officers: A. Burke, v. p.; A. W. Dougherty, sec. and treas.; M. Hays and G. Early, directors.

Property: 2 groups of claims on Silver and Big Thunder Creeks, about 2 miles from Saltese, Mineral Co.; 6 claims on a lead and silver vein form one group, 8 claims showing a shoot of copper, the other group. Work in 1916 comprised a drift from Silver Creek on the copper vein. Commercial lead ore is reported in an upper tunnel.

WISCONSIN MONTANA MINING CO. MONTANA

Office: Downing, Wis. **Mine office:** Superior, Mont.

Officers: A. O. Nichols, pres. and gen. mgr.; D. McDonald, v. p.; D. C. Coolidge, sec.; Dr. P. A. Beebe, treas.; and R. A. Cleveland, directors.

Inc. Jan. 29, 1906, in Wisconsin. Cap., \$50,000; shares 5c par. Annual meeting 1st Tuesday in February.

Property: 16 patented claims, 320 acres, and a 5-acre millsite in T. 15 N., R. 25 W., 1 mile from the Missoula river and about 10 miles east of Superior. Claims show fissure veins cutting through limestone, slate and quartz; one reported as 70' wide, with irregular shoots, assaying from 1 to 42% copper, with gold, silver, and lead values.

Development: by tunnels of 40', 80', 400' and 710' length, with laterals. A 3,000' tunnel is proposed. Mine was under lease in August, 1917.

PARK COUNTY

BUTTE-JARDINE METAL MINES CO. MONTANA

Offices: 50 Broad St., New York City, and 33 W. Granite St., Butte, Mont.

Officers: W. H. Nichols, pres.; M. W. Acklemire, v. p.; L. M. Harley, sec.; D. E. Nichols, treas.; with H. W. Barry, directors.

Inc. Jan. 10, 1917, in Montana. **Cap.**, \$250,000; shares 25c par; 600,000 shares issued.

Property: 11 claims, at Jardine, Park Co., Mont., said to have over 1,600' of underground workings exposing gold-bearing veins that vary from 2' to 36' wide, which occur in pre-Cambrian schistose rocks. In October, 1917, company had cut 5 veins and opened the Big vein, 43' wide, showing 3' of \$28 ore. Six men are employed.

The company is being promoted and stock sold by W. H. Nichols & Co., New York.

COOKE MINING & REDUCTION CO.

MONTANA

Idle. Mine near Cooke, Park Co., Mont.

Developed: by tunnels, showing auriferous and argentiferous copper ores. Has a small steam plant. District is remote from transportation, being on N. E. border of the Yellowstone Park.

COPPER KING MINING CO.

MONTANA

Address: Cooke City, Park Co., Mont.

Property: the King and Queen group, developed by tunnels, showing an extensive orebody, with fair values in gold.

GREAT WESTERN MINING & MILLING CO.

MONTANA

Address: Chico, Mont. H. F. Lawrence, mgr.

Property: 6½ miles from Chico Hot Springs, Park Co., Mont., at 7,500' elevation. Nearest railroad is at Emigrant, 10 miles away.

Development: tunnel reveals a brecciated and somewhat altered, fine-grained, light-gray porphyry in which fine-grained molybdenite intimately associated with pyrite forms the matrix and permeates the individual fragments of brecciated material. Ore contains 5% molybdenite, and deposit is extensive.

A mill using flotation was erected, but no recent news in available.

JARDINE GOLD MINING & MILLING CO.

MONTANA

Idle. Address: 4 Silver Bow Block, Butte, Mont.

Officers: W. S. Hunnewell, pres. and treas.; H. C. Bacorn, v. p. and mgr.; S. D. Bacorn, sec.; above, with J. E. Healy, directors. T. J. Welcker, supt.

Inc. 1914 in Arizona. **Cap.**, \$2,000,000; shares \$1 par; non-assessable.

Property: 26 claims, 21 patented, at Jardine, Park Co., Mont. From the 80's to 1907, the mine produced gold ore worth \$3,000,000; also 300 tons of tungsten (scheelite) ore and concentrate. Litigation tied up everything until Jan., 1917, when the present company was organized to take over the property. Management is cleaning-up and re-timbering, and will resume on a large scale. The plant will be increased to 400 tons daily capacity.

Geology: quartz vein in schist, dipping up to 45° W. and pitching N. and S. Ore is partly oxidized and partly arsenopyrite, and will average \$5 per ton.

Development: by tunnel with total workings of 3 miles to a depth of 500'.

Equipment: Ingersoll-Rand compressor, 125-ton mill and cyanide plant for gold ore and 20-ton concentrator for tungsten ore.

Production: 13½ tons of 62.35% tungsten ore was shipped in Jan., 1917. Employs 60 men.

Seems a meritorious property, and with care the treatment of low-grade ore should be profitable, plus the tungsten output.

MONTANA SCOTCH BONNET COP. & GOLD MG. CO.

MONTANA

Idle. Office: 603 Jamieson Blk., Spokane, Wash. **Mine office:** Cooke Park Co., Mont.

Officers: S. A. Gibson, pres. and gen. mgr.; C. E. Mallette, sec.-treas.

Inc. March, 1902, in Washington. **Cap.**, \$300,000; shares 10 cts. par; non-assessable; fully issued.

Property: 17 claims, partly fractional, 200 acres, in the New World district, 65 miles from a railway.

Development: by tunnel with about 1,500' of workings developing oxidized and sulphide ores of lead and copper, said to give small copper assays an average of 3.7% lead, 4 to 5 oz. silver and \$3.10 gold per ton.

Under option early 1916 to John H. Wourms, Wallace, Idaho, chief counsel for the Day interests.

WESTERN SMELTING & POWER CO. MONTANA

Office: 610 Northern Bank Bldg., Seattle, Wash.

Officers: G. L. Tanzer, pres.; Alvin Hemrich, v. p.; J. J. Black, sec.-treas.; with G. B. Baker, C. J. Steeple, E. W. Gaylord, Joseph Schlenker, W. D. Good and C. A. Swartz, directors. H. C. Reagon, supt.

Inc. 1911, in Washington. Cap., \$5,000,000; shares \$1 par; non-assessable; 1,957,624 issued. Annual meeting 1st Saturday in March.

Expenses in 1916 were \$89,592.

In March, 1917, company was said to be erecting a 300-ton custom smelter at Cooke, Park Co., Mont. Ore reserves given as over 1,000,000 tons, containing copper, gold and silver. Cooke City has yearned for smelter since 1883 and ought to support this long deferred plant.

POWELL COUNTY

BUTTE & ELLISTON GOLD & COPPER MINING CO. MONTANA

Office: 113 Hamilton Block, Butte, Mont. Mine near Elliston, Powell Co., Mont.

Officers: J. H. McOmney, pres.; D. G. Bertoglio, v. p.; F. H. Cooney, sec.-treas.; preceding officers, J. E. Homple and C. S. Jackman, directors. F. H. Cooney, mgr.

Inc. 1906, in Arizona. Cap., \$1,000,000; shares \$1 par; fully paid and non-assessable; issued, 575,000. Dividend of 1% paid 1907, since when company has been inactive.

Property: 1 claim, patented, 17 acres, in the Ontario, or Elliston mining district, known as the Big Ditch mine, 6 miles from Elliston on the side of Nigger mountain. Claim shows diorite having 6' fissure vein developed by 280' shaft and 1,000' of workings.

Ore: said to average 31 oz. gold, 15 oz. silver and 10% lead, with some zinc and copper. A new 1,230' tunnel now being driven will intersect vein 200' below bottom of the shaft.

Equipped with 25-h. p. hoist, compressor, pump and surface buildings.

Production: by lessees in 1914-15 netted the company \$1,246 in royalties, or a total to date of \$85,000.

Property now under lease and bond to a private company owning the adjoining claims, who are driving the tunnel to connect with the old workings.

ELK GOLD MINING CO. MONTANA

Address: R. Lee Kelley, sec. and mgr., Deer Lodge, Powell Co., Mont.

Officers: J. C. Conlin, pres.; Tobias Schurtz, treas.; with J. E. Neville, C. E. Asyling, S. P. Wilson, directors.

Inc. March, 1913, in Montana. Cap., \$800,000, \$1 par; assessable. 400,000 shares issued.

Property: 2 claims, 1 patented, 20 acres, 10 miles S. E. of Deer Lodge and 17 miles N. of Butte, Mont. Claims show small stringers of oxidized ore on surface which at depth of 40' are reported to assay from 4-7% copper, 1 oz. gold and 7-14 oz. silver per ton.

Development: by 100' shaft. Shipped 15 tons of ore in 1915 netting \$30 per ton.

Is a prospect, needing money for developing.

INDEPENDENCE GOLD & COPPER MINING CO. MONTANA

Deer Lodge, Powell Co., Mont.

Address: I. S. Eldred, pres. and gen. mgr.; C. H. Williams, v. p.; E. Scharnikow, sec.; C. E. Larabie, treas.

Inc. 1907, in Montana. Cap., \$900,000; shares \$1 par. Assessments to date 10 mills per share.

Lands: 120 acres in the Oro Fino district, 12 miles S. of Deer Lodge

and 5 miles S. of 2 railways, include the old Independence mine located 1870, which is a patented tract of 102'x2,200'.

Development: includes shafts and tunnels, one 425' long, 1915, showing a vein of 4' to 5' width, carrying copper ore said to have averaged as produced about \$12 per ton in combined values, and to be capable of concentration 4 into 1, giving concentrates with excess of iron.

On Aug. 13, 1915, property was leased for 3 years, with the proviso that 100' of development be done each year.

LADYSMITH COPPER MINING CO.

MONTANA

Company dissolved. Fully described Vol. XII. Formerly operated near Elliston, Powell Co., Mont.

MONTANA-CLINTON COPPER CO.

MONTANA

Office: Helena, Mont. **Mine office:** Elliston, Powell Co., Mont.

Officers: E. H. Brandegee, pres.; W. K. Armstrong, v. p.; C. L. Friederichs, sec.-treas. and gen. mgr.; above are directors; Goodall Bros., assayers.

Inc. April 16, 1909, in Montana. **Cap.**, \$1,500,000; shares \$5 par; assessable; issued, 142,874; 60,000 shares outstanding, \$1.55 paid, last call being 15 cts., Nov., 1912. First National Bank, Laurium, registrar and transfer agent.

Property: the Julia mine. 7 claims, unpatented, 140 acres, on Telegraph creek, 8 miles south of Elliston. Country rock is granite. There are numerous veins, 1 being 14' wide with a paystreak ranging from 6" to a maximum of 4', developed for 500'. Ores are mainly galena, sphalerite and tetrahedrite, with a high silver content. Surface ores carried considerable gold, decreasing with depth, while the silver content has increased.

Development: 330' shaft, 2,600' tunnel and drifts.

Property had \$35,000 mortgage on it, May, 1916, and needed a mill and new power plant to put it on a productive basis. It is still a prospect, since deeper development, to at least 600', is needed to prove whether or not the pay ore will play out at as moderate a depth as it has at the nearby Ontario and other mines of this region.

MONTANA UNITED MINING CO.

MONTANA

J. G. Kirby, pres., Willimantic, Conn.

Cap., 150,000 shares; \$1 par; all issued.

Property: 240 acres, patented, 9 miles east of Deer Lodge, adjoining the Emery mine, shows a fissure vein varying from a streak to 7', average width 3'-4'.

Ore: gold, silver, lead, zinc and much antimony. Said to have 20,000 tons ore blocked out that will average \$20 per ton, including zinc.

Equipment: includes 50-h. p. hoist, 300-cu. ft. compressor, and all necessary boilers, buildings, etc. The mine is idle, needing money for a mill and further development.

***TWIN CITY MINING & MILLING CO.**

MONTANA

Elliston, Powell Co., Mont.

Officers: W. M. O'Connell, pres.; F. B. Hubbard, v. p.; E. J. P. Dwelly, sec.-treas.; preceding, with P. H. McCauley, J. L. Hurd and John Churchill, directors; Allan McNaughton, gen. mgr.

Inc. in Montana. **Cap.**, \$500,000; shares \$1 par; issued, 300,000, fully paid and non-assessable. Annual meeting, April 4.

Property: 5 claims, 70 acres, patented, in Elliston district, 8 miles from Elliston, on east side of Telegraph creek. Ore occurs in granite and management reports 6 veins, of which one is developed by 2 shafts, 185' and 50' deep, and a 250' tunnel with 3 crosscuts. Total workings 525', said to prove vein 18' wide, traceable for 3,000' and proven to 170' depth, carrying 5% copper, 4% lead, 19 oz. silver and \$3 gold per ton. Values said to increase in depth and sulphide ores expected at about 300'.

Equipment: includes steam power, one 40-h. p. hoist and several buildings. Reported 1915, that development would be resumed; nothing reported since.

RAVALLI COUNTY

CURLEW MINE

MONTANA

Address: care A. M. Holter, owner, Helena, Mont. Mine office: Victor, Ravalli Co., Mont.

Mine: formerly a silver producer, also shows zinc ores, and a vein claimed to be 12' wide, is said to show ore carrying 10% copper, with some lead, silver and gold ores. A concentrating mill with flotation unit to treat 85,000 tons of tailings is being worked successfully, 1917. Financed by Los Angeles capitalists.

SANDERS COUNTY

ARLINGTON MINING CO.

MONTANA

Idle. Office: Wallace, Idaho. Mine near Thompson, Sanders Co., Mont. Chas. T. Fisher, pres.; M. J. Mahoney, sec.

Cap., \$1,500,000; shares \$1 par.

Land: 20 claims, well timbered in the Mountain House (unorganized) mining district, near the Idaho-Montana divide. Property shows a ledge said to be traced 6,000' by surface cuts, 30 to 100' in claimed width, carrying, at shallow depth, galena of concentrating grade, with some ore assaying up to 78% lead. The 175' upper tunnel is said to show 3' of good concentrating galena, and the 900' lower crosscut tunnel shows a 10" stringer assaying 8% copper, 15% lead and 15 oz. silver per ton. No recent returns secured.

COPPER MOUNTAIN MINING & DEVELOPMENT CO. MONTANA

Office: Mullan, Idaho. Mine near Thompson, Sanders Co., Mont.

Officers: John Hendricksen, pres.; A. B. Willard, v. p.; D. Flynn and John Foss, directors.

Inc. 1906, in Idaho. Cap., \$1,500,000; shares \$1 par. Annual meeting, 2nd Tuesday in December.

Property: 5 claims, one fractional, 95 acres, with 3 adjoining claims, at the head of Copper creek. Mine has 2 tunnels, the upper a crosscut, deflected for 56' along the vein, said to be 25' wide, carrying pockets and seams of copper carbonates, with gold and silver values. Idle.

PRINCEMONT MINING CO.

MONTANA

Property near Noxon, Sanders Co., Mont., is listed under Coeur d'Alene, Idaho.

REVIAS CREEK MINING & POWER CO.

MONTANA

Letter returned marked "defunct," 1916. Mine near Dixon, Sanders Co., Mont.; fully described in Vol. XI, Copper Handbook.

ROYAL COPPER MINING CO., LTD.

MONTANA

Office: Wallace, Idaho. Mine near Belknap, Sanders Co., Mont. John H. Nordquist, pres.

Property: 12 claims, patented, near Thompson Falls, shows a vein of about 18' surface width, traced 1,500' on company land, carrying copper and lead carbonates and sulphides, said to average 6% copper and 18% lead, with small silver values.

Development: by prospect tunnels of 50' and 600'. The property is a prospect on which assessment work only has been done for several years past.

SILVER BOW COUNTY

All the mines in and around Butte, Silver Bow County, are listed under Butte District.

GOLD HILL MINE

MONTANA

Frank Eichelberger, supt., Melrose, Mont.

Owned by J. J. Edson, Jr., 2208 First Natl. Bank Bldg., Pittsburgh, Pa.

Property: 10 claims, 3 patented, in "Highland," Moose Creek district, Mont., shows gold quartz vein averaging \$6.50 per ton, in payshoot 20' thick and 300' long in granite.

Development: by 500' incline shaft, at 10° dip with total of 1,400' of workings. 50,000 tons of ore developed. Has steam power and 50-ton mill.

NEVADA

The great mining centers of Nevada are Goldfield, Esmeralda county; Virginia City (Comstock lode), Storey county; Tonopah, Nye county; Ely, White Pine county; Yerington, Lyon county, and Rochester, Humboldt county. The mines of each of these districts, like those of other sections of the state, are arranged by counties.

CHURCHILL COUNTY

BOYER COPPER MINES CO.

NEVADA

Mine P. O.: Boyer, Churchill Co., Nev. Arthur Howe Carpenter, cons. engr., 210 Noble Ave., Crafton, Pa.

Property: 49 claims, 1,000 acres, also a 10-acre mill site and 160 acres of placer lands, at Boyer, about 30 miles from Wonder, Nev., and 75 miles south of the S. P. R. R. at Winnemucca, in the copper belt of the Piute mountains, formerly developed by Alva Boyer, now controlled by Crofton Umacke, of Reno, Nev.

Property: covers a mile of the western end of a contact between whitish andesite and an underlying greenstone, or andesite, which shows copper pyrite peppering the rock. The ore bed has a dip of but 20° and a thickness of 100' and is much altered, the footwall being a hard, silicious band. The lower 30' carries 5% copper, but the orebody developed was figured by Prof. Carpenter and A. H. Carpenter to assay 1.7% copper and about 70 cts. per ton in gold. High-grade ore occurs in small iron-capped veins which extend up through the porphyry and carry a breccia of rock fragments cemented by copper glance and bornite.

Development: by tunnels, now inaccessible. Present company has done about 500' of work on Treasury Box hill and exposed a faulted block of 200' length, 100' width and with 500' depth on the dip, assaying as above. Property promising when railroad facilities are provided. Only prospecting done.

CHURCHILL MILLING CO.

NEVADA

Subsidiary of Nevada Wonder Mining Co., which see.

FAIRVIEW RED ROCK CONSOLIDATED MINES

NEVADA

Office: J. A. Wright, financial agent, Exchange Bldg., Denver, Colo. H. A. Riedel, pres.

Inc. in Arizona. Cap., \$2,500,000; shares \$1 par; non-assessable. Stock being offered at 5c per share cash, or 5½c per share in 10 equal monthly payments, March, 1917.

Property: the Red Rock group, 15 claims, 230 acres, near Fairview P. O., in the Fairview mining district, about 42 miles E. of Fallon, the nearest railroad point. The mine shows 2 parallel contact veins, about 400' apart, between limestone footwall and porphyry hanging wall, said to be from 2-8' wide at surface for about 1,500' and to carry ore averaging \$30 per ton in gold-silver-copper. The veins have an E.-W. strike, dipping at about 65°.

There is no equipment and the property is merely a prospect as yet.

FORTUNA GRUBSTAKE MINING CO.

NEVADA

Inc. 1917, in Nevada. Cap., \$500,000; shares \$1 par; 125,000 shares issued; stock being offered at 25c, April, 1917.

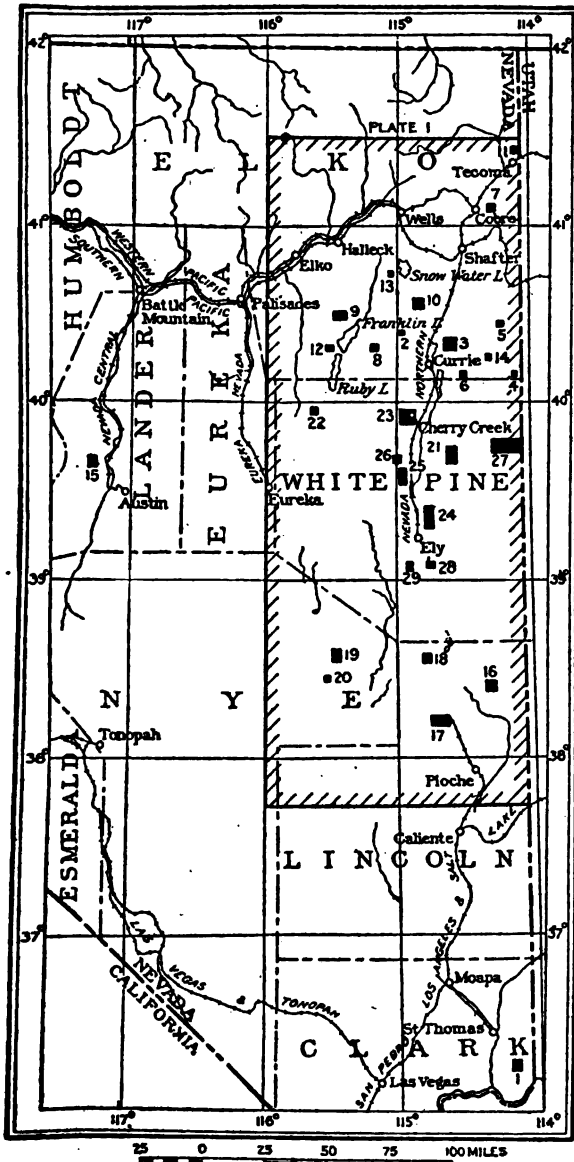
Property: in Churchill county, Nevada, said to show 12" vein carrying lead-silver values. Developed by 350' tunnel.

MINNESOTA NEVADA INVESTMENT CO.

NEVADA

Office: 436 Endicott Bldg., St. Paul, Minn. Mine near Fairview, Churchill Co., Nev.

Officers: Alf. Patterson, pres.; O. S. Deringer, sec.; M. P. Ryan, treas.;
 A. A. Day, gen. mgr., Chas. A. Peet, mg. engr.
 Inc. Aug. 6, 1906, in Oklahoma. Cap., \$1,000,000; shares \$1 par; issued
 \$690,000. Annual meeting, Aug. 6.
 Property: 28 claims, 160 acres placer ground, total about 750 acres, on



MINING DISTRICTS

CLARK COUNTY

1. Gold Butte

ELKO COUNTY

- 2. Delker
- 3. Dolly Varden (Mispah)
- 4. Ferber
- 5. Ferguson Spring
- 6. Kinalay
- 7. Luray
- 8. Mud Springs
- 9. Ruby Valley (Smith Creek)
- 10. Spruce Mountain
- 11. Tecoma
- 12. Valley View (Hankins)
- 13. Warm Creek
- 14. White Horse

LANDER COUNTY

15. Ravenswood

LINCOLN COUNTY

- 16. Atlanta (Silver Park)
- 17. Bristol (Jack Rabbit)
- 18. Patterson

NYE COUNTY

- 19. Troy (Irwin Canyon)
- 20. Willow Creek

WHITE PINE COUNTY

- 21. Aurum (Schellbourne Siegel Muncy Creek)
- 22. Bald Mountain
- 23. Cherry Creek (Egan Canyon)
- 24. Duck Creek
- 25. Granite (Steptoe)
- 26. Hunter
- 27. Kern (Antelope Regan Glenco)
- 28. Taylor
- 29. Ward



Mining district -
 (Number refers to lines.)

MINING DISTRICTS OF EASTERN NEVADA

Chalk mountain, $3\frac{1}{2}$ miles north of Fairview. Claims said to show several orebodies, of which 3, under development, are 6' average width and proven to depth of 126', showing 2% copper, 32% lead, 26 oz. silver and \$8 to \$20 gold per ton.

Development: by 3 shafts, deepest 126'. Management reports a shipment of 3 cars of 12% ore, 1915. Company succeeded to the property of the Corinthian Mining Co. and Chalk Mountain Copper Co.

Idle since 1915. Patent applied for claims. Transportation facilities lacking.

NEVADA HILLS MINING CO.

NEVADA

Reno, Nev.

Officers: Geo. Wingfield, pres.; H. M. Hoyt, v. p.; E. A. Julian, gen. mgr.; C. F. Burton, sec.-treas., with Chas. E. Knox and L. A. Gibbons, directors. A. H. Westall, supt.

Inc. April 19, 1906, in South Dakota. **Cap.**, \$6,250,000; shares \$5 par; 1,065,687 shares issued. Reno Nat'l Bank, registrar. Stock is listed on San Francisco Exchange.

The report for 1916 shows a net operating profit of \$99,462, against which there are charges totaling \$31,818, leaving a surplus for the year of \$67,644. There was a book deficit of \$10,437 for 1916, reducing surplus to \$147,825. Net resources at the close of the year were \$351,140, something less than 33c per share on the outstanding stock.

Property: the Fairview Eagle mine, about 107 acres at Fairview, Churchill Co., Nev. After a profitable career as a gold-silver producer the mine was permanently closed early in 1917 and company is looking for a new property.

Production: in 1916 was \$325,720 from 52,436 tons of \$7.68 ore. Recovery was 80.9% at a total cost of \$4.03 per ton.

NEVADA LINCOLN MINING CO.

NEVADA

Reno, Nev.

Officers: J. Parker Lewis, pres.; Murray K. Scott, v. p.; T. J. Flynn, sec.-treas.; Frank Wilson, supt., with Zeb Ray, directors.

Inc. Dec., 1915. **Cap.**, \$1,250,000; shares \$1 par; 750,000 shares were issued to Wilson and Scott for the property.

Property: 5 claims, covering 3,000' on the strike of the ore channel at Lincoln, Churchill Co., Nev., shows gold-silver ore in 3 veins traceable for over 400' on the surface.

Development: by 550' crosscut tunnel. About 600' west of the portal a 6' vein is said to have been encountered, giving assays of from \$24-\$59 per ton. Ore occurs in bands and seams in a broken formation of quartz and talc. Company also owns a mill-site and water rights. Considered a promising prospect.

NEVADA SILVER CONSOLIDATED CO., INC.

NEVADA

Office: Wonder, Nev.

Officers: G. H. Manning, pres.; R. V. Ellis, v. p.; N. H. Manning, sec.-treas.; E. S. Cox, asst. sec.; S. H. Brady, mgr., also directors.

Inc. in Delaware. **Cap.**, \$2,500,000; shares \$1 par; fully paid and non-assessable; 1,700,000 issued.

Property: 9 quartz claims, 166 acres, 4 miles N. W. of Wonder, Churchill Co., Nev. Nearest railroad point is Fallon.

Geology: ore deposition has followed a dike of dense and hard intrusive rhyolite, showing intense silicification. This dike is intruded along the dacite-rhyolite contact, except where quartz-porphry intervenes between it and the dacite. The dike is itself classed as a vein, as it is silicified, and somewhat mineralized. The quartz of the hanging and foot walls

carries the best values. Forty-six samples taken from various exposures on the property returned from 0.3 to 13.6 oz. silver per ton.

Development: in 1907 extensive openings were made by lessees, who shipped ore, one lot of 500 tons averaging \$125 per ton. Little work has been done on the dike-vein at depth. A shaft was down 216' in July, 1917, and is to be sunk to 400 or 500'.

Mine examined by S. H. Brady and E. V. Schulze.

A prospectus gives 15 reasons why shares should be bought, several of which should not be considered. With silver at \$1 an ounce property ought to make fair profits on low-grade ore.

NEVADA WONDER MINING CO.

NEVADA

Office: 572 Bullitt Bldg., Philadelphia, Pa. **Mine office:** Wonder, Nev.

Officers: C. A. Higbee, pres.; J. S. Austin, v. p.-treas.; J. H. White-man, v. p.-gen. counsel, with C. A. Daniel, Barton Hoopes, Jr., Chas. R. Miller and Wm. M. Potts, directors. P. S. Bickmore, sec.; E. E. Carpenter, supt.; E. S. Cunningham, asst. supt.

Inc. Sept. 19, 1906, in Delaware. **Cap.**, \$1,500,000; shares \$1 par; all issued. **Dividends:** paid at the rate of 20% annually. Last dividend paid May 8, 1917, of 10c per share. Total, \$1,056,045.

Company owns the Wonder Extension, Hidden Treasure and Reorganized North Star Mining companies.

Balance sheet for 15 months ended Dec. 31, 1916, showed assets totaling \$2,065,049, including \$1,477,507 for property and plant, \$251,591 stocks owned, and \$335,294 accounts receivable. Current liabilities total \$54,333. Surplus was \$510,716. Revenue for the period was \$1,399,818 from bullion sales, including \$471,081 from silver on hand but sold.

Combined and condensed cash receipts and disbursements of Nevada Wonder Mining Co. and Churchill Milling Co. for year ending Dec. 31, 1916, showed: cash on hand, Sept. 30, 1915, \$10,274; receipts, \$1,475,105, which included: loans, \$40,000, Selby Sm. & Lead Co., mill products \$1,399,918. Disbursements totaled \$1,403,981, including two dividends of 25% in all, \$352,091; cash on hand, Dec. 31, 1916, \$71,124.

In June, 1916, company acquired a 25-year lease on the Jack Pot mine, from Atlas Leasing Co. Other claims acquired were the Occidental and Anna groups.

Property: 328 patented and 73 unpatented acres at Wonder, Churchill Co., Nev., shows gold-silver ore in fissure veins 5-6' wide in rhyolite with occasional dacite. The gangue consists of quartz, feldspar and kaolin. The rock is mined by the waste-filling system as the walls in the lower levels are insecure, caving in large masses, thus making the shrinkage system of stoping used above the 400' level, inadvisable in the lower workings.

Development: by 1,300' shaft and winze 600' deeper. There is a total of 46,650' of underground workings. Work done in last 15 months was 10,569'.

The Jack Pot mine, recently acquired, extends the company holdings to the northward on the vein system.

The 100-ton mill is operated by the Churchill Milling Co., whose entire stock issue is owned by the Nevada Wonder Co.

Exploration in 1916 indicated good possibilities at depth. In the original sulphide vein, above and below the 1,300' level, there is high grade ore. The winze below this level was in ore for 45' before the value broke to the north, and averaged \$30 to \$40 per ton for 4' in width. The 1,600' level is under this winze, enabling further exploration of the vein. Mining cost \$5.29 per ton. A 50 h. p. electric hoist was placed at the sub-shaft, to

enable sinking it to 1,900'. An electric tractor moves ore from stopes at 1,300'.

Production: in 1916, 72,241 tons of ore averaging 18.72 oz. silver, 0.159 oz. of gold and worth \$15.40 per ton. This yielded 1,243,753 oz. silver and 10,933 oz. gold, worth \$1,031,243. The recovery was 92.67% of total value at a cost of \$8.90 per ton for all departments. In 1915 the cost was \$7.26 per ton.

Churchill Milling Co.

Is a subsidiary of the Nevada Wonder Mining Co. with same directorate. Operates a 100-ton mill at Wonder, Churchill Co., Nev. Treated from Oct. 1, 1915, to Dec. 31, 1916, 72,241 tons of ore of \$1,112,835 gross value, showing a 95.35% recovery of the gold contents, 91.95% of the silver contents and 92.67% of the total value, or 11,466 oz. gold and 1,352,615 oz. silver. Total cost per ton was \$2.761, compared with \$2.268 in 1915.

Annual report for 15 months ending Dec. 31, 1916, showed: assets, \$237,122, which include property, \$80,889; accounts receivable \$78,032 and liabilities \$14,579, leaving a surplus of \$68,543. During same period \$352,091 was paid in dividends, making a total of \$915,205.

VULTURE-WONDER MINES CO.

NEVADA

Title changed to Nevada Silver Consolidated Co., which see.

WESTERN ORE PURCHASING CO.

NEVADA

Address: F. M. Manson, Hazen, Nev. Company operates a 900-ton sampler at Hazen and is well and favorably known.

CLARK COUNTY

AZALIA MINING CO.

NEVADA

Address: F. M. Berry, sec.-treas., Union Oil Bldg., Los Angeles, Calif.

Officers: F. W. Cole, pres.; S. E. Vermilyea, v. p.; preceding officers, John Woodson and S. L. Carpenter, directors; Dee W. Minier, supt.

Cap., \$1,000,000; shares issued, 700,000.

Property: 4 claims, 8 miles N. W. of Platina, Yellow Pine district, covering a vein in limestone, containing zinc-silver ore, for 3,000'. Developed by an 80' incline shaft which passed over the ore, said to be 6' thick and faulted at a depth of 30'. Operated under lease by C. E. Cree in 1917.

Company is developing a group of 9 claims about 1 mile below the Cerro Gordo mine, in the Cerro Gordo mining district, Inyo Co., Calif. A tunnel, 750' long., in June, 1917, is being driven to reach the contact.

AZURITE MINING CO.

NEVADA

J. W. McFatridge, mgr.-sec.-treas., 941 W. 35th St., Los Angeles, Cal. **Mine address:** Goodsprings, Clark Co., Nev. A. C. Black, pres. and purch. agt.; T. D. Knights, v. p.; preceding officers, M. P. Erwin, M. M. McFatridge and Samuel Yount, directors.

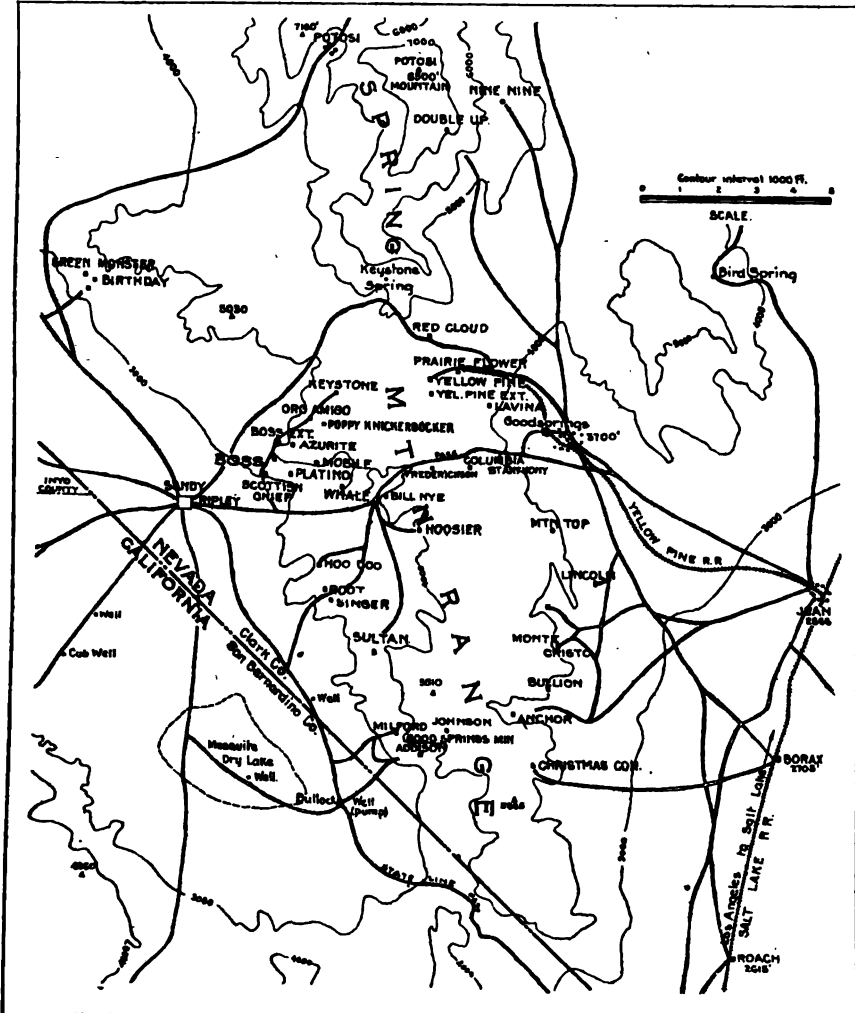
Inc. Feb. 7, 1911, in Nevada. **Cap.,** \$1,000,000; shares \$1 par; nonassessable; issued 440,879 shares.

Property: 9 claims, 174 acres and a 3-acre smelter site, in the Yellow Pine district, sections 26, 27, 34 in T. 24 S.; R. 57 E., 12 miles from Goodsprings and 20 from Jean on the Salt Lake railroad. The mines adjoin the Boss mine on the east.

Ore: carries plumbojarosite, a very rare mineral, carrying gold and platinum (see U. S. Geol. Survey Bull. 620). The Shenandoah, Jolly Boy and Copper Chief mines, all producers, adjoin the Azurite. A 150' tunnel, 80' below the incline shaft, at the Azurite mine, will give working ground for stopes. Claims show ores carrying gold, silver, copper, lead, zinc and

platinum, lowest assay at the copper mine said to be \$3.60 gold, \$4.50 silver, 27% copper, .03 oz. platinum. Ore occurs in replacement orebodies of irregular size and shape, the largest 35x40' and 8 to 10' thick. These replacements occur in thick bedded limestones cut by porphyry dikes.

Development: the Azurite copper mine has a 78' and a 20' shaft.



MAP OF SOUTH-EASTERN NEVADA, INCLUDING YELLOW PINE DISTRICT

Property has 1,626' of workings, including several tunnels, the longest being 450', estimated to block out 8,800 tons of 20% copper ore and 30% lead ore.

Company bought the Nevada Copper Realty property, Feb. 7, 1911. The proposed Parump Valley branch of the Salt Lake Route from Jean to

Goodsprings will open up this district and enable many of the mining companies to ship ore. The mine shipped four carloads of high-grade copper and lead ore in 1914, but has been idle since 1915.

BIG CASINO MINING CO.**NEVADA**

Office: 775 Drexel Bldg., Philadelphia, Pa. **Mine office:** Searchlight, Nev.

Officers: M. W. Johnson, pres.; H. C. Gibson, v. p.; F. E. Sharps, v. p.; O. C. Small, sec.-treas. and gen. mgr.; W. W. Wishon, cons engr.

Inc. Sept. 14, 1914, in Delaware. **Cap.**, 1,000,000 shares, non-assessable; 880,000 shares outstanding.

Property: 9 contiguous lode claims and 2 mill sites, about 4 miles E. of Searchlight, said to show a zone of altered andesite in granite-porphry carrying copper-gold ore.

Development: main shaft about 550' deep with 4 levels at about 100' intervals. Equipped with 30-ton concentrator, 25 h. p. hoist, air compressor, etc.

Present states that mine is still in development stage and company does not care to furnish the information requested by us.

BOSS EXTENSION MINING CO.**NEVADA**

Al. E. Buys, gen. mgr., Goodsprings, Nev. Edw. Kennedy, fiscal agent, Security Bldg., Los Angeles, Calif.

Officers: Peter Buol, Las Vegas, pres.; Nick Kunz, v. p.; Harry K. Rid-dall, Goodsprings, Nev., sec.-tras.

Inc. Nov. 12, 1914, in Nevada. **Cap.**, \$1,000,000; shares \$1 par; 558,500 shares issued. In Dec., 1916, company sold 100,000 shares, which were offered to the public by Kennedy at 11 cts.

Property: 3 claims, 60 acres, adjoining the Boss mine and between it and the Oro-Amigo mines in the Yellow Pine mining district, Clark county, Nev. Claims show a porphyry dike, whose mineralized contact with limestone is said to carry platinum gold ore, similar to that of the Boss mine.

Development: by 40' shaft and 2 tunnels (250').

BOSS GOLD MINING CO.**NEVADA**

Goodsprings, Clark Co. **Officers:** S. E. Yount, pres.; J. F. Kent, v. p.; F. A. Hale, Jr., sec.-treas.; with O. J. Fisk and R. B. Chapman, directors. O. J. Fisk, gen. mgr.

Inc. 1914, in Nev. **Cap.**, \$1,000,000; shares \$1 par; outstanding \$408,500. Annual meeting, third Wednesday in Jan.

Financial statement, Jan. 1, 1917, shows: balance in bank, \$26,093. Smelter returns for 1916 were \$45,725 and operating disbursements, \$28,811; ore in transit, \$5,000. Dividends amounted to \$8,170.

Property: 5 claims, 85 acres, unpatented, 12 miles west of Goodsprings and 3 miles from new townsite of Platina.

Geology: orebodies consist of oxidized copper ore, mostly chrysocolla and limonite, and of gold-platinum-palladium ore in fine-grained silicious gangue. The later ores contain a small quantity of bismuth-bearing plumbojarosite (a hydrous sulphate of iron and lead). The shoots can be mined separately. The orebodies occupy a nearly vertical zone of fracturing in the horizontal strata of dolomite. The zone is 30' wide on surface, 100' long, with precious metal shoots confined to the 12' resting on the footwall. **Ore reserves:** blocked out and on dump, estimated Jan., 1916, as 14,200 tons valued at \$296,000. Assays said to be 2 to 15% copper, 0.2 to 100 oz. gold and 0.2 to 100 oz. platinum per ton.

Development: several tunnels, with a total of 5,635' underground work. Equipment includes an 800' tramway.

Production: ore shipments started in February, 1916, and a total of 746 tons were shipped during the year, 451 tons of copper ore, the remaining 295 tons being shipped East for recovery of platinum values.

In 1917, the Pacific Platinum Works of Los Angeles, Calif., contracted for the entire output of the mine, paying \$191 per ton net for a shipment made in July, including platinum at \$103 per oz. and palladium at \$110 per oz., besides gold and copper values. On November 1st, the new works of the Palau Metals Co. were started at Los Angeles, and will treat 200 tons per month.

Mining costs for 1916 averaged \$16.10 per ton.

Company has erected an experimental mill of 10 tons capacity which started operations in April, 1917. R. J. Goodwin is metallurgist in charge.

BULLION MINING CO.

NEVADA

Mine at Goodsprings, Nev. Gen. office: 61 Main St., Salt Lake City, Utah.

Officers: J. J. Daynes, Jr., pres.-mgr.; J. B. Phelps, supt.; E. L. Talbot, C. E. Jenkins, directors. Company is privately owned.

Ore: occurs in ledges between white and blue lime on bedding plane, carrying lead and zinc, and about 10 oz. silver to the ton. Lead is dry concentrated and shipped. Zinc is shipped crude. Mill is now working two shifts. Part of property is under lease. Is 8 miles from a railroad.

Production about 15 cars monthly.

COLORADO-NEVADA MINING & MILLING CO.

NEVADA

Nelson, Clark Co., Nev. **Officers:** F. C. Avery, pres.; Alex. Mead, v. p.; I. W. Bennett, sec.-treas.; G. A. Duncan, mgr.; with Geo. P. Avery, C. R. Welch, P. Anderson, directors.

Inc. Oct. 13, 1915, in Colorado. **Cap.**, \$1,000,000; shares \$1 par, none outstanding. Annual meeting Oct. 1st.

Property: 11 claims, patented, 163 acres, Eldorado mining district, Clark Co., Nevada, shows gold and silver ore in fissure veins in andesite, with a mining width of 15', and said to average \$10 to \$12 per ton, as fed to mill.

Development: by 600' shaft.

Equipment: includes a 25-h. p. hoist, Ingersoll-Rand compressor, and a 10-stamp mill and cyanide plant, daily capacity 75 tons, which is said to give an extraction of 92%. Company started operations late in 1915. No production figures to date.

COPPER METAL MINES CO.

NEVADA

Address: Goodsprings, Nev.

Officers and directors: C. B. Stewart, pres.; Peter Clegg, v. p.; J. B. Jensen, sec.-treas.

Inc. Dec. 20, 1916. **Cap.**, \$1,000,000; shares \$1 par; 400,000 shares issued. Financial report dated Aug. 30, 1916, showed operating expenses for 1916, \$2,000; receipts \$4,000; cash in treasury \$6,000.

Property: 11 claims, 220 acres, in Ivanpah district, about 35 miles S. W. of Goodsprings, only slightly developed and claimed to show a 3' contact vein between granite and porphyry, assaying 6% copper and 6 oz. silver with a trace of gold.

COPPER PEAK MINING CO.

NEVADA

Office: Goodsprings, Nev.

Officers: P. S. McClanahan, pres.; F. A. Hale, Jr., v. p.; R. W. Andruss, sec.-treas.; preceding, with W. E. McClanahan, directors, all of Goodsprings, Nev.

Inc. in 1916 in Nevada. **Cap.**, \$1,000,000; shares at \$1 par; outstanding 520,000 shares, non-assessable.

Gross earnings for 1916 were \$13,000 and operating expenses were about \$10,000. About 150 tons of ore were shipped.

Property: 6 claims, about 120 acres, on the south and east slopes of Olcot Peak, Yellow Pine mining district, ten miles north of Goodsprings, Clark Co., Nev.

Ore: is a high grade copper carbonate occurring in chambers and kidneys embedded in limestone. The highest assay of the 5 cars sorted ore shipped was 25% and the lowest was 14% copper.

Development: by 6 adits with total of 600', the longest being 150'. Property has been worked intermittently for a number of years and efforts are now being made to finance some consistent plan of development.

DUPLEX MINING CO.

NEVADA

Office: 501 P. E. Bldg., Los Angeles, Cal. **Mine office:** Searchlight, Clark Co., Nev.

Officers: Geo. L. Craig, Long Beach, Cal., pres.; C. W. Ennis, v. p.; Geo. R. Colton, sec.; G. F. Colton, pres.

Inc. May 7, 1915, in Nevada. **Cap.**, \$500,000; shares \$1 par. All stock issued is assessable.

Property: 7 patented claims, 101 acres, is a well-known gold mine, with veins in quartz monzonite, carrying gold-silver ores, changing to copper, lead and zinc at depth. Orebodies from 2.5' to 5' in width.

Development: by 600' vertical shaft, a 45° incline shaft 400' deep, and a 74° incline shaft 300' deep, with about 2,500' of underground workings. Assay results from carload lots are 0.9 oz. gold, 4.9 oz. silver, 8.6% lead, 2.3% copper, 1.3% zinc. Company claims that on the lowest levels the amount of lead is diminishing and copper increasing. The first copper ore mined in commercial quantities in the district was shipped from this mine in Aug., 1913. Gross earnings from ore sales in 1914-1915 were \$7,500, with operating expense of \$10,500. Property equipped with stamp mill, which will resume operations when property is opened up between 500' and 700' levels. Company planning to remodel mill and install an oil flotation plant.

Leasers reported to be shipping ore, 1917.

DUPONT COPPER MINES CO.

NEVADA

Office: N. H. Wheeler, 7 East 42d Street, New York. **Mine address:** Searchlight, Nev.

Officers: S. J. Kistler, pres.; Wm. D. Miller, v. p.; Chas. M. W. Keck, sec.-treas.; with Geo. S. Fenwick and A. M. Marshall, directors. G. B. Hartley, supt.

Inc. Feb., 1916, in Ariz. **Cap.**, \$2,500,000; shares \$1 par, non-assessable; 1,500,000 issued. Security, Transfer & Registrar Co., N. Y., transfer office. Metropolitan Trust Co., N. Y., registrar.

Property: the Sazarac group, formerly owned by the Gold Coin Mining Co., defunct 1907, and the Bornite group. These holdings comprise 23 claims, 8 patented, 410 acres, at Camp Dupont, 18 miles from Searchlight, Clark Co., Nev.

Geology: the mineralized dikes or veins at the property occurs in a batholith of granite porphyry (or quartz monzonite), which intrudes a pre-Cambrian granitoid complex, overlain by Tertiary volcanics. A contact between a white microcline aplite and a greenish basic granite is observable, the basic rock being invaded by great tongues of the former and by N. S. pegmatite dikes paralleling the vein system.

Ore: carries copper and gold in silicified quartz porphyry with specular iron and spathic iron and occurs in the N. S. Sazarac vein, 5' wide, with specular hematite in silicified quartz porphyry at contact with a dike. It is 15' wide on 200' level. The Bornite vein, 5' wide, runs E-W, and shows

quartz porphyry gangue on surface. Four per cent Hill is a stockwerk of veinlets, making a possible disseminated or porphyry orebody.

Development: 216' shaft on the Sazarac, 92' and 141' shafts on the Bornite, and 100' shaft on the Copper Queen claims.

Reported on by Carl Anderson, E. M., and by W. W. Wishon, E. M., Los Angeles, in 1916.

Property regarded as promising.

EASTERN COPPER CO.

NEVADA

Office: 805 H. W. Hellman Bldg., Los Angeles, Calif. **Mine address:** St. Thomas, Nev.

Officers: L. H. Lathrap, pres.; J. K. Turner, v. p.; C. P. Campbell, sec.-treas.; C. R. Topping, supt.; above with W. F. Vidal, directors. J. K. Turner, cons. eng.

Inc. 1917 in Ariz. **Cap.**, \$1,500,000; shares \$1 par, non-assessable. Security Transfer & Registrar Co., N. Y., and Registration Surety Co., S. F., transfer and registry agents, respectively.

Property: 12 claims, 240 acres, in Gold Butte mining district, Clark Co., Nev., about 15 miles east of St. Thomas, the nearest railway point.

Ore: occurs in a fracture zone in limestone and carries copper in the form of chalcocite and malachite.

Report by L. J. Lathrap recommends sinking a shaft. Leasers have shipped surface ore only in past, some of it reported to have carried 29% copper.

Is a prospect which needs deep development.

ELDORADO ENTERPRISE GOLD MINING CO.

NEVADA

E. P. Jeanes, pres., Las Vegas, Nev. Company reported to have made a discovery of platinum ore on their property, 1916.

EL DORADO GOLD STAR MINING CO.

NEVADA

Operating claim in Nob Hill section of El Dorado mining district. Company offered 40,762 shares for sale, Aug., 1917, proceeds to pay off \$15,000 due on purchase, and to pay for development.

GOOD SPRINGS ANCHOR CO.

NEVADA

Office: 1202 Hollingsworth Bldg., Los Angeles, Calif. **Mine at** Jean, Clark Co., Nev.

Officers: Frank A. Keith, pres.; Philip Wiseman, v. p.; R. I. Rogers, treas.; I. Mattern, sec.; with Seeley W. Mudd, directors. Roy W. Moore, mgr.

Inc. Dec. 20, 1913, in Nevada. **Cap.**, \$1,000,000; shares \$1 par; issued, \$550,000. Annual meeting, second Monday in May.

Gross earnings in 1916, \$111,359; in first 4 months of 1917, \$34,940. Total dividends to June 1, 1917, \$147,285.

Property: 7 patented and 1 unpatented claims at Jean, said to show lead-zinc ore occurring as replacement deposits in limestone, strike N.-S., dip 50°. Developed by 212' winze from a 110' tunnel; greatest depth of workings 400'; total underground workings, 1,600' of drifts.

Equipment: 15-h. p. oil hoist, 3-drill compressor, 2,000' gravity tram, 50-ton dry mill using Stebbins tables.

Production: in 1916, 872 tons crude zinc ore, 472 tons crude lead ore and 712 tons lead concentrate.

First 4 months of 1917 yielded 178 tons of 37% zinc ore, 136 tons of lead ore carrying 59.1% lead and 5.61 oz. silver, and 208 tons concentrate assaying 56.8% lead and 12.62 oz. silver.

GREEN MONSTER MINE.

NEVADA

Office: Phoebe A. Hearst Estate, 410 Hearst Bldg., San Francisco. C. B. Neel, mgr., Goodsprings, Nev.

Property: in Yellow Pine district, Clark county, 16 miles N. W. of Goodsprings, Nev. Ore is mainly zinc carbonate with a little lead, copper, and silver. Output to Sept., 1917, totals 3,000 tons, averaging 35% zinc.

Development: 250' single-compartment shaft with manway, 2 incline shafts, 100 and 255' deep, and 140' winze.

INGOMAR MINE.

NEVADA

Address: Samuel S. Arentz, 303 Dooly Bldg., Salt Lake City, Utah.

Property: 3 claims (patents pending), 10 miles S. of Goodsprings, Clark Co., Nev., said to show a chamber deposit in limestone, dipping 35° S. E. and pitching N. 20° E. Ore assays 42% zinc as carbonate and 65% lead.

Development: by incline shafts to 50' depth, and tunnels 200 and 300' long.

Gross yield in 1916 was \$36,000. To May, 1917, the output was 33 car-loads, and monthly returns are said to be \$10,000 gross. Twelve to 18 men are employed. A washout of 7 miles of Borax Smith's state line highway in August, 1917, cut the district off from Roach, forcing teams to haul 29 miles to another station.

A promising mine in a good district.

IRONSIDES MINING CO.

NEVADA

Goodsprings, Nevada.

Officers: W. H. Gable, pres.; J. C. McCreary, v. p.; both of Scotts Bluff, Neb.

Property: near Goodsprings, had 100' shaft with drifts and stopes on shipping ore.

IVANPAH COPPER CO.

NEVADA

Goodsprings, Nevada.

Company shipping 100 tons of copper ore daily. A new smelter at Valley Wells was nearly completed in September, and will handle mines output.

JUNE BUG DEVELOPMENT CO.

NEVADA

Office: Ogden, Utah. **Mine office:** Las Vegas, Clark Co., Nev.

Directors: Lester S. Scoville, pres.; Milton J. West, v. p.; Frank L. Scoville, sec.-treas.; above, with John Hochett and Walter B. Scoville. Milton J. West, mgr.; L. S. Scoville, supt.

Inc. Jan., 1916. **Cap.**, \$100,000; shares 10c par; 825,000 issued. Annual meeting, Jan. 4th.

Property: 9 claims, surveyed for patent, 18 miles N. W. of Las Vegas, in the Goodsprings district, Nev., said to show gold, silver and zinc ore. Pay ore occurs in shoots 30' long, from 6-10' wide and from 14" to 5' thick, reported to assay 40% zinc, \$1.50 gold and \$4 silver per ton. The ore is a zinc silicate. Veins are in limestone formation.

Development: by shallow shafts and about 1,200' of underground workings. Shipments of 650 tons for 4 months ending June, 1916, to the Utah Ore Sampling Co., returned \$35,000. Management reports that company marketed sufficient ores to take care of all extensions and new developments.

KANSAS NEVADA MINING CO.

NEVADA

Address: Goodsprings, Clark Co., Nev.

Officers: Frank Williams, pres.; Chas. Locknow, v. p.; J. T. Bristow, sec.-treas., with John Williams and Thos. Williams, directors.

Inc. July 16, 1907, in Nev. **Cap.**, \$1,000,000; shares \$1 par; 706,895 outstanding. Operating expenses for 1915 were \$2,128 and gross earnings from ore sales were \$1,560.

Property: 3 unpatented claims, about 53 acres. 9 miles W. of Goodsprings, show zinc, lead and silver ore in a 4' vein in limestone formation.

The vein runs E. W. and dips N. Developed by 500' tunnel to depth of 130'. An initial shipment of 53 tons of ore made in 1915 averaged \$30 per ton.

No recent information.

ORO AMIGO PLATINO MINING CO.

NEVADA

Goodsprings, Nev.

Officers: S. E. Yount, pres.; Geo. A. Fayle, v. p.; H. K. Riddell, sec-treas. and mgr., with N. B. Hunter and Fred A. Hale, Jr., directors.

Inc. Nov., 1914, in Nevada. Cap., \$1,000,000; shares \$1 par; 515,100 shares issued. Annual meeting, Jan. 15th. Operating expenses for 1915 were \$8,500.

Property: 5 unpatented claims, 60 acres, in Yellow Pine mining district, Clark Co., Nevada, about 2 miles N. E. of the Boss mine.

Ore: quartz and plumbojarosite in fissure veins in limestone. Values are copper, gold, platinum and palladium, occurring in shoots 6"-4' wide.

Development: by 2 tunnels, 70' and 150' long, with 1,500' total underground workings. Not yet producing.

PLATINO MINES CORPORATION

NEVADA

R. Mausard, supt., Goodsprings, Clark Co., Nev. Mine about 30 miles from Las Vegas, in the Platino district, is said to carry a 2' vein of copper ore. A winze sunk on vein is also reported to have disclosed a body of manganese carrying platinum and gold values.

PRAIRIE FLOWER DEVELOPMENT CO.

NEVADA

Address: Jas. Ashbaugh, mgr.; Goodsprings, Nev.

Officers: G. A. Fayle, pres.; Jas. Ashbaugh, v. p.; F. A. Hales, Jr., sec-treas., with N. B. Hunter and O. J. Fisk, directors.

Inc. Dec. 23, 1916, in Nevada. Cap., \$100,000; shares 10c par; non-assessable; 300,000 issued. Annual meeting, first Tuesday in Jan.

Property: 4 patented claims, 60 acres, 4 miles W. of Goodsprings, Nev., adjoining the Yellow Pine mine on the N. Property is owned by the Prairie Flower Mining Co., but is being developed by this corporation.

Claims cover a replacement deposit in limestone with an orebody that is 6' wide, dips 40° W. and has a N.-S. course. The ore which contains carbonates of lead and zinc is said to assay 15% lead, 30% zinc and 10 oz. silver.

Development: by 200' and 300' incline shafts and 2,500' of workings. In Aug., 1917, 55% lead-zinc ore was cut at bottom of the 200' shaft, thought to be the Yellow Pine ore zone.

Equipment: 18 h. p. hoist, Ingersoll-Rand compressor, and distillate engine.

QUO VADIS GOLD MINING CO.

NEVADA

Las Vegas, Nev.

Officers: Peter Buol, pres.; C. C. Ronnow, v. p.; Ed. W. Clark, sec-treas.; above, with F. A. Clark and J. B. Anderson, directors.

Inc. Dec., 1915, in Nevada.

Property: the Quo Vadis mine at Las Vegas, Clark Co., Nev., said to show rich stringers of free milling gold ore in latite and andesite formation. Developed by 300' tunnel and a shallow shaft, which will eventually be sunk to 500'.

SAINT ANTHONY MINING CO.

NEVADA

Goodsprings, Clark Co., Nev. Jos. Dederichs, gen. mgr. and chief owner.

Property: 7 claims, 140 acres, in the Yellow Pine mining district, 2½ miles W. of Goodsprings. Ore is said to assay 10% to 18% copper in

orebodies up to 15' in width. Developed by 2 incline shafts, 240' and 175' deep, located 500' apart.

Equipment: includes 2 gasoline hoists and an aerial tram 850' long.

Production: to June, 1915, reported as \$60,000. Reported shipping one car of ore every 6 weeks during 1916.

SULTAN MINE

NEVADA

Address: Henry Robbins, owner, Goodsprings, Nev.

Property: in Goodsprings district, Clark Co., Nev., is said to show a replacement orebody in limestone. Minerals are zinc and lead carbonates, averaging $\frac{1}{2}$ to 1 oz. silver to each 1% lead. Surface outcrops are said to be extensive.

Equipment: includes 50-ton dry concentrating plant, separating the lead, making a 50% lead and 25 oz. silver concentrate. Tailing carries 15% zinc, 4% lead and 4 oz. silver per ton. Only the lead is being saved. From 15 to 20 men employed.

TECHATTICUP MINE

NEVADA

Address: R. T. Walker, lessee, Nelson, Nev. Owned by Joseph Wharton Estate, Philadelphia, Pa.

Property: 9 claims, 8 patented, 1 mile E. of Nelson, Clark Co., Nev., said to show a quartz vein in monzonite, dipping 10 to 80° and pitching E. W. Ore is a sulphide.

Development: by 600' incline shaft, and 3,000' of workings.

Equipment: 25 h. p. gasoline hoist, 3 compressors and 50-ton cyanide mill.

Production: in 1916 was 7,676 oz. gold and 58,393 oz. silver.

WHALE MINE

NEVADA

Goodsprings, Nev.

Officers: T. A. Varden, mgr.; J. M. Hays, sec.; R. M. Salisbury, C. W. Whitley, L. Greene, trustees.

Property: the Whale mine, 6 unpatented claims, 120 acres, 8 miles W. of Goodsprings, Clark Co. The mine has deposits of zinc ore which occur in limestone and dip 45°, the pay ore being found in shoots 2' to 5' wide. Mine is worked by a 600' tunnel. Greatest depth of workings, 300'. The mine is still in development stage.

Equipment: includes 10"x10" compressor. A shipment of carbonate ore, said to have averaged 38% zinc.

YELLOW PINE EXTENSION CO.

NEVADA

Office: Goodsprings, Nev.

Officers: A. J. Robbins, pres.; E. B. Critchlow, v. p.; Reynolds Robbins, sec.-treas., with A. J. McDermott and G. A. Fayle, directors.

Inc. in Utah. Cap., \$100,000; shares 10c par; assessable; 575,000 issued.

Revenue in 1916 was \$22,000, of which \$16,000 was from ore production. Expenses totaled \$20,000.

Property: 12 claims, 190 acres, in Yellow Pine district, Clark Co., Nev., said to show a chamber deposit in limestone, dipping 45° W., with N.-S. course. Ore shoots are 2 to 8' wide and 10 to 40' long. Ore contains carbonates of zinc and lead, with some copper and silver; zinc content is 35%.

Development: by 800' incline shaft, 200' tunnel and total of 4,000' of workings. A new shaft has been sunk.

Production: to 1917 about \$100,000, average in 1916 being \$25 per ton.

YELLOW PINE MINING CO.

NEVADA

Offices: 431 Security Bldg., Los Angeles, Calif., and Goodsprings, Nev.

Officers: J. F. Kent, pres.; R. B. Chapman, v. p.; F. A. Hale, Jr., sec. and mgr.; G. W. Kent, treas., with S. E. Yount, directors; J. C. Kemple, mine supt.

Inc. 1905, in Nev. Cap., \$1,000,000; shares \$1 par; non-assessable; all issued. No bonded indebtedness. Stock transferred and registered at company's Los Angeles office. Annual meeting, third Wednesday in Jan. Listed on Los Angeles Stock Exchange.

Gross earnings, year ending Jan. 10, 1917, \$1,017,613; receipts from sale of ore, \$1,011,730; operating expenses, \$219,857; cash, \$152,133; dividends paid, \$800,000. Total dividends to Sept., 1917, \$1,983,000.

Property: 13 patented claims, about 240 acres at Goodsprings, Yellow Pine district, Clark Co. Ore occurs as carbonate and oxide in limestone and average 30% zinc, 14% lead and 12 oz. silver. The main deposit dips about 30° and strikes N. S. The ore consists principally of lead and zinc carbonates and silicate. Sulphides are almost entirely absent as evidenced by the fact that the smelter returns on the lead concentrates show only 2 or 3% sulphur.

In Sept., 1916, the Charleston claims, 36 miles from Las Vegas, were taken under option. Three feet of 45% lead-zinc ore was opened.

Development: by an inclined shaft, 900' deep, greatest depth of workings being 950' and linear extent 25,000'. During 1916 new work amounted to 3,358', costing \$9.31 per foot. In July, 1917, an extensive shoot was opened at 700', several feet assaying 34.6% zinc and 18.3% lead. By Sept., it had been opened for 150'. A winze has been sunk to determine its limits. Ore is mined by square set stoping.

Equipment: includes 40 h. p. electric hoist, compressor, 12 miles of 36" gauge railway, with Shay locomotive; 75 h. p. semi-Diesel engine, etc.

Mill: the 100-ton mill is, strictly speaking, a separator rather than a concentrator. The ore is a high-grade lead-zinc material, and in the treatment at this plant no rejection is made, all products of the mill being shipped.

From the mill bin the ore is fed to a short conveyor, on which the larger pieces of waste are sorted out. This conveyor dumps over a 1" grizzly and the oversize goes to an 8" by 16" roll-jaw crusher. Grizzly and rock breaker both discharge to a chain elevator, which dumps to the fine-ore bin.

The fine ore is delivered to a set of 16" by 36" Cornish rolls set to ¼". These discharge to a wet elevator, which raises the ore to the top of the mill, where it passes successively over ¼" and ⅛" impact screens. The screen oversize is treated on two 2-compartment Harz jigs, which make lead concentrates from the bed and hutch of the first compartment and middlings through the second compartment and over the tailboard. The middlings from the coarse jig are returned to the first set of rolls and those from the finer jig to a second set, both of which discharge to the elevator and to the impact screens.

The undersize of the second screen goes to a 5-compartment Richard's classifier, which makes 6 products, each of which goes to an Overstrom table. The tables make only 2 products, lead and zinc concentrates. The lead goes to tubs and the zinc, with all slime to settling bins beneath the table floor. The lead is shoveled to small cars, the zinc is drawn off through gates and the slime overflows to ponds from which it is shipped when a sufficient amount accumulates.

Production:

	Ore				Cost P. T. Shipped			
	Milled Tons	Lead %	Zinc %	Silver oz.	Mining	Milling	Transp'n	General
1916.....	20,581	10.5	30.4	4.53	\$5.418	\$1.546	\$0.860	\$2.095
1915.....	16,136	10.2	31.8	5.40	.....	1.530	.....	.....

Total costs, 1916, were \$9.919 per ton shipped and the ore averaged \$44.456 per ton, leaving \$34.537 net. This is a highly profitable property.

DOUGLAS COUNTY

ANTELOPE GROUP**NEVADA**

Held by Louis W. Trankle, Yerington, Nev. Claims 23, unpatented, 430 acres; in the Buckskin Range, Douglas Co., 16 miles from Yerington.

The ore bearing formation is a monzonite belt 4,200' wide, extending N. 7° W., dip 47° to east, for 1½ miles, with diorite on the west and andesite on the east. This monzonite is highly altered, showing strong kaolinization and sericitization to depth of 150 feet, deepest working. Surface shows scanty copper carbonates throughout length and breadth, with small streaks of copper sulphide ore near footwall side. Water encountered in lower workings shows strong copper content.

The property is a promising prospect. Has been examined by L. A. Wright, V. A. Hart, E. R. Richards, Fred Alsdorf and W. H. Weed.

KENNEDY CONSOLIDATED MINING CO.**NEVADA**

Office: Yerington, Nev. Mine at Buckskin, Douglas, Co., Nev.

Utah people, headed by J. F. Cowan, took over this property in June, 1917, from the previous owners, the Kennedy Cons. Gold M. & M. Co., of which W. C. Pitt was president.

Property: 7 claims, 110 acres, patented, in Buckskin district, Douglas Co., Nev., developed by 3 shafts, 90', 147' and 220' deep and by one 240' tunnel, said to expose some large bodies of ore, mostly sulphides with gold, silver and copper. Said to show 30' of 3½% copper ore, with high gold and silver-contents at 80' depth. Mine is 4 miles from Nevada Copper Belt railroad and has power line within 1 mile. A flotation plant is being planned.

ELKO COUNTY

ALASKA IMPROVEMENT CO.**NEVADA**

Office: Room 302, No. 65 Second St., San Francisco, Cal.

Bonded Rip Van Winkle mine, at Lone Mountain, Elko Co., Nev., to Lone Mountain Mining Co., in March, 1916. Property produced, \$13,813 net to the Alaska Investment Co., making a total of \$42,000 to date.

Mine optioned to Stewart Mining Co., 1916, but bond forfeited.

ALPHA MINE**NEVADA**

Owned by Horace Palmer, of Chicago. Chas. Nelson, mgr.

Property: at Jarbidge, Elko Co., Nev., contains veins of gold-silver ore in Tertiary volcanic rocks.

Development: crosscut tunnel, several hundred feet long.

Equipment: 5-stamp mill. Employs 20 men.

Production: \$10,000 bullion per month by amalgamation. Plan installing cyanide plant to treat tailings. See Bull. 497, U. S. Geol. Survey, 1912, by F. C. Schrader, for geology, etc.

BLUSTER CONSOLIDATED MINING CO.**NEVADA**

Officers: T. B. Beadle, pres. and gen. mgr.; Frank Benan, v. p.; H. L. Rummel, sec.; J. D. Goodwin, treas.

Property: at Jarbidge, Elko Co., Nev., shows gold ore in 7' veins, said to assay \$10 to \$40 per ton.

Equipment: 10-stamp mill, sawmill, aerial tramway, electric power. Tailing being impounded for cyaniding at a later time.

Ore reserves: management estimated 100,000 tons of milling ore, valued at \$12 per ton, blocked out and on dumps, Jan., 1915.

Production: claimed to be \$12,000 in bullion per month. No 1916 returns received.

BROOKLYN MINING CO.**NEVADA**

Idle. E. S. Shields, sec.-treas.; 19 W. Granite St., Butte, Mont. Mine near Contact, Elko Co., Nev. S. V. Kemper, pres.; T. M. Hodgens, v. p.

Inc. 1898, in Montana. **Cap.**, \$500,000; shares \$1 par; 213,000 shares issued. Has no debts.

Property: 7 claims, 75 acres in the Contact district, with ore deposits occurring on the contact between limestone and porphyry. This ore belt is about 18' wide, runs E.-W. for several thousand feet, dips at 75° and is said to contain 8% copper, with about 2 oz. of silver and \$1 gold per ton.

Development: by 196' shaft with 600' of workings, said to have developed 2,000 tons of ore. Property idle, waiting the advent of railway. Equipped with 25 h. p. boiler, 15 h. p. gasoline engine and hoist. Is 40 miles from railway.

CONTACT COPPER CO.**NEVADA**

Hutchinson, Minn., and Contact, Elko Co., Nev.

Officers: S. G. Anderson, pres.; Wm. Schultz, v. p.; Sam G. Anderson, Jr., sec.-treas., with J. A. Lindenberger and J. A. Jorgenson, directors.

Cap., \$1,000,000; shares \$1 par.

Property: two groups, the Lucie, 11 patented claims, and the Blue Rock, 8 patented and 5 unpatented claims, at Contact, said to show copper carbonate ore in veins.

Development: the Lucie group has a 145' shaft, said to show ore all the way to the bottom. The Blue Rock has 2 shafts, 50' and 30' deep, both said to show ore. Management says it will sink the main shaft to the 500' level. No production to date.

COPPER SHIELD MINING CO.**NEVADA**

Office: 45 W. Second St., Salt Lake City, Utah. **Mine office:** Contact, Elko Co., Nev.

Officers: Dr. C. I. Douglas, pres.; U. U. Hiskey, v. p.; C. R. Strock, sec.-treas.; H. M. Shields, mgr., and J. A. De Valley, directors.

Inc. 1907 in Nevada. **Cap.**, \$1,000,000; shares \$1 par; issued, 610,000. Annual meeting, second Tuesday in April.

Property: 11 claims, 200 acres, in the Salmon River district. **Development:** by 4 shallow shafts, deepest 73', and several tunnels, with a total of 646' of workings, showing 4 veins in monozonite porphyry dikes in grano-diorite, said to carry up to 40% copper and 2 to 6 oz. silver per ton. Oregon Short Line railroad is 37 miles distant.

CUNAPAH MINING CO.**NEVADA**

Address: Montello, Nev. **Officers:** P. O. Perkins, pres.; S. C. Sherrill, v. p.; G. W. Lynch, sec.-treas.; J. M. Bowker, mgr.

Inc. 1916, in Utah. **Cap.**, \$50,000; shares, 10c par; 205,000 issued. Listed on Salt Lake Exchange.

Property: 5 unpatented claims in Lucin district, Elko Co., Nev., near Utah border.

Development: by 250' shaft and several tunnels, said to show a lead-silver vein in limestone. Several carloads of ore shipped to June, 1917, averaging 25% lead and 2 oz. silver per ton.

Company installing compressor, hoist and power plant. and will sink shaft, 1917-18.

Is in same hill as Salt Lake Copper & Tecoma Consol. mines and shows limestone intruded by porphyry and granite. Ore occurs in "breaks" in limestone near contact.

DARKEY MINE**NEVADA**

Owned by W. S. Holmquist and M. W. Johnson, Ely, Nevada. W. S. Elliott, mgr.; Walter Geddes, supt.

Property: 9 claims, 180 acres, in Elko county, about 9 miles E. of Decoy, developed by 65' shaft, shows a blanket deposit of manganese ore, in limestone formation. Owners shipped 562 tons of ore, averaging 45% from Oct. 1916 to March, 1917.

Property leased to W. S. Elliott and W. Geddes, for 2 years from March 1917. Installed a hoist and plans shipping 15 tons per day, 1917, from Decoy on the Nevada Northern R. R.

EASTERN STAR MINING CO.**NEVADA**

Office: Winnemucca, Humboldt Co., Nev. **Officers:** E. Reinhart, pres.; Chas. F. Spilman, v. p.; L. G. Campbell, sec.-treas.; above, with Daniel Craig and R. S. Bolam, directors.

Inc. 1911 in Nev. **Cap.**, \$1,500,000; shares \$1 par; outstanding, 1,340,000.

Property: 5 claims, 70 acres, in Gold Circle mining district, Elko Co. Nev., with a 4½' gold quartz vein, in andesite.

Development: 280' incline shaft with levels at 75', 160' and 240'.

Equipment: includes two 25 h. p. gasoline engines.

The secretary L. G. Campbell, attorney, Winnemucca, Nev., writes us in 1917 that the company is not responsible for statements made by the G. S. Johnson Co., of San Francisco and that company has had no connection whatever, with the nauseous Thousand Member Gold Mining Association, so luridly advertised by the Johnson Co., in 1914.

Examination and report by a mining engineer estimates \$100,000 worth of ore in sight averaging \$20 a ton.

ELKO MINING CO.**NEVADA**

Property at Jarbidge, Nev., inactive.

H. L. Hollis, cons. engr., 1925 People's Gas Bldg., Chicago, Ill.

ELKO PRINCE LEASING CO.**NEVADA**

Out of business. Was operating property of the Elko Prince Mining Co. (which see), and when indebtedness to J. N. V. Dorr was paid off, the mine was taken over by the present company.

ELKO PRINCE MINING CO.**NEVADA**

Address: L. L. Savage, Golden Gate Mfg. Co., New York, pres.; Paul Ehlers, v. p.; L. S. Jackson, sec., with R. P. Jackson, directors.

Cap., \$1,150,000; shares \$1 par; 1,108,566 issued.

Dividends: 3½% paid Oct. 23, 1917; to be paid regularly at 2½% quarterly thereafter. Net earnings said to be at the rate of \$64,000 per quarter. On October 1, cash and bullion in transit were valued at \$70,000, and supplies at \$30,000.

Property: 9 patented claims at Midas, Gold Circle district, Elko county, Nevada, 50 miles N. E. of Golconda on the S. P. R. R., and 35 miles from Red House on the W. P. R. R. Examined by H. V. Winchell and F. F. Sharpless.

Geology: the Gold Circle formation consists chiefly of rhyolite, andesite and bostonite. Ore occurs in vertical fissures in the rhyolite. The hanging wall of the Elko Prince mine is bostonite, the foot wall is rhyolite. The ore carries gold and silver, as 65% and 35% respectively. Ore averages \$20.50 per ton.

Development: by tunnels, shafts and winzes to depth of 750'. On the 300' level the shoot is 15" wide and 630' long; on 600' level it is 810' long, and to Nov., 1917, 30" wide and 230' long at 750', with good indications for greater length than at 600'. All ore above 300' has been broken and 66% removed. Below 300' and above 600' most of the ore is broken, and 66%

drawn N. of the shaft, the S. end being intact. In the June Bell, a parallel vein to the Elko Prince, reserves are estimated as 5,000 tons of \$16.35 ore, with five times this quantity probable. The shoot is 30" wide and 200' long. All reserves are valued at \$700,000.

Equipment: includes complete mining plant and mill employing 4' Marcy mill, 5 by 14' tube mill, Dorr classifier and thickener, Oliver filter, 185 h. p. Allis-Chalmers oil engine, 10,000' water pipe line, etc., the whole valued at \$150,000.

Production: from Oct., 1916, to Sept., 1917, the mill extracted \$381,689, of which \$255,862 was profit. To Oct., 1917, the mill treated 31,954 tons of \$20 ore. In Sept., 1917, from a yield of \$27,300, \$17,605 was profit.

ELKORO MINES CO.

NEVADA

Subsidiary of Yukon Gold Co., which see.

Office: 120 Broadway, New York. **Mine office:** E. A. Austin, Jarbidge, Nev.

Officers: William Loeb, Jr., pres.; C. K. Lipman, v. p. and sec.; with O. B. Perry, Charles Earl, R. W. Straus, W. E. Bennett, E. L. Newhouse, F. R. Foraker and Louis Sloss, directors; Leopold Frederick, treas.; O. B. Perry, cons. engr. and gen. mgr.

Inc. Sept., 1916, in Delaware. **Cap.**, \$1,000,000; shares \$5 par; non-assessable; all issued. D. A. Crockett, 149 Broadway, New York, transfer agent; Guaranty Trust Co., of N. Y., registrar. Annual meeting third Tuesday of January.

Property: the Long Hike and O. K. groups of 52 claims in Jarbidge district, Elko county, Nev. In the Long Hike there is a strong fault fissure in porphyritic rhyolite. Alteration, leaching and replacement has taken place in the brecciated vein material and walls. Ore consists of sugary and solid quartz, adularia and silicious rhyolite, carrying free gold, with a little silver.

Development: by 1,500' tunnel to depth of 600' in the Long Hike, and 250' in the O. K. Ore blocked out was estimated early in 1917 at 214,000 tons, averaging \$15 per ton.

Equipment: electric hoist, 2 Ingersoll-Rand compressors, pumps, aerial tram being constructed, also 100-ton mill employing counter-current decantation system of cyanidation.

All costs are estimated at \$4.50 per ton.

ELY CONSOLIDATED COPPER CO.

NEVADA

Office: 414 Judge Bldg., Salt Lake City, Utah. **Mines:** Ruth, via Ely, Nev., and Elko, Nev.

Officers: S. M. Levy, pres.; D. B. Shields, v. p.; Gideon Snyder, sec.; John Pingree, treas.; with Grant Snyder, directors. C. W. Geddes, cons. engr. and mgr., Merchants Bank, Salt Lake City. R. M. Kellogg, supt.

Inc. Oct. 2, 1906 in Utah. **Cap.**, \$1,500,000; shares \$1 par; non-assessable; 1,000,000 issued; changed Jan., 1917, from \$1,000,000, shares \$10 par, assessable, of which 300,000 shares were donated to treasury by incorporators.

Stock listed on Salt Lake Stock Exchange and New York Curb. Registrar and transfer agent, United States Corporation Co., 34 Nassau St., New York.

Property: 3 groups, 20 claims, 370 acres, in the Ely district, also a lease and bond on the Copper Queen mine, Elko, Nev., and the Baltimore, an adjoining property.

The Ely property, 15 claims, about 300 acres is on the south side of the mineral belt, near the Ruth and Jupiter groups of the Nevada Consolidated. Developed by 3 vertical shafts. The 625' Brilliant shaft has

silver-lead ore on the 400' level, and near the bottom is said to show a 100' bed of disseminated copper ore, below commercial grade. The American shaft is 500' deep.

Development: in recent years has been at the 725' Zack shaft in the western end of the group. Orebody on 500' level reported to be 100' wide. From 500 to 700' levels, ore flattened, being 264' farther south on the 6th than on the 5th level. Ore consists of bunches of copper glance with some oxide and carbonate in white, clayey gouge and decomposed rock. Crosscut on 700' cuts monzonite, but too deep for pay ore. Car-load shipment in 1913 netted \$21.65 per ton, averaging 3.3% copper, 15.2 oz. silver and 12.2% lead.

The Copper Queen group, 18 claims, in the Merrimac district, 22 miles N. W. of Elko, Nev., shows a gossan outcrop, 500x600', carrying 40 to 50% iron; also 2 veins, one of them traceable a mile, showing surface exposures of shipping ore. Work was begun on this property in March, 1913, and shipments in May and June averaged 100 tons per week. Smelter returns showing 7.40% copper, 7.9 oz. silver per ton, 40 cts. gold, 28% iron and about 35% silica. The ore is hauled by automobile trucks.

The Baltimore group, 12 claims, 6 patented, includes, the Cuag and Morgan mines, taken under bond June, 1913, on 15% royalty, with no cash payment until 1914, appears to be a valuable acquisition. The Cuag workings contain ore blocked out and the shaft has been enlarged, re-timbered and is now reported to show high-grade bornite ore. The Morgan mine shows 4' of ore and shipments have carried 3% copper, a varying percentage of lead and 7.8 oz. silver. Developed by Morgan tunnel driven to open up Morgan vein on 200' level.

After an expensive campaign of development at the Ely-Nevada property, it was realized that the property could not be put on a paying basis under existing conditions and the policy of the company was changed and new properties sought. In March, 1913, the Copper Queen mine, near Elko, Nev., was purchased, for \$50,000. In May the Peterson group in Pine Valley was bonded and in June the property of the Pacific Consolidated Mining & Smelting Co., near the Copper Queen, was taken over on \$30,000 bond and lease.

The Peterson group, bonded in 1913, is located at Lone mountain, midway between Elko and Tuscarora, 8 miles from Hale Crossing, a station on the railroad with which it is connected by good wagon road. Property shows veins with ore shoot carrying high-grade copper ore and old workings carry 5% copper ore from which shipments were being made. The Pacific Consolidated Mining and Smelting Co. property, also held under lease and bond, consists of a 300-acre group of claims on which shipping ore was also found. About 350' from portal of Morgan tunnel a 4' copper vein was opened up with reported values of from \$12 to \$25 per ton. A copper-zinc vein was also being developed, 1915-16.

Company has a practical business man looking after its affairs and seems now to be operated on safe lines. For several years past, extravagant statements concerning the company were issued by brokers and misleading assays were published of the value of the ore developed in the Zack shaft. It is now known that the orebody is low-grade and cannot be profitably mined. The company has a large capitalization, but the new management and new properties appear likely to bring the property to a self-supporting, if not a profitable basis.

Shipments started in 1917 and in July, company was shipping 4 cars of concentrates weekly. Earnings in March are reported to have been \$70,000.

Company has installed a 500-ton flotation plant and plans to double the capacity, 1917-18.

GOLD CIRCLE QUEEN CO.

NEVADA

Address: L. G. Campbell, Winnemucca, Nev.

Officers: J. E. Pelton, pres.; R. S. Belam, v. p.; L. G. Campbell, sec-treas.; preceding with G. S. Pelton, directors.

Cap., 1,000,000 shares, \$1 par; 840,000 outstanding.

Property: 5 unpatented claims, in Gold Circle district, Elko, Nev., held under lease.

Geology: lodes and fractured zone in rhyolite, containing shoots up to 40' width. Ore carries gold, silver, and some manganese, averaging \$16.40 per ton.

Development: by 130' shaft, and 2 tunnels 180' and 210', with total workings of 1100'.

Ore reserves: estimated at 4,000 tons above 132', worth \$65,000.

Equipment: 15 h. p. Fairbanks-Morse gasoline hoist. Proposed to erect 30-ton mill and deepen shaft, 1917. **Production:** ore sales in 1916, \$8,006; to 1917, \$16,970. Recovery by amalgamation alone, 80%.

HOLDEN MINING & MILLING CO.

NEVADA

Tuscarora, Nev. **Edw. R. Holden,** pres., 524 S. 4th St., Los Angeles, Cal. **Inc.** 1916 in Nev. to take over leases and bond on properties of Tuscarora Cons. M. Co. and in Nevada rights of the Holden patents for concentrating and reducing ores. **Cap.,** \$500,000; shares \$10 par.

JARBIDGE CENTRAL MINES CO.

NEVADA

Address: Jarbidge, Elko Co., Nev.

Officers: J. P. Duncan, pres.; Angus McDonald, v. p.; W. W. Fisk, sec.; with John MacRae, Ira Brackitt and H. O. Milner, directors.

Inc. Oct. 5, 1911, in Nev. **Cap.,** \$1,500,000; shares, \$1 par; non-assessable; 1,250,000 issued.

Property: 9 unpatented claims in Jarbidge district, said to show a quartz vein in rhyolite, dipping 85° S. W. and pitching S. 32° E. Average gold assay is \$15 to \$20 per ton.

Development: by vertical shaft to 65' and by 2 tunnels -175' and 225' long. Work in 1916 cost \$5,000, done on an option. A prospect.

JERSEY CONS. COPPER & GOLD MINING CO.

NEVADA

Office: 272 Grant St., Salem, N. J. **Mine office:** East Ely, Nevada.

Officers: R. T. Seagrave, pres.; H. M. Loveland, v. p.; F. Eldridge, sec.; W. L. Bassett, treas.

Inc. Jan. 15, 1917, in Delaware, **Cap.,** \$100,000; shares \$1 par; non-assessable; 4,950 issued. Annual meeting 1st Thursday of March.

Property: 15 claims, unpatented, 300 acres in the Mizpah Mining district, 5 miles east of Mizpah, on Nevada Northern railroad. Claims show several fissure veins in granite and contact deposits between granite and rhyolite, one of which is estimated by the management at 200' width, carrying mainly bornite and chalcopyrite ore.

Company relocated above property, formerly owned by Mizpah Cons. Copper & Gold Mining Co., when latter failed to do its annual assessment work for 1915.

Development: by 70' two-compartment shaft, showing a 3' orebody, said to give maximum assays of about 15% copper, 8 oz. silver and \$18 gold per ton, which are not to be considered as average ore values. At last reports company was driving a tunnel, 1,385' long, expected to cut ore at about 1,450'.

KINSLEY DEVELOPMENT CO.

NEVADA

Currie, Elko Co., Nev. **Officers:** John D. Kendall, pres.; W. M. Brad-

ley, v. p.; Newton A. Dunion, sec.-treas. and mgr.; R. J. Deighton, asst. sec.; preceding with B. F. Beaur and Wm. Fischell, directors.

Cap., \$1,000,000; shares \$1 par.

Property: 28 miles from Currie, on Nevada Northern railroad, shows limestone cut by parallel N.-S. fissures, which carry copper ore at the south end of the property and lead ore $1\frac{1}{2}$ miles north. Has been worked intermittently by lessees for past few years. Has steam plant, 3 hoists, compressor and a concentrating mill erected 1909. Presumably idle.

LONE MOUNTAIN MINING CO.

NEVADA

See Alaska Improvement Co., p. 1072.

MIZPAH CONS. COPPER & GOLD MINING CO.

NEVADA

Out of business: property operated by Jersey Cons. C. & G. M'ng Co.

NEVADA-BULLION MINES CO.

NEVADA

Mine near Bullion, Elko Co., Nev. Company often called the Bullion-Nevada Mines Co., owns a group of claims adjoining the Nevada-Bunker Hill Mining Co. holdings and a half interest in the Kerr & Peterson lease on that company's ground.

Development: by a 1,970' tunnel, which will be extended 200' further to cut the vein opened in old mine workings. Lessees were shipping ore, 1916, but property is now tied up in litigation.

NEVADA-BUNKER HILL MINING CO.

NEVADA

Address: Box 477, Elko, Nev.

Officers: J. A. McBride, pres.; W. W. Booker, v. p.; Frederick Davis, sec.; John Henderson, treas., with O. T. Williams, R. H. Mallet and G. S. Brown directors.

Inc. April 28, 1905, in Nevada. **Cap.**, \$2,000,000; shares \$1 par; fully paid and non-assessable; 600,000 shares reserved in treasury for sale for development. Annual meeting, first Wednesday in May.

Gross earnings in 1916 were \$24,404, of which \$18,860 was from lessees royalties. Expenses balanced revenue. Current assets, May, 1917, were \$1,236, and liabilities, \$15,409.

Property: 16 unpatented claims and 6 patented claims, in Railroad district, Elko Co., Nev., 28 miles S. W. of Elko. Claims said to show copper-silver ore in porphyry contacts, silicious copper ore in porphyry intrusions, and silver-lead ore in limestone.

Development: numerous tunnels and shafts and a deep tunnel 2,550' long, to tap veins at a depth of 500 to 800' below deepest workings, 350' further work will bring it to the Tripoli and 1,350' further to the Standing Elk fissure. Workings total about 2 miles.

Production: about \$3,000,000. In four years: 1912-1915, lessees shipped 4,570 tons yielding \$114,102; in the winter of 1915-1916, they produced 600 tons valued at \$32,000; and in year ended May 1, 1917, 3,767 tons worth \$110,751, royalty being \$18,860.

Ten sets of lessees are working at present above 800' level. Royalty derived is put into company's development work.

Property has been reported on by Chas. E. Van Barneveld, H. L. Huston and by Prof. Chas. H. White of Harvard University.

NEVADA-BUTTE MINING CO.

NEVADA

Martin Benson, pres.

Inc. 1913. **Cap.**, \$1,000,000; shares 25c par.

Property: 15 claims in Dolly Varden and Mizpah districts, Elko Co., Nev., 75 miles from Ely, said to be on the northern end of a great belt of mineralized porphyry and to carry fissure and contact deposits.

Development: by several shallow shafts, shows mineralization, but property still in prospect stage. Drilling on neighboring areas has shown commercially mineralized porphyry.

NEVADA COPPER MINING, MILLING & POWER CO. NEVADA

Office: Tacoma, Wash. Mine at Contact, Elko Co. Nev. **Officers:** E. F. Messinger, pres., Tacoma, Wash.; Henry Smith, v. p. and gen. mgr., Contact, Nev.; E. S. Price, sec.-treas.; M. K. Price and C. Smith, all of Tacoma, directors.

Inc. May 5, 1905, in Arizona. **Cap.**, \$1,500,000; shares \$1 par; non-assessable; issued, \$1,500,000.

Property: 52 claims, patented, in Salmon River district, better known as Contact district, shows Paleozoic sediments cut by granite with ore-bodies along the contact. Several hundred tons of high-grade ore are at the Alice mine awaiting shipment by auto truck to Rogerson, Idaho, 40 miles away. In 1915 a 100-ton flotation plant was erected, following extensive diamond-drill explorations. Property and geology fully described Bull. 497, U. S. Geol. Survey.

NEVADA LEAD MINING CO. NEVADA

Address: H. L. Brooks, mgr., Cobre, Nev.

Officers: B. F. Woodward, pres.; H. C. Eldridge, sec.; with Jasper Hall, Mathew Mesler, E. E. Fisher, directors.

Property: 11 miles from Cobre, Nev., and 7 miles from Loray, on Southern Pacific R. R., said to show ore in limestone-quartzite contact. At depth of 80' is said to be 18" of ore assaying 40% lead, 20 oz. silver and \$3 gold per ton. Several carloads have been shipped.

NEVADA ZINC CO. NEVADA

G. L. Bemis, Tobar, Elko Co., Nev., gen. mgr.

Property: the Polar Star group near Tobar, has a zinc-lead deposit, 40' wide and opened for 600' on surface. Ore said to average from 30-35% zinc and from 4-5% lead. Developed by tunnel and shaft, down 500' in Sept., 1917. Producing at the rate of 200 tons per month in 1917. Total output is 4,000 tons since Utah people acquired mine.

NEW TUSCARORA MINING CO. NEVADA

Address: Tuscarora, via Elko, Nevada. **Officers:** W. J. Craig, pres.-mgr.; J. R. Austin, v. p.; W. J. Wolstenholme, sec.-treas., with E. L. Soule, H. S. Barnhart and P. D. Fenkell, directors.

Cap., \$50,000; shares 5c par; 500,000 issued.

Property: 4 claims in the old Tuscarora district, Elko Co., Nev.

Development: a tunnel (in 482', July, 1917,) is being driven to cut the vein. Shallow shafts said to show ore with high gold-silver values.

PALISADE COPPER CO. NEVADA

Address: T. W. Smith, supt., Bullion via Elko, Nevada. Owen Goldsmith & Co., Elko, Nev., are largely interested, but company is controlled in Boston, Mass.

Property: the old Heckla & Silver King mines, 2 claims, patented, at Bullion, Nev., held under bond and lease. In May a large body of high-grade copper ore was found in cleaning out an old tunnel; four 40-ton cars of \$50 copper ore were shipped, May 22, 1916. Property is an old silver-lead mine, idle for many years.

PANTHER CITY MINING CO. NEVADA

Office: c/o M. R. Sanguinet, sec.-treas., 1st National Bank Bldg., Fort Worth, Tex. Wm. Bryce, pres.

Property: 7 patented claims in 2 groups, the Panther City and Olinda, in Salmon River mining district, Elko Co., Nev. Ore said to carry copper, silver and a trace of gold. Planned to start development work in 1917.

SALMON RIVER MINING CO. NEVADA

Office: 19 West Granite St., Butte, Mont. Mine near Contact, Elko Co., Nev., carries gold and silver-bearing copper ore. Had gasoline power and a small smelter. Not operating, at last accounts.

SEATTLE CONTACT MINING CO.**NEVADA**

Address: J. V. Marshall, gen. mgr., Contact, Elko Co., Nev. T. A. Marshall, pres., L. B. Walters, sec., Seattle, Wash.

Property: the Delano mine, 8 claims, in 3 tiers at Contact, Nev., carries the Brooklyn contact vein, the Palo Alto and Blue Bird veins, 150' apart. The latter is a fissure vein, 1'-15' wide, in grano-diorite, with high-grade streak mined in 1916 for 2' to 10' wide, and yielding copper ore.

Geology: and development of this group are fully described by Schrader, Bull. 497, U. S. Geol. Survey, 1912, pp. 119 and 121.

Development: mainly by tunnels and to a depth of 175'; a new shaft being 170' deep in July, 1916.

Production: Feb.-July, 1916, 1,950 tons, averaging \$45 per ton, and carrying 18% to 23% copper, 6 oz. silver and 80 cts. gold per ton. Production costs are given at \$17.50 per ton.

SEATTLE MINING, MILLING & POWER CO.**NEVADA**

Contact, Nevada. Henry Smith, mgr. Company owns the Mammoth mine covering 12,000' along a contact deposit 20' to 125' wide, reported to show 55' of 5% ore in one face.

Production: began May 20, 1916, up to Aug., 1916, amounted to 165 tons containing 9.5% copper, 6 oz. silver and \$2 gold, averaging \$43 per ton. Transportation to the railway at Rogerson is reported at \$7 to \$11 per ton, railway freight \$3.75, smelting \$2 and sampling 50c, or a total of \$13.75. Twelve men are employed.

TUSCARORA-NEVADA MINES CO.**NEVADA**

Bankrupt. **Address:** J. E. Harrington, 1482 Broadway, New York. Henry Stanley Haskin, receiver; \$150,000 receiver's certificates authorized; 53,286 issued; \$600,000 claim against company allowed by Court.

Property leased Aug. 18, 1915, for ten years to Jas. E. Harrington and lease transferred to Stewart Mining Co. in 1917.

The mortgage held by the Dexter Tuscarora Cons. G. M. Co. on the Dexter group of this company has been foreclosed and the property purchased by the mortgage holders. This includes 17 claims and the Jack Creek power plant, all under bond and lease for \$175,000.

Stated in 1917 by Prof. Holden that a 150-ton mill was to be erected in July, followed by one of 1,000 tons. A process for recovering 95% of the silver and gold said to have been developed.

WESTERN MINES DEVELOPMENT CO.**NEVADA**

Office: 1605 Walker Bank Bldg., Salt Lake City, Utah.

Officers: F. A. Fisher, pres.; H. R. Smoot, v. p.; E. T. Jones, sec-treas.; with Imer Pett, N. A. Dunyon, P. D. Richards and Duncan MacVichie directors.

Inc. Feb., 28, 1917, in Utah. Cap., \$100,000; shares 10c par; non-assessable; 41,000 issued. Annual meeting third Monday in January.

Property: 7 patented claims, 153 acres, at Ferber, Elko Co., Nev., held under lease and bond to purchase.

In Sept., 1917, a shaft was down 50' and from an open cut several hundred tons of high-grade lead-silver ore was reported as ready for shipment.

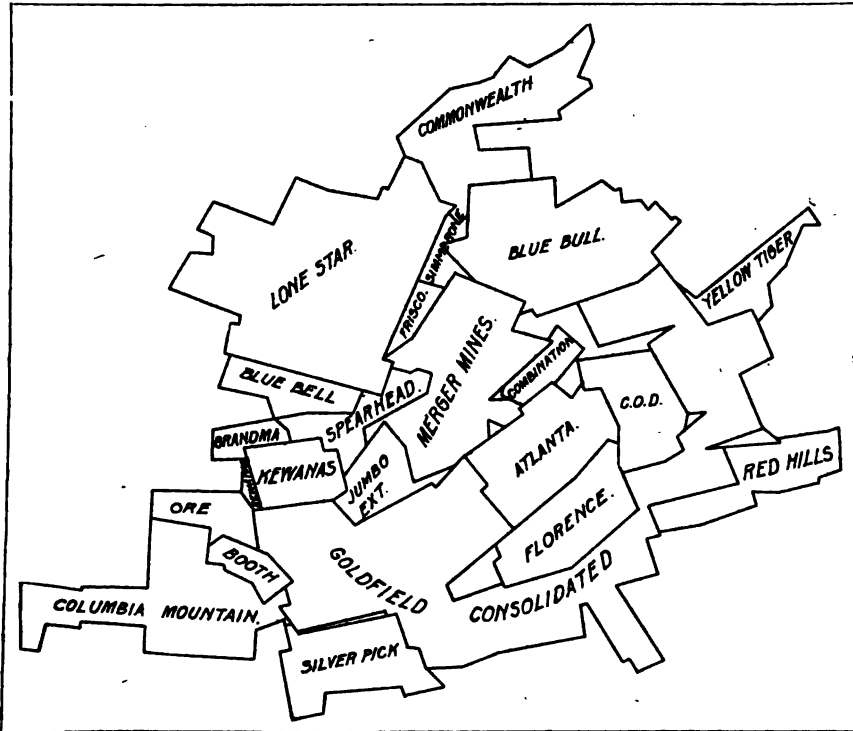
ESMERALDA COUNTY**ADAMS GOLDFIELD MINING CO.****NEVADA**

Property purchased, January, 1916, by the Reorganized Cracker Jack Mining Co., which see. Stockholders of the Adams Co., were permitted to exchange their stock for stock of the Reorganized Cracker Jack Co. remaining outstanding at that time.

ATLANTA MINES CO.**NEVADA**

Office: 406 Columbia St., Goldfield, Nev. **Officers:** Geo. Wingfield, pres.; A. H. Howe, sec.-treas.; Chas. E. Knox, v. p.; preceding officers, Benj. J. Henley, W. E. Zoebel, Frank C. Favier and Clyde A. Heller, directors; A. I. D'Arcy, mgr.

Inc. March 3, 1905, in Arizona. Cap., \$5,000,000; shares \$1 par; non-assessable. In treasury, \$469,880. Stock listed on New York Curb. Annual meeting, April 6th. Receipts for year ending March 31, 1917, \$111,249. Disbursements for same period, \$109,265, of which \$13,483 was spent in exploration.



PROPERTY MAP OF GOLDFIELD, NEVADA

In 1912 the company was reorganized and refinanced for deep mine development, \$100,000 cash being raised by Geo. Wingfield and associates. Work was begun Dec., 1913.

Threatened apex litigation with the Florence was settled 1914, by a sideline agreement, the Florence to be opened from Atlanta workings. In 1915 the company secured a lease on the southern half of the Grizzly Bear claim of the Goldfield Cons. Co., to all ground below the 1,400' level.

Property: 74 acres, patented, at Goldfield, Nev., includes the Atlanta, Black Bear and Union Jack mines, adjoining the Florence on the east and the Goldfield Cons. on the north. Contains the extension of the Goldfield Cons. orebodies on the shale-latite contact. Exploratory work carried on through the St. Ives shaft of the Goldfield Cons. cut the Atlanta vein on

the 1,750' level. This vein is 40' to 100' wide, runs N. S. and dips at 45°. The ore is pyritic with tetrahedrite, and varies from gold ore, free from copper, to ore carrying 9% to 14% copper. The great ore shoot thus far shows bands of medium grade shipping ore, but is, as a whole, a low-grade concentrating ore that may average \$8 per ton, besides a shoot of shipping ore 6'-15' thick that averaged \$20 per ton. The orebody is proven for 110' upward and for 380' on the strike having been opened on the 1,660' level and by a winze below the 1,750' level. Early in 1917 a promising strike of 6' of \$50 ore was made on the 1,750' level.

Production: began April, 1915. Total shipments in 1916, from the 1,750' level, 239 tons, netting \$1,347.

The geology of the district is described in Prof. Paper No. 66 of the U. S. Geological Survey, 1909, by Ransome, and by J. E. Spurr, in Econ. Geology, Feb., 1916. Property promises to be an important producer of low-grade concentrating ore from which it should be able to make profits.

BLUE BULL MINE

NEVADA

Described under Reorganized Blue Bull Co.

C. O. D. CONSOLIDATED MINING CO.

NEVADA

Goldfield, Nev. L. K. Koontz, pres.

Inc. May, 1908, in South Dakota. Cap., \$3,000,000; shares \$1 par. Treasury, 1,000,000 shares. Listed on New York Curb. Inc. as a merger of the Goldfield C. O. D. and the Gold Bar Mining companies, taking over the C. O. D., Golden Eagle and Zoe from the C. O. D. Co.; the Gold Bar from the Gold Bar Co., and the Victor and Victor fraction from the Goldfield Cons. Last two claims were obtained by purchase, others by exchange of stock. Claims form a compact group, 90 acres, at Goldfield. Controlled by Goldfield Cons.

Development: 350' shaft and several thousand feet of workings. Was operated under 5-year lease by Nevada Co-Operative Company, and under option in 1915 to Tonopah Mng. Co. and Tonopah Belmont Dev. Co. Said to have a total production of \$75,000 with \$250,000 milling ore on the dumps. Plan sinking shafts to 500' level.

CUPRITE COPPER CO.

NEVADA

No recent returns. Described Vol. XII.

CUPRITE SULPHUR CORPORATION.

NEVADA

Office: 50 East 42nd St., New York City. J. E. Bowman, pres., Greenwich, Conn.; F. S. Taggart, v. p.

Inc. 1917 in Delaware. Cap., \$2,000,000.

Owms and operates sulphur property near Cuprite, Nevada. Output of 100 tons per day shipped to Coast. Retorting plant to be installed 1917.

DIAMONDFIELD BLACK BUTTE REORGANIZED MNG. CO.

NEVADA

Office: 406 No. Columbia St., Goldfield, Nev. **Officers:** L. L. Patrick, v. p.; Harry B. Ruhl, sec.-treas., P. O. Box 1515, Goldfield., with T. C. Damskey and M. Fenwick directors. Andrew J. Canavan, supt.

Inc. 1905, in Nevada, reinc. April, 1910. Cap., \$2,000,000; shares \$1 par; 1,300,000 outstanding. Transfer office, U. S. Corp. Co., New York, and home office. Annual meeting, July. Listed on Salt Lake and San Francisco Stock Exchanges. Two assessments, ½c in April and 1c in August, 1914, have been called, to meet operating expenses.

Property: the Black Butte mine, 60 acres, in the Goldfield district. Esmeralda Co. **Ore:** gold, in numerous veins in fine grained andesite. Up to the present time the main producers have been the "Quartzite" and the "Flat" veins. The former is said to have produced \$500,000 under

early lease operations, but values ended within 150' from surface. The "Quartzite" orebody was cut off by a fault and its downward extension has not been found. The "Flat" vein apparently ends at the tunnel level.

Development: tunnels and shafts; the main shaft is 300' deep and the old Dortch shaft, 350' south of the main shaft, is 200' deep, but little work has been done below the 110' level.

Equipment: includes two 15 h. p. gasoline hoists and a 3-drill air compressor.

Prospecting by Calyx drill in 1917, to explore shale-latite contact, at depth of 1,000'. Lessees are taking out rich ore on 150' level. Property quite fully described by Chas. D. Wilkenson, E. M. See Geol. Survey Prof. Paper No. 66, by Ransome.

DIAMONDFIELD DAISY GOLD MINING CO. NEVADA

Goldfield, Nevada. Inc. 1910, as reorganization of the Goldfield Daisy Mng. Co., of Goldfield, Nev. Property was under lease to the Justice Gold Mines Co.

DIAMONDFIELD MINING & MILLING CO. NEVADA

Company operated a lease on the property of the Goldfield Great Bend Mining Co. Practically merged into the Great Bend Co. in 1915.

DIAMONDFIELD TRIANGLE MINING CO. NEVADA

Idle. Goldfield, Nev.

Under reorganization as Reorganized Diamondfield Triangle Mng. Co. FLORENCE GOLDFIELD MINING CO. NEVADA

Offices: Goldfield, Nev., and Denver, Colo.

Officers: A. D. Parker, pres. and treas., P. O. Box 4561, Denver, Colo.; G. C. Cunningham, v. p.; S. G. Arscott, sec.; preceding, with S. W. Morris, and J. K. Turner, directors. H. B. Clapp, receiver.

Inc. April 28, 1905, in South Dakota. **Cap.**, \$1,250,000; outstanding, \$1,050,000; shares \$1 par. Stock transferred at company's office.

Dividends: 1908, 40%; 1909, 20%; 1910 and 1911, 10% each; none since. Annual meeting, March 1st, at Goldfield, Nev.

Company went into receivers' hands Feb. 1917 and was reported reorganized under Wingfield control, July, 1917. In Sept., the entire milling equipment, including flotation plant, was ordered sold to satisfy creditors' claims.

Financial statement for year ending Dec. 31, 1916, shows: cash \$66,451; ore returns, \$29,231; interest, \$580; misc. \$1,051; decrease in material and supplies, \$5,171, a total of \$102,485. Expenses amounted to \$75,146; taxes paid, \$754; misc. \$335; additions and deductions to property acc't. \$38,706; deficit \$13,543. Cash on hand Sept. 1917, \$7,927.

Property: 67.7 acres at Goldfield. The main shaft was sunk 1,200' several years ago; at this depth the vein was mineralized, but ore was not of commercial grade and the shaft was allowed to fill with water to the 600' level. Work since then has been above this level. The orebody which was furnishing the shipping ore played out in Sept., 1915; no shipments have been made since. Management claims there are 100,000 tons of low-grade sulphide ore, averaging \$4 to \$6 per ton in gold, silver and copper, opened up in the mine.

In Oct., 1915, a 2-year lease on the surface dumps was granted to F. A. Mead, who organized the Nevada Metals Extraction Co. to erect a 150-ton mill and treat the low-grade ore by flotation. Mill started operations in April, 1916, and reported an extraction of 92% gold and 99% copper. Operating costs were reported under \$2.25. Dumps have been estimated to contain 50,000 tons of \$5 ore. The Nevada Metals Ex. Co., has since passed away.

Production: for 1915, 3,194 tons ore, average value \$17.42 per ton; compared with 8,029 tons, average value \$26.39 in 1914.

Company inoperative, but 14 sets of lessees are working from surface to 660' level, and royalties amount to \$2,000 monthly, 1917.

GOLD MOUNTAIN MINING & MILLING CO. NEVADA

Properties: about 13 miles from Bonnie Claire and 6 miles from Horn-silver, Nev., operated under lease by J. W. Crane. Veins are silver-gold deposits carrying copper. Developed by two 240' shafts and connected by a 200' drift. Estimated reserves, 2,000 tons of milling ore, valued at \$20 per ton, blocked out on the 200' level. An outcropping oreshoot 20' wide said to have yielded ore assaying from \$100 to \$500 per ton.

GOLD PRINCE MINING & LEASING CO. NEVADA

E. L. Luker, sec.-treas., Grand Island, Neb. **Officers:** Dr. A. H. Farnsworth, pres.; Jos. Kotik, St. Paul, Neb., v. p.; Chas. O. Orr, Goldfield, Nev., gen. mgr.; with E. L. and E. S. Luker, directors.

Inc. in 1914. **Cap.**, \$500,000; shares \$1 par.

Has lease and bond on the Gold Crater mine, formerly owned by the Gold Crater Cons. Mng. Co., about 30 miles S. E. of Goldfield, Nev.

Ore: gold, milling grade, said to run about \$15 per ton.

Development: 265' shaft and crosscuts. Management claims large ore reserves in sight.

Equipment: includes a 12 h. p. hoist and small mill.

GOLDFIELD BLUE BELL MINING CO. NEVADA

Address: Austin, Nev.

Officers: D. S. Johnson, pres.; B. W. Ward, treas.; J. M. Hiskey, sec.

Property: 3 fractional claims at Goldfield, under lease to Spearhead Gold Mining Co., reorganized; Cotter mines (10 unpatented claims) at Golden Arrow, 50 miles E. of Tonapah, Nev.; Berlin mine (16 patented claims), Berlin, Nev.; Richmond mine (3 patented claims), 1 mile S. of Berlin; Shamrock mine (10 patented claims), 6 miles N. of Berlin; Downeyville and Sullivan mines (6 patented claims), 5 miles S. of Lodi, Nev.

Development: Cotter 450' deep; Berlin (gold), 364'; Downeyville (silver-lead), 250'; Richmond (gold, silver, copper), 75'; Shamrock (gold, silver), 350'; Sullivan (gold), 100'. The Goldfield (950') is the only mine worked at present, but others are to be operated soon.

Equipment: Berlin has 2 steam hoists, 2 compressors, assay-office, store, machine-shop, complete 30-stamp mill, etc.

A group of mines like these ought to develop something.

GOLDFIELD CONSOLIDATED EXPLORATION CO. NEVADA

Office: Crocker Bldg., San Francisco, Cal.; E. A. Julian, engr-in-charge.

Subsidiary of Goldfield Consolidated Mines Co. (which see), formed in 1916 to examine and develop properties submitted for sale.

Properties: 717 submitted, 111 examined, several optioned, none purchased, development on only one in Peru.

GOLDFIELD CONSOLIDATED MINES CO. NEVADA

Office: Goldfield, Nev.

Officers: Geo. Wingfield, pres.; J. D. Hubbard, v. p.; A. M. Howe, sec.-treas.; J. W. Hutchinson, gen. mgr.; with J. H. Carstairs, F. M. Manson, and H. M. Hoyt, directors. J. B. Kendall, mine supt.; J. B. Lain, mill supt.; R. H. McLoughlin, chief engr.; B. B. Beckett, elec. engr.; E. M. Moore, purch. agt.; R. J. Davey, cashier.

Inc. Nov. 13, 1906, in Wyo. **Cap.**, \$50,000,000; shares \$10 par; issued. \$35,591,480. Stock listed on San Francisco and Salt Lake Exchanges and

New York and Boston Curbs. Stock was stricken from N. Y. Stock Exchange list, Dec. 26, 1914.

Dividends: to date, \$28,998,831. John S. Cook & Co., Goldfield, Nev., registrar. Company office, Goldfield, transfer agt. Annual meeting, third Monday in March.

Company is a merger of Goldfield-Mohawk, Red Top, Jumbo, Laguna Goldfield, Goldfield and Combination mining companies. In 1911, company acquired Vinegerone Fraction and the Bull Dog and Jumbo Fractions. Company owns entire stock of the Goldfield Cons. Milling and Transportation Co.; 25% stock interest in the C. O. D. Cons. Mining Co., and 87% stock interest in the Aurora Cons. Mines Co., of Aurora, Mineral Co., Nev., described under that title; also the Goldfield Consolidated Exploration Co. (which see). Reported to have bought the Sure-ease gold mine near Oroville, Calif., in Sept., 1917.

Annual report for 1916 shows gross value of ore treated, \$2,548,426, of which \$428,620 was profit, a big reduction compared with \$1,558,308 profit in 1915. Cash on hand, Dec. 31, 1916, was \$1,021,086, plus \$358,700 loaned to subsidiaries.

Dividends: 20c in 1907; 90c in 1909; \$2 in 1910; \$2 in 1911; \$1.60 in 1912; 70c in 1913; 30c in 1914; 45c in 1915, and earnings at rate of about 12c per share in 1916, but no distribution made.

Property: 26 patented lode claims, and 1 unpatented claim, 390 acres, at Goldfield, Nev., with 6 working shafts, Combination, Mohawk, Red Top, Jumbo-Clermont, Jumbo No. 2 and Laguna, 46% of the ore coming from the Mohawk shaft. Deepest shaft is 1,450'. Output is from several mines working fissure veins whose stoping width varies from a few feet to as much as 20 or even 30'. Veins show orebodies with variations in which the commercial limit is not dependent upon structural planes, the shoots swelling out and pitching with but slight relation to the vein walls.

Geological: development has shown that (1) most of the orebodies have first appeared as oxidized masses under silicified outcrops, invariably turning to sulphide ore; (2) silicification always accompanies mineralization, but many zones of breccia are barren; (3) whenever ore is known in latite, it has always been first exploited in the overlying dacite, and is a continuation downward of the one ore-shoot; there is marked falling-off in value as the latite is reached, and practically all ores thus far mined in the latite are sulphides; (4) the bonanzas have been confined to the dacite, with the exception of the Engineers' lease and a few isolated shoots in the similar Milltown andesite; and (5) no pockets have as yet been proved under the Siebert lake beds, all known orebodies being indicated by surface exposure.

Development: during 1916, 28,333' of work was done at an average cost of \$5.73 per foot. **Ore reserves:** estimated Jan. 1, 1917, at 85,000 tons of ore, but 300,000 tons should be extracted before the mine is depleted.

In 1916 there was no important work done in the low-grade copper-gold ore areas. A system of leasing outlying parts of the property on a royalty basis was decided upon. Several lessees mined good ore.

Equipment: is excellent and complete for daily output of over 1,000 tons of ore. The 100-stamp mill treated 928 tons per day, recovering 86.77%. Experiments resulted in a 500-ton flotation plant being installed. In May, 1917, when the yield was \$10,186 net from 23,300 tons, 500 tons was treated by flotation and 500 tons by cyanidation, daily. Flotation is saving 90% of the gold and more in copper values.

Production: from 6 shafts aggregated 338,680 tons in 1916, valued at \$2,548,426 gross and \$428,620 net.

Production, Costs, and Profits Since Completion of Mill:

	Ore, Tons	Rec. per Ton	Total Cost per Ton	Operating Profit per Ton	Operating Profit Total	Dividends
1916	338,680	\$7.52	\$5.18	\$2.34	\$792,511	.....
1915	390,054	10.37(c)	5.16	....	1,568,308	\$1,601,617
1914	338,192	11.61	6.19	5.42	1,835,224	1,067,744
1913	349,465	14.14	6.32	7.82	2,731,945	2,491,403
1912(a)	415,786	18.40	6.65	11.75	4,886,399	5,694,637
1911(b)	330,549	30.74	7.97	22.77	7,526,846	7,118,296
1910(b)	266,867	38.50	10.97	27.53	7,347,692	7,118,271
1909(b)	194,479	34.72	8.88	25.84	5,026,620	3,201,239

(a) 14 months ending Dec. 31, 1912. (b) Year ending Oct. 31. (c) Average value per ton.

In 1917 production is averaging about 20,000 tons monthly.

As a stock investment the buyer is taking a chance on a rapidly liquidating proposition, for the irregularity of the gold in the orebodies makes it impossible to give an accurate estimate of ore reserves; the discoveries each year about balance extraction and the records show a well sustained yearly average tonnage treated, but the ore shows decreasing value ranging from \$38.50 per ton in 1910 to \$7.52 in 1916.

Company has ranked as one of the greatest mines in the world, producing \$49,437,847 in 8 years, disbursing \$28,998,831 to shareholders. A few more dividends may be paid. Shares sold under \$1, 1917.

GOLDFIELD GREAT BEND MINING CO.**NEVADA**

Office: 302 News Bldg., Goldfield, Nev.

Officers: C. S. Sprague, pres.; J. K. Turner, v. p.; S. A. McCandless, sec.-treas.; preceding, with H. G. Mayer, directors.

Inc. May 8, 1915, in Nevada. Cap., \$1,500,000; shares \$1 par; assessable, all issued.

Property: 7 patented claims in Diamondfield section of Goldfield, Esmeralda Co., Nev., said to show a quartz vein in andesite, dipping 28° with E.-W. course. Oxide and sulphide ores occur in shoots averaging 6'x40'x70' in size, and \$60 per ton.

Development: by vertical shafts to 400' depth. Total underground workings, 5,000'. Ore reserves estimated at 10,000 tons of \$20 ore. Operating expenses in 1916, \$28,720.

Equipment: 75-h.p. Fairbanks-Morse hoist, Ingersoll-Rand compressor, Cameron pump and an old mill which will probably be re-built.

Shipments: 5 carloads from 160 to 300' levels during 1917, averaging \$40 per ton; last lots \$26.

GOLDFIELD MERGER MINES CO.**NEVADA**

Address: Goldfield, Esmeralda Co., Nev. John Mocine, supt.

Inc. 1908 in Washington. Cap., \$6,000,000; shares \$1 par.

Property: St. Ives and Velvet claims, the latter causing considerable litigation with the Jumbo Extension during 1915, for which see Vol. XII.

Development: by shaft to 1,750', opening veins with shoots of copper-gold-silver ore. Recent work of 1,350' developed 2% copper ore, but no gold.

Judging by results at other mines in the district, depth holds little promise.

GOLDFIELD ORO MINING CO.**NEVADA**

Controlled by New York Oro Corporation.

Address: Goldfield, Esmeralda Co., Nev. T. F. Manning, mgr.; Ben Gill, sec.

Inc. 1912 in Arizona. **Cap.**, 3,000,000 shares; \$1 par; 2,500,000 outstanding. **Property:** 33 acres at Goldfield, Nev., developed to 800' depth, where \$40 assays were reported in 1916. Company also developing Vulture mine in Wonder district.

No late news from properties worth mention.

GOLDFIELD SHALE MINING CO. **NEVADA**

Out of business. Property worked by Spearhead Gold Mining Co., which see.

GOLDFIELD SUNRISE GOLD MNG. CO. **NEVADA**

Controlled by Grandma Cons. Mines Co., which see.

GOWGANDA COPPER CO. **NEVADA**

Letters returned from Goldfield, Nev., address, C. A. Braconier, pres.; Herman Krieger, sec.; S. H. Thompson, Reese Wampler, W. H. Brock, directors.

Inc. July, 1913, in Nevada. **Cap.**, \$100,000; shares 10 cts. par.

Property: 9 claims, near Round mountain, 14 miles south of Goldfield, said to show a deposit of low-grade copper ore. Workings are as yet shallow. Probably idle.

GRANDMA CONSOLIDATED MINES CO. **NEVADA**

Address: Goldfield, Nev.

Officers: C. S. Sprague, pres.; J. K. Turner, v. p.; Ben Gill, sec.-treas.; with P. T. Somers, Jr., and S. A. McCandless, directors.

Inc. 1905 in Arizona. **Cap.**, \$2,500,000; shares \$1 par; 1,262,493 outstanding. Assessment of 1c a share levied Feb., 1917.

Organized to acquire and develop the Grandma claim of the Grandma Mining Co. (which see).

In 1916 company acquired stock control of the adjoining Goldfield Sunrise Gold Mng. Co. and now owns 1,242,401 shares out of 1,500,000.

Statement of accounts for 6 months ending July, 1917, shows: receipts, \$18,810, including \$12,445 from assessment No. 1; \$3,000 bills payable and demand notes; treasury stock sales, \$1,368; store acct., \$1,826; misc., \$395.

Expenditures: mine development, \$5,692; purchase Goldfield Sunrise stock, \$6,000; misc., \$6,118; bills payable, \$1,000.

Property: at Goldfield shows a quartz lode in dacite with 60° dip and N. W.-S. E. course. Sulphide ore contains gold, silver, and copper values.

Development: by 400' vertical shaft, which cut shale during July, 1917. Sinking to be continued to shale-latite contact.

Ground acquired through the Goldfield Sunrise Gold Mng. Co. is said to be very promising and nearly doubles the acreage of the company. Future of the company depends on results in the contact area, of doubtful extent.

GRANDMA MINING CO. **NEVADA**

Goldfield, Nev. **Officers:** Chas. S. Sprague, pres.; J. K. Turner, v. p.; Ben Gill, sec.-treas.; with P. J. Somers, Jr., and S. A. McCandless, directors.

Inc. Nov., 1904, in Ariz. **Cap.**, \$1,500,000; outstanding \$1,500,000; shares \$1 par.

Property: consists of the Paragon and Jumbo A claims in Gold Mountain district, Esmeralda Co., Nev., held by location.

In April, 1916, the Grandma claim in Goldfield district was deeded by the Grandma Mining Co. to the Grandma Consolidated Mines Co. (which see). Company has no assets excepting the 2 claims in the Gold Mountain district.

Shareholders may exchange their stocks for equal amount in the Grandma Cons. Mines Co.

INDIAN SPRINGS MINING CO.**NEVADA**

Address: 223 Mohawk Block, Spokane, Wash. Mine at Lida, Esmeralda Co., Nev.

Officers: A. B. Railton, pres.; H. T. DeMerritt, v. p.; Fred N. Davis, sec.; Thos. R. L. Harris, treas.; Ross C. Craddock, supt., at last accounts.

Inc. Feb., 1911, in Washington. **Cap.**, \$1,500,000; shares \$1 par; assessments, 3 mills to April, 1913. Company is a reorganization of the Indian Springs Copper Mining Co., with new directorate.

Company owns 8 claims, 100 acres mineral land in Lida valley, or Tule Canyon district, 30 miles S. W. of Goldfield, Nev. Ground shows veins and replacements in massive gray limestone. Vein runs E.-W., has vertical dip and is said to be 70' wide, traceable for 1,000'.

Development: by 100' shaft and 200' tunnel. Has steam power.

INTERSTATE CONSOLIDATED MINES CO.**NEVADA**

Address: Camp Harding, Esmeralda Co., Nev.

Officers: Franklin Harding, pres. and gen. mgr.; J. L. Simmons, v. p.; R. W. Force, sec.-treas.; preceding, with A. M. Shull and A. C. Frary, directors.

Inc. Sept. 4, 1909, in Arizona (to be changed to Nevada). **Cap.**, \$2,500,000 shares, \$1 par; non-assessable.

Property: 23 claims being worked and 18 others held, 12 miles from railroad at Goldfield.

Geology: the Harding group shows copper-silver-gold ore in lime-shale for a considerable distance. The copper-content varies greatly, but hand sorting gives about 10% grade. A carload of ore from near the surface, sent to the Mason Valley smelter at Thompson, returned 7.1%. The veins dip 45° N. E. and have a strike of S. 68° W. Other claims said to show copper, lead, and silver ore.

Development: by 127' shaft and tunnels, two being 327' long each. Total workings approximate 5,100' Extensive exploration by core-drilling is contemplated.

Owners believe development work will open up shipping ore.

JUMBO EXTENSION MINING CO.**NEVADA**

Office: Goldfield, Nev.

Officers: Chas. S. Sprague, pres.; J. K. Turner, v. p.; Ben Gill, sec.-treas.; preceding, with C. D. Olney, and R. S. Goodrich, directors.

Inc. April, 1904, in Ariz., as successor of the Jumbo & Vernal Extension Mng. Co. **Cap.**, \$1,250,000, increased to \$1,550,000 in 1915; shares \$1 par; all issued. Security Transfer & Registrar Co., N. Y., and Registration Surety Co., San Francisco, transfer agents and registrars. Annual meeting, July 18th. Listed on New York Curb and San Francisco Stock Exchange.

Comparative Income Statement

Year Ending June 30

	Previous			Other	
	Cash Bal.	Receipts	Dividends	Expends	Cash
1917.....	\$103,274	\$193,522	.....	\$194,792	\$90,268
1916.....	120,533	688,086	\$465,100	240,255	103,274
1915.....	29,100	473,335	125,317	256,585	120,533

Dividends: first dividends, 10c per share, was paid in July, 1911, out of proceeds of sale of Vinegorone fraction. Dividends since then have been as follows: Dec., 1914, 5c; March, 1915, 5c; Sept., 7½c; Dec., 10c; March, 1916, 7½c; June, 5c per share. Dividend for 3rd quarter passed; none since. The total paid is \$685,008, equal to 50c per share.

On Jan. 1, 1912, the company had cash on hand \$106,575, and on Jan. 1,

1914, only \$9,350, a cash loss of \$97,000 in 2 years and nothing to show for it. In Dec., 1913, control of the property passed to C. S. Sprague and associates of Goldfield, with H. Schwaikert, New York, as president. In first 5 months of new arrangement, net profits were \$53,342. In August, 1914, stock sold down to 12½ per share. In October a rich orebody was found that started the stock on a sensational career, making it a storm center on the New York Curb, that lasted for several months. A timeworn and familiar but, nevertheless, effective trick played on brokers carried the price to \$4 in December, after which record it immediately dropped to lower levels.

In February, 1915, an apex suit was filed by the Reorganized Booth Mining Co. against the Jumbo Extension to recover \$900,000 for ore claimed to have been mined from one of the veins of the Goldfield Booth Co. and the mine was closed. Within a short time an agreement was reached whereby operations were resumed, pending the hearing of the case in May. The litigation was settled by the Reorganized Booth Mining Co. deeding to the Jumbo Ext. Co all ore in the Velvet claim and in return the Booth Co. was given 300,000 shares of Jumbo Ext. stock, the cause of the increase in Jumbo Ext. Co. capitalization, and also \$15,000 in cash. The Jumbo Ext. Co. now has sideline agreements with the Booth, Goldfield Cons. and Goldfield Merger Mines Co., thus protecting itself from all future litigation.

Property: 9 patented claims, 97 acres, in Goldfield district, Esmeralda Co., Nev. **Ore:** gold, silver and copper in a quartz vein, occurring on the contact between shale and latite, locally called goldfieldite. Vein strikes N.-S.; dips 30° E. The pay ore occurs in shoots averaging 4' in width. For geology of the district, see U. S. G. S. Prof. Paper, No. 66.

Development: by two shafts, one on the Poloverda claim, 1,017' deep, and the Original Velvet, or No. 2 shaft, on the Velvet claim, 400' deep, until May, 1915, when work was started on enlarging it from a 2-compartment to a 3-compartment shaft and sinking to the 1,017' level.

In 1917 exploration was continued in the Poloverda and Velvet claims from Nos. 1 and 2 shafts. Several lenses of high-grade ore were exposed, but proved disappointing in tonnage. Drilling to a depth of 292' below the 1,017' level found nothing in the alaskite formation. The Goldfield Consolidated has leased from the Jumbo some ground containing \$8 ore, suitable for treatment in the lessee's flotation plant nearby.

Shaft is equipped with 100-h. p. double drum hoist and Cameron pump. Air is supplied from the 16-drill compressor at No. 1.

Development work, 1916, totaled 4,929'; 4,329' in the Velvet and 600' in the Poloverda, at a cost of \$11.84 per foot.

Production: for fiscal year ending June 30:

	Ore Tons	Gross Value	Loss in Treatment	—Value—	
				Total	Per Ton
1915:					
To smelter.....	10,873	\$669,560	\$51,161	\$618,399	\$56.87
To Cons. Mill (3 mos.)	5,547	81,850	49,302	32,548	5.87
1916:					
To smelter.....	35,541	1,124,487	153,703	970,785	27.32
1917:					
To smelter.....	8,143	219,441	26,727	192,714	26.95
Dump ore.....	807	.....	.....	807	.....

The output in 1917 was 8,950 tons, realizing \$193,521, less operating charges, which left a balance of \$20,976. To June 30, 1917, gross production was 81,330 tons of \$29.48 ore.

Costs amounted to \$23.92 per ton. The Goldfield Consolidated, adjoining, mines and treats ore for under \$5 per ton.

It is evident that the property has been forced to pay dividends for stock market effect. The Bonanza orebody, 150' long and 56' vertical, was greatly over-estimated. The boosting of the price to \$4 a share was a case of rank market rigging by brokers, the real value being believed to be less than \$1.00.

An exploration department was organized in Aug., 1916, and over 100 properties have been submitted, of which 35 were examined. Only one was considered worthy of serious development, the Copper Mountain of 340 acres, 15 miles from rail at Nolan, Mineral Co., Nev. Three shafts have opened good copper ore, 2 carloads being shipped in June, 1917. The mine is properly equipped and leases have been granted on several blocks. Possibilities of this property are considered good—\$22,726 was spent on it during the past fiscal year.

On Oct. 29, 1917, the company stated that developments indicated that the Copper Mountain would become a large producer and it was deemed advisable to organize a company to look after it. The Jumbo Copper Mountain Mining Co., which see, was incorporated for this purpose, Jumbo Extension holders receiving one new share of assessable stock for each share held, free of cost.

JUMBO JUNIOR MINING CO.

NEVADA

Address: Goldfield, Nev.

Officers: J. L. McCarthy, pres.; A. I. D'Arcy, v. p.; Floyd Cable, sec-treas.; with Joseph Bruder and H. E. Clark, directors.

Cap., \$1,500,000; shares \$1 par, non-assessable. Stock listed on San Francisco Exchange.

Property: the Spearhead Fraction claim, 6 acres, located between the Jumbo, Kewanas and Spearhead properties at Goldfield, purchased of the Spearhead Fraction Mining Company.

In 1917 development was centered on ground below the 880' level. In June, 1917, ore was opened for a few inches to 36" in width and the first carload of gold-silver-copper ore was shipped in July.

Possibilities, though small, seem brighter than a year ago.

JUSTICE GOLD MINING CO.

NEVADA

Goldfield, Nev. Officers: O. M. Justice, pres.; John La Foe, v. p.; Mrs. A. B. Hays, sec.-treas.; C. W. Hays, gen. mgr., with J. R. West, directors.

Inc. 1914, in Nevada. Cap., \$1,000,000; shares, \$1 par. Stock listed on San Francisco Stock Exchange.

Property: the Gold Coin Extension claim in the Diamondfield section of the Goldfield district and a lease on the adjoining property of the Diamondfield Daisy Gold Mining Co., which carries a 2½' vein of gold-copper ore running from \$18-\$39 per ton.

Development: by 265' Daisy shaft, which crosscuts, drifts and stopes. Several carload shipments in 1915 from stope above the 265' level reported to have yielded \$70 per ton.

KEWANAS EXTENSION MINING CO.

NEVADA

Inc. 1915, in Goldfield, Nev. Cap., \$1,000,000. Is a small well located property, 18 acres, adjoining Kewanas on the north and in direct line with its ore zone, as developed on its north drift. It adjoins the Booth mine at Goldfield. Is controlled by the Sprague interests and other California men who have underwritten the stock at 5c a share. Gave the Booth

company 25,000 shares of stock for a sideline agreement, thus avoiding litigation.

Ore reserves in June, 1917, were reported to be of fair quantity.

KEWANAS MINING CO.

NEVADA

See Reorganized Kewanas Gold Mining Co.

KLONDYKE-PORTLAND MINES CO.

NEVADA

Goldfield, Nev. Officers: Benj. Rosenthal, pres.; M. F. Hill, v. p.; J. F. Henry, sec.-treas.; with J. B. Witt and Peter Felis, directors.

Inc. 1915 in Nev. Cap., \$100,000.

Property: 9 claims in the Klondyke district, near Goldfield, Esmeralda Co., Nev., showing gold-silver-lead ore.

LONE STAR CONS. MNG. CO.

NEVADA

Office: 10 E. 43rd St., New York.

Officers: N. H. Wheeler, pres.-gen. mgr.; T. W. Kendall, v. p.-supt.; A. M. Marshall, sec.-treas., above with S. J. Kistler, directors.

Inc. April 17, 1912, in Nevada. Cap., \$2,500,000; shares \$1 par; assessable; all issued. John S. Cook & Co., Goldfield, registrar. Stock listed on Salt Lake and San Francisco Exchanges. Two assessments, total 3c, called in 1915. Annual meeting last Wednesday in April.

Property: 16 patented claims in Goldfield mining district, Esmeralda Co., Nev., and 7 unpatented claims in Indian mining district, Mono Co., Calif.

Development: the Goldfield property is developed by two 200' vertical shafts and 500' of drifts and crosscuts on the 250' level of the Nelligan shaft. Operations suspended July, 1915. No commercial ore developed as yet, though some medium grade ore was found.

Reported on, June, 1916, by Emory J. Arnold.

LUNING GOLD MINES SYNDICATE.

NEVADA

See R. B. Todd Mines Co.

MILLTOWN EXTENSION GOLD MINING CO.

NEVADA

Cripple Creek, Colo. Inc. in Nevada. Cap., \$1,500,000; shares \$1 par; in treasury, 800,000 shares. Company was organized in 1915 to secure title to the Louise Fraction and Milltown Extension claims at Goldfield; also owns 2 claims in Pioneer, Nev., has a lease on the Pioneer Extension property, and a half interest in the lease on the Jerry Johnson mine at Cripple Creek; this lease, owned by the Cripple Creek Deep Leasing Co., is from the 650' level down.

The 2 claims at Goldfield are being explored on the 700' level by a crosscut being run from the Yellow Tiger Co.'s shaft to the property of the Red Lion Cons. Mng. Co., which lies on the opposite side of Milltown Ext.

Work at present in the Jerry Johnson mine is on the 850' level. Management states that since shipments started in 1915 to May, 1916, 22 carloads of ore have been shipped, ranging in value from \$6.30 to \$28 per ton.

Property holdings of the company do not look attractive.

NEVADA CO-OPERATIVE MINING CO.

NEVADA

Goldfield, Nev. Officers: Chas. S. Sprague, pres.; J. K. Turner, v. p. and cons. engr.; P. J. Somers, sec.

Inc., 1913. Cap., \$2,000,000; shares \$1 par; assessable; 1,500,000 shares in treasury. Company is a reorganization of Goldfield Mines Operating Co.

Property: 11 claims, 150 acres, including the Nevada Empress, in Gold Mountain mining district, Esmeralda Co., 37 miles S. E. of Goldfield, shows 3 well-defined quartz veins, from 1-6' wide with numerous quartz stringers, running N. E. The formation is Cambrian sedimentary rocks, quartz-monzonite porphyry, granite, rhyolite and basalt.

Development: total work to June, 1915, was about 3,000', of which

2,000 is on the Central or Liberty vein. A crosscut tunnel, driven 800', exposed ore averaging \$8.17 across a width of $1\frac{1}{2}'$. Drifts run from a raise on the hanging-wall from the 800' level, encountered a quartz vein, assaying \$26.40 gold and 54 cts. silver per ton. Management plans developing from surface.

Equipment: includes several buildings and an old 10-stamp mill, which is to be remodeled.

Reported in June, 1917, that considerable free-milling ore had been developed.

NEW EMPIRE GOLDFIELD MINES CO.

NEVADA

Goldfield, Nev. **Officers:** C. D. Terwilliger, pres.; Chas. Wittenberg, v. p.; Fred J. Amigo, sec.-mgr.; F. M. Manson, treas., with E. Marks, directors.

Inc. 1915, in Nevada. **Cap.**, \$1,500,000; shares \$1 par.

Property: 3 claims and a fraction, 50 acres, adjoining the Lone Star on the E. and Commonwealth property on the N. at Goldfield, formerly owned by the Empire Gold Mining Co.

Development: by an old 150' shaft and 150' crosscut said to have disclosed a 16" streak of \$20 ore. Shaft is being sunk to 500' to reach the latite-shale contact.

Equipment: includes electric power and 40-h. p. electric hoist.

NEW GOLDFIELD SIERRA MINING CO.

NEVADA

Office: 107 Boston Bldg., Denver.

Inc. 1915 in Nevada. **Cap.**, \$1,500,000; shares \$1 par; assessable. Is a reorganization of the Goldfield Sierra Mining Co.; 750,578 shares of the old company were exchanged for stock in the new company.

Property: 3 patented claims, about 42 acres, at Goldfield, Esmeralda Co., Nev. Active development planned by management.

NEW GOLDFIELD SIMMERONE MINING CO.

NEVADA

Harry C. Cutler, Reno, gen. mgr.; F. B. Knickerbocker, supt. **Inc.** 1915 in Nevada. Stock listed on San Francisco Exchange.

Property: the Simmerone Fraction at Goldfield, Esmeralda Co., and a 3-year lease and bond on the adjoining Blue Bell group, worked through the Simmerone workings. The Simmerone, acquired 1914 at sheriff's sale, is developed to 250'. A raise from the 100' level disclosed an 18" quartz vein in July, 1915, said to have assayed from \$42-\$117 gold per ton.

Letters returned from Reno in July, 1917.

NEW JERSEY MINES CO.

NEVADA

Offices: 628 Hudson St., Hoboken, N. J., and Goldfield, Nev. **Officers:** Henry V. Broeser, pres.; L. A. Opdyke, v. p.; J. H. Stegman, treas.; Geo. H. Snyder, sec., Jersey City; above, with 14 others form the directorate; Harry Ernest, mgr.

Inc. Jan. 15, 1912, in Nev. **Cap.**, \$1,250,000; shares \$1 par; outstanding, 1,010,850 shares; assessable 1c per share per year. Registrar & Transfer Co., New York, registrar. Listed on San Francisco Exchange and New York Curb as a prospect.

Treasurer's report for year ending March, 31, 1917, shows receipts of \$18,017, which includes assessments, \$6,912, sale of shares, \$1,000, renewal of note, etc., \$4,997. Disbursements amounted to \$17,672, leaving balance on hand, \$346. There is only \$1,500 now owing on the note.

Property: 5 claims, 3 patented, 53 acres, several miles N. E. of Goldfield, said to show gold-silver ore.

Development: 507' shaft, with work done in 1916 on the 330' and 400' levels. Conditions remain as in 1916, ore always showing, but not in commercial quantities.

ORIGINAL BULLFROG MINES SYNDICATE **NEVADA**

Reorganized, 1917, as the Reorganized Original Bullfrog Mines Syndicate, which see. Old Stockholders invited to exchange their certificates for shares of the reorganized company.

ORLEANS MINING & MILLING CO. **NEVADA**

Address: Hornsilver, Esmeralda Co., Nev.

Officers: J. W. Dunfee, pres.; C. A. Terwilliger, v. p.; E. C. Edwards, sec.; J. W. Dunfee, treas. and mgr.; above, with C. H. Ellsworth, directors.

Inc. Sept. 1916, in Nev., 1,000,000 shares issued. Latest earnings reported at \$14,448.

Property: 5 unpatented claims, 120 acres, at Hornsilver, 28 miles S. of Goldfield, carries gold-silver ore in 8' fissure vein in diorite-lime-shale contact. Average assays given as \$21 per ton. Claims reserves of 15,000 tons of mill ore.

Development: by 500' incline shaft.

Production: in 1915, 2,165 tons of \$26 ore; in 1916, 1,126 tons of \$21 ore. Shipping regularly, 1917.

PALMETTO CONSOLIDATED, INC. **NEVADA**

Office: Goldfield, Nev. **Officers:** Edw. Cebrian, pres.; John T. Murphy, v. p.; L. Algeria, sec.-treas., 57 Post St., San Francisco, Calif.; Clyde P. Johnson, asst. sec.-treas. and John T. Murphy, mgr., Goldfield, Nev.

Inc. in Nevada. **Cap.**, \$1,500,000; shares \$1 par. Operated as a close corporation.

Property: 25 claims, 12 patented, about 500 acres, 42 miles S. E. of Goldfield in the Palmetto Mtns., credited with past production of \$6,500,000 in silver. Development by shafts, deepest 400'. The mine is said to contain large bodies of ore carrying good values in gold-silver-copper.

After an idleness of 20 years, the mine is to be reopened, extensively developed and modern machinery installed 1917-18.

QUALEY MINE. **NEVADA**

See Excelsior Mtn. Copper Co.

RED HILL FLORENCE MINING CO. **NEVADA**

Office: Goldfield, Nev. **Officers:** F. C. Favier, pres.; W. E. Zoebel, v. p.; A. H. Howe, sec.-treas., H. G. McMahon, mgr., with B. G. Henley, directors.

Inc. Nov. 20, 1916, in Nevada. **Cap.**, 2,500,000 shares; 10c par; all outstanding; assessable; 1½c levied, Dec., 1916. Company is a consolidation of the Red Hill Mining, Florence American Mining and Florence Extension Mining companies.

Property: 5 claims, 70 acres, owned outright, and 10 acres held under lease, at Goldfield, adjoining the Florence Goldfield on the S. and W. Ore contains gold, silver and copper values, occurring in a quartz vein in andesite. The property carries the extension of the Florence vein. Developed by 800' vertical shaft.

Equipment: includes double drum electric hoist, compressor and electric power.

Management plans extensive development from the 500-800' levels, with raises above the 500' level.

RED LION CONSOLIDATED MINES CO. **NEVADA**

Goldfield, Nev. A. P. Mackey, pres.

Inc. in Wyoming. **Cap.**, \$2,000,000; shares \$1 par. In treasury April, 1916, 700,000 shares. Listed on San Francisco Exchange. Control held by Yellow Tiger Mining Co.

Property: 6 claims, 97½ acres, patented, at Goldfield, adjoining the Milltown Extension and Yellow Tiger Mining Co.'s lands. Plans develop-

ment by running a crosscut from the shaft of the Yellow Tiger Mining Co. across the property of Milltown Extension and then into Red Lion territory; this crosscut to be on the 600 or 700' level; the nearest point to reach Red Lion territory from the Yellow Tiger workings is 1,400'. As additional footage is required for any prospecting done in Red Lion ground the scheme does not commend itself as being attractive and the property must be classed as a decided prospect. At last accounts the Yellow Tiger shaft had not been unwatered.

Mail returned and mine presumably idle, 1917.

REORGANIZED BLUE BULL MINING CO.

NEVADA

Office: P. O. Box 565, Goldfield, Nev.

Officers: Geo. Wingfield, pres.; F. A. Favier, v. p. and asst. sec.; A. H. Howe, sec.-treas.; preceding, with J. S. Henderson and K. M. Simpson, directors.

Inc. 1912, in Nevada. Cap., \$1,500,000; shares \$1 par; outstanding, 1,309,000 shares; assessments totaling 4c called to end of 1915. J. S. Cook & Co., Goldfield, Nev., registrar. Annual meeting, third Monday in Dec. Company was organized to acquire title to the property of the Blue Bull Mining Co., sold at sheriff's sale June 14, 1912. Latter company's stock was exchanged share for share for new stock on payment of 1c per share.

Property: 8 claims, 148 acres, in the Goldfield district, Esmeralda Co., Nev.

Development: by a 730' shaft with workings on the 500 and 700' levels opening up the Victor and Blue Bull veins. Crosscuts have been run into the C. O. D. Consolidated Mining Co. ground under a leasing agreement. Commercial ore was found on the 500' level, but not on the 700.

Property is a prospect.

REORGANIZED BOOTH MNG. CO. OF GOLDFIELD

NEVADA

Goldfield, Nevada.

Officers: Geo. Wingfield, v. p.; A. H. Howe, sec.-treas., with F. C. Favier, W. E. Zoebel and B. J. Henley, directors; A. I. D'Arcy, mgr.

Inc. 1912, in Nev., as a reorganization of the Booth Mng. Co. Stock was exchanged, share for share, on payment of 1c. Cap., \$1,000,000; shares \$1 par; assessable; 999,957 outstanding. Annual meeting, third Monday in December. Listed on San Francisco and Salt Lake City Exchanges; traded in on New York Curb. Stock transferred at company's office. John S. Cook & Co., Goldfield, registrar. Control is held by Geo. Wingfield. Five assessments, aggregating 7c, have been levied; the fifth, 2c per share, was in Jan., 1915.

Financial statement from Dec. 23, 1914, to Dec. 1, 1915, shows receipts of \$245,447, which includes: assessment No. 5, \$19,973; realized from mine rights, \$15,000; dividends on stock owned, \$19,275; sale of capital assets, \$187,316; balance Dec. 23, 1914, \$3,681; miscellaneous, \$202. Disbursements totaled \$47,988, leaving a cash balance Dec. 1, 1915, of \$197,458. Cash balance on hand April 27, 1916, after payment of dividend No. 3 was \$222,320.

Dividends: No. 1, 5c per share, paid March 6, 1916; No. 2, 15c, on April 6; No. 3, 10c, on April 26; No. 4, 5c, on June 6, making a total of \$349,984.95.

The company's treasury is built upon the apex suit filed Feb., 1915, against Jumbo Extension, which see; as a result of this suit it was proven that the Reorganized Booth Mining Co. was the owner of all the ores in the same vein throughout the entire sweep of the extralateral lines, which included the Laguna claims of the Goldfield Cons. Mines Co., a considerable part of the property of the Reorganized Kewanas Mining Co., a part

of the property of the Spearhead Gold Mining Co., a small part of one of the claims of the Lone Star Cons. Mining Co., a considerable part of the property of the Goldfield Merger Mines Co., and other miscellaneous claims and fractions.

As a result of this litigation an agreement was entered into with the Goldfield Cons. whereby subsequent litigation between them was obviated; the production from the Goldfield Cons. ground had been at a time so remote that recovery for the bulk of the proceeds was found to have been barred by the statute of limitations. From Jumbo Extension the Reorganized Booth Co. received \$15,000 cash and 300,000 shares stock; from the Reorganized Kewanas the company received 250,000 shares stock; from the Goldfield Merger 750,000 shares stock. With regard to the Lone Star Cons., the extended north end line of the Booth claim only touched one corner of the Lone Star, which happened to contain the working shaft of that company; a settlement was effected for a nominal consideration only. No settlement, as yet, has been effected with the Spearhead Gold Mng. Co.

By Dec. 1, 1915, the company had disposed of 135,400 shares of Jumbo Ext. stock in the market, for which it received \$187,316; up to the present time it is said to have disposed of at least 224,000 shares.

Property: formerly owned by the old Booth Mining Co., consists of one claim adjoining the Red Top and Laguna mines of the Goldfield Cons. In Sept., 1915, all development work was suspended and it was reported the management would endeavor to purchase another property.

The company is said to have the distinction of being the only non-producing mine that receives an income without incurring the slightest expense for operating.

REORGANIZED CRACKER JACK MINING CO. NEVADA
Goldfield, Nev.

Officers: E. P. Junor, pres.; Geo. K. Cremer, v. p.; H. G. McMahon, sec., treas. and mgr., with C. H. Shirts and J. A. Erickson, directors.

Inc. Dec. 18, 1915, in Nev. as a reorganization of the Cracker Jack Mining Co. **Cap.**, \$150,000; shares 10c par; assessable; all outstanding. Company being financed by assessments. Listed on San Francisco Exchange. On Dec. 21, 1915, a call of 1c per share was made, each stockholder in the old company being required to pay the assessment before receiving share for share of the new company.

Property: 5 claims, 2 patented, 140 acres, at Goldfield, adjoining the Sandstorm-Kendall on the east; said to have had \$50,000 expended on it for development. In Jan., 1916, the company purchased the adjoining 3 claims, 60 acres, formerly owned by the Adams Gold Mining Co., which had been sold for taxes. Adams group has a vertical shaft 320' deep with levels at 115' and 300' depth, said to show gold-silver ore in a 20' vein in rhyolite. Work on the 300' level has been carried to a point 500' from the shaft and is being still further advanced to determine value of the property.

Equipment: includes electric hoist, compressors and drills. Property is a prospect.

REORGANIZED DIAMONDFIELD TRIANGLE MNG. CO. NEVADA

Address: Ben Gill, treas., Goldfield, Nev.; J. K. Turner, cons. engr.

Inc. 1917, in Nev. **Cap.**, \$2,000,000; shares \$1 par. Is a reorganization of the Diamondfield Triangle Mng. Co.

Property: 7 claims in Diamondfield district, developed by vertical shaft said to show a promising quartz vein.

Idle, 1917, pending refinancing of company. Stockholders are invited to exchange their stock, share for share and payment of 1c assessment.

The indebtedness against the Diamondfield company to be liquidated is \$4,849.

REORGANIZED KEWANAS GOLD MINING CO. NEVADA

Address: A. H. Howe, sec.-treas., Goldfield, Nev.; Geo. Wingfield, pres.; A. I. D'Arcy, mgr.

Inc. July, 1913, in Nevada. Cap., \$1,500,000; shares \$1 par; all outstanding; assessable. Assessment No. 2, 1c per share, delinquent, Aug., 1916. Listed in Salt Lake City; traded on New York Curb.

Company is a reorganization of the Goldfield Kewanas Mining Co., which became bankrupt in 1913. As a result of the apex suit filed in 1915 by Reorganized Booth Mining Co., which see, the latter company received 250,000 shares Kewanas stock.

Statement issued June 25, 1916, showed: receipts—assessment No. 1, \$14,508; misc., \$209. Disbursements: \$7,257, which includes mine development, \$6,195; bank overdraft, March 15, 1916, \$9,281; leaving overdraft, June 25, 1916, \$1,822.

Property: 2 claims and a fraction, about 40 acres, east of the Laguna group of the Goldfield Cons. at Goldfield.

Development: by means of the winze on the Kewanas ground below an east crosscut into it from the 700' level of the Laguna shaft of the Goldfield Cons. Work up to July, 1917, consisted of exploration of the vein exposed on the 840' level; 550' N. of the winze the vein split, one branch strikes N. W., the other N. E., with shale between. Both branches have been explored about 800' N. of the winze and work said to have disclosed a 3' vein, giving "good assay returns in gold, silver and copper." Assay results not reported. To date, no "large bodies of commercial ore have been exposed, but with the size of vein and values that have been obtained from portions of the vein, and the amount of unexplored ground still available along the strike of the vein on Kewanas claims, it would seem that the possibilities of encountering bodies of good ore are favorable." Development has been continuous and is to be extended to the southern part of the property to connect with the Jumbo Junior workings. Property is a prospect.

REORGANIZED ORIGINAL BULLFROG MINES SYNDICATE

NEVADA

Ben Gill, sec., Goldfield, Nev. Is a reorganization of the Original Bullfrog Mines Syn., the new company assuming an obligation of \$13,000, to be paid off with funds derived from assessments. Stockholders in the old company united to exchange their stock share for share in the new company upon payment of the assessments.

Cap., \$2,000,000; shares \$1 par; assessable; 1,500,000 shares reserved for conversion of stock of the Original Bullfrog company. The treasurer reports, May, 1917, 1,500 tons of \$12 ore on the ground, to be treated at the Sunset Mining & Development Co.'s mill at Rhyolite, 4 miles distant.

ROYAL CONSOLIDATED COPPER CO.

NEVADA

Letter returned, 1915, from St. Louis, Mo., address. Mine office: Hawthorne, Esmeralda Co., Nev.

Officers: L. L. Crisp, pres. and gen. mgr.; G. L. Werth, v. p.; R. E. Drake, sec.-treas.; B. H. Martens, supt.; preceding, with Robt. W. Alt and Albert Lawson, directors.

Inc. April 27, 1907, in Arizona. Cap., \$2,500,000; shares \$1 par; non-assessable; issued, \$1,434,477, Dec. 31, 1910.

Bonds: \$300,000, authorized, at 7%; issued, \$2,300, Dec. 31, 1910. Annual meeting, first Monday in April.

There are two companies of this title; one an Arizona, the other a

Nevada corporation; the Arizona company apparently holding stock in the Nevada operating company.

Property: 10 claims, 1 fractional, 200 acres, 8 miles from Luning and 16 miles from Hawthorne and Mina. According to the company's former expert, the formation is "dyarite," porphyry and limestone, with large "burns" of iron gossan, the ore deposits consisting of copper, gold and silver, lying in a fissure "cutting" a contact of porphyry and lime, the orebody being claimed to be 250' wide.

The company's past literature contains some ridiculous and misleading statements. Fully described Vol. XI, Copper Handbook. Unfavorably regarded.

SANDSTORM-KENDALL CONSOLIDATED MINES CO. NEVADA

Goldfield, Esmeralda Co., Nev.

Officers: Geo. Wingfield, pres.; A. H. Howe, treas.; A. I. D'Arcy, mgr. Inc. in Nev. **Cap.**, 1,500,000 shares; \$1 par; assessable; outstanding 1,326,724. Listed in San Francisco.

Property: 70 acres at Goldfield, developed by shaft to 500' with a winze to the 700' level.

Ore: gold in contact deposit between andesite and rhyolite. In 1917 the company was doing development work on and above the 350' level, and in Sept. was prospecting at 260' to find ore that yielded well years ago.

The mine is a prospect undergoing development.

SILVERMINES CORPORATION, THE NEVADA

Office: 302 Nixon Bldg., Reno, Nev. **Mine office:** Hornsilver, Esmeralda Co., Nev.

Officers: S. H. Brady, pres. and gen. mgr.; G. B. Thatcher, v. p.; C. F. Stevens, sec.-treas.

Inc. in Nevada. **Cap.**, \$1,500,000; shares \$1 par; non-assessable.

Property: owns 85% of capital stock of Southwestern Mines Co., which has 9 claims at Hornsilver, 28 miles S. W. of Goldfield. The company also owns 6 other claims, the townsite of Hornsilver, telephone line to Goldfield and a 150-ton cyanide plant, built, 1917, to treat Southwestern company's ore. Reserves are reported as ample for a considerable time.

Equipment: 45 h. p. hoist, 6 drill compressor, 200 h. p. Fairbanks-Morse semi-Diesel engine and 120 k. w. generator and modern cyanide mill. Company also owns a 5" pipe line from Lida to Hornsilver, 8½ miles long. See Southwestern Mines Co.

SILVER PICK CONSOLIDATED MINES CO. NEVADA

Office: Goldfield, Nev.

Officers: Herman Zadig, pres.; E. S. Van Dyck, v. p. and gen. mgr.; C. D. Olney, sec.-treas.; G. F. Dyer, supt.

Inc. Sept., 1911, in Nev. **Cap.**, \$1,500,000; all outstanding. Shares traded in on San Francisco Exchange and New York and Philadelphia Curbs.

Property: 5 claims at Goldfield, Nev., being developed from 1,100' shaft on the Deserted claim and a 280' shaft on North End claim. At 1,100' a large body of low-grade sulphide ore is exposed in the Deserted. Some good assays were obtained, but there is no quantity of commercial ore yet. Work is under way at 300' in the old Von Polenz lease.

SOUTHWESTERN MINES CO. NEVADA

Office: 302 Nixon Bldg., Reno, Nev. **Mine office:** Hornsilver, Esmeralda Co., Nev.

Officers: G. B. Thatch, pres.; S. H. Brady, v. p. and gen. mgr.; C. F. Stevens, sec.-treas.

Inc. in Nev. **Cap.**, \$1,250,000; shares \$1 par; non-assessable. Silvermines Corporation, a holding company, controls 85% of shares in the Southwestern, and built a 150-ton cyanide plant.

Property: 9 claims, 135 acres, at Hornsilver, 28 miles S. W. of Goldfield, formerly known as the Great Western mine. Claims said to show silver-gold ore with silver predominating, occurring as chlorides and bromides, the gold being free milling. The veins occur in limestone and shales intruded by diorite dikes, the largest vein said to vary from 5' to 20' in width and to traverse the property for 4,000'.

Development: by 400' shaft with winze to 445' depth, and 3,000' of lateral workings. New 150-ton mill operating, Oct., 1917.

SPEARHEAD GOLD MINING CO. (REORGANIZED) NEVADA
Goldfield, Nevada.

Officers: Geo. A. Kernick, pres.; H. Berg, v. p.; A. A. Codd, sec. treas., Reno, Nev.; H. F. Bruce, supt., with C. M. Smith, directors.

Reorganized March 25, 1916, in Nevada. **Cap.**, \$1,500,000; increased from \$1,000,000; shares \$1 par; assessable; 1,000,000 issued. Listed in San Francisco and Salt Lake City.

Property: 2 claims, 27 acres, at Goldfield, adjoins the Kewanas. Jumbo Extension and Merger Mines Co. on the east. Several years ago lessees sank 4 shafts, 80' to 100' in depth. Mine was worked intermittently until Oct., 1915, with the idea of continuing the 240' shaft to the shale-lattice contact. A report, dated March 20, 1917, states that this formation was cut at 880' and the shaft bottomed at 910'. In sinking, 3 wide quartz veins of no value were passed through. Exploration of a dacite dike at 450' is under way. At 910' depth stringers containing chalcocite and chalcopyrite were cut, some said to assay \$30 per ton. New openings to March, 1917, amounted to 1704'.

Company has a 3 years' lease on the Never Sweat claim of the Blue Bull Mining Co. adjoining. Spearhead 450 and 910' levels are headed toward this claim.

Equipment: 60 h. p. hoist, compressor, drills, etc.

SYNCLINE GOLD-SILVER-COPPER MINING CO. NEVADA
Lida, Esmeralda Co., Nev.

Officers: L. Kershaw, pres., Tacoma, Wash.; H. C. Peet, v. p.; L. E. Campbell, sec. treas. and gen. mgr., with F. A. Campbell, B. A. Howes, E. P. O'Leary, E. B. Campbell and E. C. Peet, directors.

Inc. June 4, 1910, in Nevada, as successor of Washington-Nevada Mining & Milling Co. **Cap.**, \$1,000,000; shares \$1 par; non-assessable; issued \$799,420. Annual meeting, first Monday in January.

Property: 11 claims, 3 patented, 57 acres, with 120 acres mill and smelter sites, 30 miles S. W. of Goldfield and 10 miles from a railway, in the Lida district. District shows Cambrian limestone and shale, cut by quartz monzonite, capped by volcanic rocks. The ores occur as impregnations and veins. The claims are reported by the management to carry 12 deposits, 4 under development of 4 to 20' average width, traceable 5,000', carrying a sulphide ore, said to give assays of 8.7% copper, 17 to 19% lead, 11% zinc, 11 oz. silver and \$1.90 gold per ton.

Development: by 9 shafts, of 31 to 120' depth, and by 6 tunnels, of 12 to 140' length; the tunnels are not being used. Owing to lack of rail transportation and complex nature of the ore, company is devoting attention mainly to the development of lead carbonate ores.

Equipment: includes a 15 h. p. gasoline hoist and 5 mine buildings. The management plans deepening the main shaft to 200'.

VERNAL MINING CO. NEVADA
Office: 351 Bullitt Bldg., Philadelphia, Pa. **Mine office:** Goldfield, Nev.

Officers: M. Schamberg, pres.; E. S. Van Dyke, treas.

Inc. in Arizona. **Cap.**, \$1,500,000; shares \$1 par; increased, 1915, from

\$1,000,000. Central Trust and Savings Co., Philadelphia, transfer office. Listed on San Francisco and Salt Lake City Exchanges.

Property: 2 claims, in Diamond district, Goldfield, is developed for a few hundred feet, partly by lessees. Has shipped in a small way.

VICTORIA COPPER MINES CO.

NEVADA

Address: F. A. Strehlke, sec., Goldfield, Nev.

Property: the Victoria mine, an old copper producer now reopened and equipped.

WEST TONOPAH MINING CO.

NEVADA

Office: H. L. Williams, supt., Tonopah, Nev.

Officers: M. R. Ward, pres.; R. E. Mulcahy, v. p.; J. A. Percy, sec.-treas., with A. Hamilton, F. S. Glover, C. W. Buthmann and E. C. B. Adams, directors; J. G. Kirchen, mgr., Reno, Nev.

Inc. in Nevada. Cap., \$1,000,000; shares \$1 par; all issued; assessable. Annual meeting, first Tuesday after first Monday in January.

Property: 7 patented claims, 123 acres, in Esmeralda Co., Nev. Idle from 1907 to March 18, 1916.

Geology: quartz vein in trachyte and rhyolite, dipping 65 to 70°, with E. W. course. Ore contains gold and silver.

Development: 1,050' shaft, to be deepened when water is overcome. On 950' level an 800' crosscut passed through the vein, which is to be developed at depth.

Equipment: 75 h. p. Hendrie and Bolthoff hoist, Imperial type 10 Ingersoll-Rand compressor, 75 h. p. Aldrich triplex pump, ventilating fan, etc.

YELLOW TIGER MINING CO.

NEVADA

Reorganized as Yellow Tiger Consolidated Mining Co., which see.

YELLOW TIGER CONSOLIDATED MINING CO.

NEVADA

Office: 107 Boston Bldg., Denver, Colo. **Mine office:** Goldfield, Nev.

Officers: H. A. Riedel, pres.; Douglas Kellis, supt.

Cap., \$450,000; shares 10c par; assessable; 500,000 shares in treasury. Assessments are limited to 2c per share per annum.

Stock is listed on San Francisco and Salt Lake City Exchanges and is traded on the New York Curb.

Property: 35 acres, next S. of the Goldfield Consolidated and E. of the Columbia mountain fault, shows a vein of 18" to 2' width worked to a depth of 750' by shaft with several hundred feet of openings. Ores are said to carry from 6 to 9% copper, and gross values reported as from \$25 to \$32 per ton, are apparently mainly in this metal. About \$120,000 has been spent in development work. In 1915 obtained control of the Red Lion group of claims, adjoining on the south, supposed to contain the continuation of veins found on Yellow Tiger company's land.

Only development work was done in 1914 and 1915, mainly on the 600' and 700' levels. In April, 1916, property was closed down, but the Red Lion and Yellow Tiger claims are now being developed by assessments.

EUREKA COUNTY

ALKALI MINES CO.

NEVADA

Mine address: Eureka, Eureka Co., Nev. W. E. Sanders, supt.

Property: the Windfall mine, developed by a 500' shaft.

Ore: contains gold, silver and lead.

Equipment: includes a crushing plant and 150-ton cyanide plant. About 25 men are employed. Returns not available.

BUCKHORN MINES CO.

NEVADA

Buckhorn, Nev. Property shut down permanently, Feb., 1916. Plant dismantled. **Address:** George Wingfield, owner, Reno, Nev.

CALIFORNIA MINE**NEVADA**

J. B. Rebealletti, mgr., Eureka, Nev. Mine adjoins the Connolly and is reported shipping in 1917. About 12 men employed.

CROESUS-EUREKA MINING CO.**NEVADA**

Mine address: Eureka, Nev.

Property: the Connelly mine, developed by 400' shaft and 127' drift, said to show a body of high-grade galena and carbonate ore.

Management planned equipping mine and developing to 600' in 1917. About 14 men employed.

EUREKA-HOLLY MINING CO.**NEVADA**

Address: W. A. Barnes, mgr., Eureka, Nev.; Thos. Robinson, pres.

Property: the Holly mine on Adams Hill, Eureka, contains deposits of silver-lead ore. Developed by 400' shaft. Working, 1917.

HOLLY MINING CO.

See Eureka-Holly Mng. Co.

LYNN BIG SIX MINING CO.**NEVADA**

W. W. Ruby, supt., Goldville, via Carlin, Nev. Henry Harker, pres. Taylorsville, Utah; J. H. Marshall, mgr., Cont. Nat'l Bank Bldg., Salt Lake City, Utah.

Property: a gold mine, with a 4' vein said to carry a 20" streak of ore averaging \$150 per ton smelter return. The rest of the vein is said to assay \$46 per ton. A second vein, the West, shows mill ore.

Development: 200' shaft with drifts at 100 and 200'. Mill erected, 1917, with 25-tons daily capacity.

Production: about \$15,000 worth of ore shipped to date.

MINERAL HILL CONSOLIDATED MINES CO.**NEVADA**

Address: Mineral Hill, Nev.

Officers: Frank Stollenwerck, pres.; S. F. Stollenwerck, v. p.; Daniel Pratt, sec.; J. S. Willcox, treas.

Inc. 1906, in Ariz. **Cap.**, \$1,000,000; shares \$1 par; non-assessable; 713,000 issued; \$100,000 6% bonds authorized; issued, \$2,500.

Property: 11 claims, 3 patented, 135 acres, in Mineral Hill district. Eureka Co., Nev. Mine discovered 1869 was worked from 1871 to 1878, when it was closed because of the drop in silver; reopened in 1906.

Ore: occurs in dolomitic limestone and carbonaceous shale. Commercial orebodies, usually confined to the limestone, are found in fractured zones which correspond to strike faults. Principal ore is silver, which occurs as argentite with some gray copper, galena and gold. There is about 2,000' of underground development.

Samples of over 4,000 tons varied from 3.8 to 177 oz. silver and 0.5% to 0.7% lead, averaging 53.5 oz. silver and 0.04 oz. gold.

NEVADA CENTRAL COPPER CO.**NEVADA**

Went out of business, Jan., 1916. Property near Cedar, Eureka Co. Nev., deeded to Mrs. G. W. Leighton, who has leased it to local people. For description see Vol. XII.

RICHMOND-EUREKA MINING CO.**NEVADA**

Address: P. O. Box 385, Boston, Mass.

Officers: W. G. Sharp, pres.; C. G. Rice, v. p.; F. W. Batchelder, sec.-treas.; above, with Albert Fries, A. J. Seligman, C. A. Wimpfheimer, Frederick Lyon and C. A. Hight, directors.

Inc. Sept. 28, 1905, in Maine. **Cap.**, \$3,600,000; shares \$10 par. Annual meeting, fourth Wednesday in Sept.

Property: at Eureka, Nev., has been practically idle since 1910, when shipments of low-grade ore were stopped, owing to increased freight rates, which condition still obtains. Though the railway was reopened for traffic

during 1912, the new company put the freight rates at figures largely in excess of even the old rates, which were prohibitive.

In 1915 efforts were made to find higher grade ores, but as yet no considerable tonnage of such ore has been developed.

SAFFORD COPPER CO.

NEVADA

Office: 67 Milk St., Boston, Mass.

Officers: Jas. H. Kimball, pres.; Jas. S. Whitelock, v. p.; Owen Goldsmith, treas.; Frank W. Smith, supt.; preceding officers are the directors.

Inc. 1915. **Cap.**, \$300,000; shares \$1 par. Metropolitan Trust Co., Boston, transfer agents.

Property: 4 claims in Safford Mining district, Eureka Co., Nev., said to show copper-silver ore in quartz veins from 18"-30" wide, traversing porphyry and rhyolite formation.

Development: by 2 shafts, 30' and 100' deep, on the Evening Star claim. First shipment to Garfield, Utah, smelter, returned 8.28% copper and 128 oz. silver per ton, on Jan. 30, 1917. Active work resumed June first. Merely a prospect.

UNION MINES CO.

NEVADA

Office: Union, Nev.

Officers: W. P. Fairman, pres.; E. T. Comfort, sec.; L. R. Thatcher, mgr. A close corporation and prefers not to publish information.

Operates a silver-lead mine, 35 miles S. of Palisade, Eureka Co., Nev. In Sept., 1917, the manager discovered rich lead-silver ore in a claim near the Union.

HUMBOLDT COUNTY

ADELAIDE STAR MINES, LTD.

NEVADA

Liquidated. Fully described in Vol. XI, Copper Handbook.

AMERICAN MINING & EXPLORATION CO.

NEVADA

Office: Boston Bldg., Salt Lake City, Utah.

Officers: Fred H. Vahrenkamp, pres. and gen. mgr.; Geo. W. Morgan, v. p., with B. F. Bayer and A. E. Vail, directors; W. C. Johnston, sec.-treas.

Inc. Aug., 1917, in Utah. **Cap.**, \$1,500,000; shares \$1 par.

Property: the Imlay mine, 29 claims and 2 mill sites; also the Rye Patch mine, near Imlay, Humboldt Co., Nev. The latter is an old time producer, formerly held by the Eccles interests of Ogden and credited with production of \$25,000,000 in silver. The dumps are reported to contain 300,000 tons of ore averaging 16-22 oz. silver, \$1.20 gold and 4% zinc.

Equipment: includes the old 100-ton Imlay mill and a 200-ton mill equipped with Koering cyanide plant at the Rye Patch.

ANTELOPE SPRING MINING CO.

NEVADA

Office: 625 Dooly Bldg., Salt Lake City, Utah. Property leased by Linke-O'Byrne, incorporated, 1916. **Mine office:** Jungo, Humboldt Co., Nev.

Officers: Wm. H. Fitch, pres.; Gust Holm, v. p.; John W. Geiger, sec. and mgr.; Allen C. Eakin, treas.; preceding officers, Edith M. Brounzel, Fred Hubbard and E. R. Reitsch, directors.

Inc. April 11, 1906, in Utah. **Cap.**, \$300,000; shares \$1 par; assessable; 200,000 issued; 8 assessments levied, amounting to 13c per share.

Property: 17 claims, partly patented, 15 miles from Humboldt House, developed by 3 crosscut tunnels, each reaching the 2 principal oreshoots.

Ore: carries lead, silver and copper. The oreshoots occur on a limestone-shale contact, one shoot carrying zinc sulphide, the other, 20% lead ore containing gold and copper values. High-grade silver-lead concentrate is produced in the mill.

ANTIMONY SYNDICATE**NEVADA**

Controlled by John Ross, Unionville, Nev. Gross earnings for 1916 amounted to \$9,200 and operating expenses were \$4,000.

Property: the Black Warrior and Bloody Canyon antimony mines, 2 claims, 40 acres, in Humboldt Co., Nev. The Black Warrior mine in the Buena Vista district is developed by several tunnels to depth of 150', with total workings amounting to 2,000'. Ore, partly oxide and partly sulphide, occurs in fissure veins in porphyry, with N. S. course and dip of about 80°. Equipment consists of 25-ton mill.

Output amounted to \$92,500 in 1915, and \$230,000 in 1916, the ore averaging 62½% in 1915, and 40% in 1916. Production for 1917 amounted to 161¼ tons.

The Bloody Canyon mine in the Star district is developed by 2,500' of tunneling to depth of 300'. Made one shipment of 54% ore in 1916. Management plans active development of both properties in 1917.

ASSOCIATED MINES DEVELOPMENT CO.**NEVADA**

Office: 617 Pacific Bldg., San Francisco, Cal. C. N. Miller, pres.; E. N. Bannon, sec.

Inc. in Nev. Cap.: \$500,000; shares \$500 par.

Lands: at Rochester, Humboldt Co., Nev. Owns the Wild-Cat and Tiger patented claims, the Taylor Hill, Colorado and the Plainview-Plain-site group; also a stock interest in the Tohoqua mine, Gerlach, Nev. Claims to have \$200,000 worth of silver and gold ore in sight and no debts.

BLACK WARRIOR MINE**NEVADA**

Acquired 1915, by the Antimony Syndicate, which see.

BLOODY CANYON ANTIMONY MINE**NEVADA**

Acquired 1916, by the Antimony Syndicate, which see.

BONANZA MINING CO.**NEVADA**

Mine office: Winnemucca, Humboldt Co., Nev. Company controlled by Chas. Baagoe and D. F. Shiveley of Winnemucca.

Property: 5 claims, 5 miles from Winnemucca, shows a contact fissure vein 11'-22' wide and proven for length of 115', between diorite-porphyry hanging wall and lime shale footwall. Development includes 3 shafts, deepest 215' with crosscuts, a tunnel driven east from No. 2 shaft, 37' deep and a winze sunk all in ore. Mine has no equipment.

BUFFALO VALLEY MINES CO.**NEVADA**

Address: Lovelock, Nev. John T. Reid, mgr.; O. P. Richards, supt., Volney, Nev.

Inc. Jan. 7, 1916, in Ariz. Cap., \$500,000; shares \$1 par; 185,000 shares outstanding.

Property: 26 claims, 500 acres, about 18 miles S. of Volney. Ore occurs in a quartz vein in limestone; is 1'-25' wide with N. S. course and dip 35° W. Pay ore occurs in shoots, 100' long and said to average \$7.75 in gold. Development by 300' shaft, reported to prove ore reserves of 25,000 tons.

Idle owing to lack of funds.

CHICAGO-NEVADA TUNGSTEN CO.**NEVADA**

Lovelock, Nevada. **Address:** care H. M. Byllesby & Co., 208 La Salle St., Chicago, Ill.

Property: the Ragged Top and Besson group, 11 miles from Toulon, a station on the S. P. R. R., shows tungsten deposits. Ore will be treated in a mill planned to be put up at Toulon on the shore of Humboldt sink.

Production: 550 tons in May and June, 1916. The mill will handle custom ores.

CROWN MINES**NEVADA**

Jos. H. Playter, mgr., Golconda, Nev.

Property: 15 claims, about 200 acres, 12 miles S. of Golconda, said to carry a fissure vein in andesite, having a N. 15° E. course and dip of 60°. Ore occurs in shoots and is said to average \$6-\$10 in gold and silver.

Development: by about 2,000' of underground work, including a 600' tunnel. A prospect.

DELAWARE MINING CO.**NEVADA**

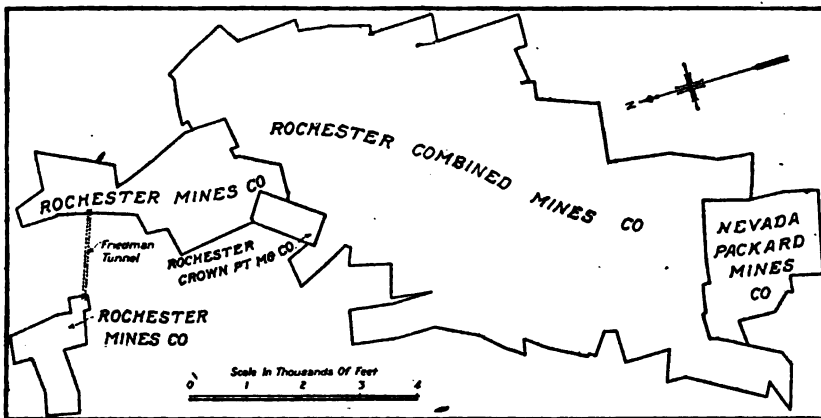
H. H. Hunter, mgr., Lovelock, Humboldt Co., Nev.

Property: 200 acres, in Seven Troughs district, near Vernon, Humboldt Co., Nev. Ore occurs in veins 5-7' wide, said to average \$18-\$20 per ton.

Equipment: includes the Darby mill 4½ miles from the mine, said to treating 50 tons of \$20 dump ore per day. Management is planning to explore the Delaware veins at depth.

56 (FIFTY-SIX) COPPER MINE**NEVADA**

Is the first quartz mine located in Nevada, being staked out in 1856,



PROPERTY MAP OF ROCHESTER, NEVADA.

by L. D. Vary. The mine is in the southern end of the Eugene mountains, not far from the Humboldt river and S. W. of Mill City. Idle.

GLASGOW & WESTERN EXPLORATION CO., LTD. **NEVADA**

In liquidation; Joseph Ralph, attorney for the liquidator, 65 I St., Salt Lake City, Utah. See Vol. XI, Copper Handbook, for details of organization, capitalization, directors, property, etc.

Company went into voluntary liquidation April, 1913, and all operations ceased. In April, 1913, the company owned the Montreal mine, Beaver Co., Utah; Copper Canyon, and Copper Basin mines, Lander Co., Nev. The Star property, White Pine Co., and Adelaide mine, Humboldt Co., Nev., were operated as subsidiary interests and fully described in Vol. XII.

The Star, Adelaide and Copper Canyon mines have been sold outright to the Copper Canyon Mining Co., which see; for the Montreal and Copper Basin, half of purchase price has been paid under working options. By Oct., 1917, the last asset is expected to be realized upon.

GOLCONDA GOLD LEDGE MINING CO.**NEVADA**

Address: 909 Sharp Bldg., Kansas City, Mo.

Officers: M. A. Fyke, pres.; W. H. Otto, v. p.; A. C. Sweet, sec.; C. V. Fyke, treas., with F. M. Planck, directors.

Cap., 1,000,000 shares; \$1 par.

Property: 8 claims, 2 miles S. of Golconda, Humboldt Co., Nev., known as Kramer Hill.

Three-year lease given Sept., 1915, to Golconda Nevada Mining Co. (J. B. Tomlinson).

GOLCONDA NEVADA MINING CO.

NEVADA

Address: Golconda, Humboldt Co., Nev. J. B. Tomlinson, mgr., has 3-year lease from Sept., 1915, on the Kramer Hill mine of Golconda Gold Ledge Mining Co.

Equipment: Lane mill replaced by 20 stamps in 1916, for sampling and testing on large scale. A 500-ton plant to be erected.

HAYSTACK MINES, INC.

NEVADA

Officers: F. L. Reber, v. p. and treas., Winnemucca, Nev.; C. T. Smith, pres. and supt., with W. J. Merryfield, directors; B. Smith, sec.

Inc. June, 1914. No outstanding stock. Annual meeting, first Tuesday in Jan. Gross earnings in 1915, \$7,500 from lessees.

Property: 5 unpatented claims, 35 miles W. of Winnemucca and 7 miles S. of Jungo, on the Western Pacific R. R.

Ore: occurs as free milling gold, in fissure veins in granite and quartzite, said to average \$22 per ton.

Development: by 3 shallow shafts.

HUMBOLDT CONS. MINES CO.

NEVADA

Office: 108 So. La Salle St., Chicago, Ill.

Officers and directors: C. F. Champion, pres. and treas.; C. J. Hayden, v. p.; L. R. Miser, sec. A. E. Taylor, asst. sec.; J. B. Newman, mgr.

Inc. in Ariz. Cap., \$1,500,000; shares \$1 par. Owns entire capital stock of La Toska Mining Co.

Property: La Toska mine, about 360 acres., at head of Wright Canyon, 5 miles from Rye patch and the same distance from Oreana, both on the S. P. R'y, Humboldt Co., Nev. Claims reported to show gold-silver ore occurring in 2 well defined veins. The main vein 6' wide has limestone hanging wall and rhyolite foot, and carries free gold, as well as silver minerals (bromide).

Development: by tunnel 2,640' long. The main vein was cut in 1917, at depth of 1,345' as a result of six years' work. Spent \$73,626 on mine, of which \$64,825 was for development work.

HUMBOLDT TRINITY GOLD MINING & MILLING CO. NEVADA

Office: Lovelock, Humboldt Co., Nev. E. L. Connell, mgr. Not incorporated.

Property: 10 claims, 200 acres, 12 miles N. of Lovelock, said to show gold-silver ore in quartz vein, 18" to 2' wide. The ore above water level at 100' depth is said to assay \$18 to \$25 per ton, with higher values below.

Development: 108' Humboldt incline shaft with drifts on 90' and 55' levels, 80' and 90' long, respectively. Claims \$10,000 in ore is blocked out.

Equipment: includes an 11-ton Huntington mill, and a 15 h. p. gasoline engine. "Production varies on account of lack of water; if mill runs steady, about \$3,000 per month." Nevada is a dry state.

LINCOLN HILL MILLING & MINING CO.

NEVADA

Office: G. S. Johnson Co., Clay Peters Bldg., Reno, Nev. G. S. Johnson, pres. and mgr. Robt. Nye, supt.

Cap., \$1,000,000; shares \$1 par; non-assessable; 100,000 shares in treasury.

Property: the Lincoln Hill mine on Lincoln Hill, Rochester mining

district, Humboldt Co., Nev., is said to carry 35 well defined veins, averaging \$150 per ton.

Development: by 1,600' of tunnels, raises and winzes.

Equipment: includes electric power, compressor, power drills, hoist, 2-stamp mill, and surface buildings. Mine, reported to have produced \$50,000 worth of ore under former owners. Shipping, 1917.

MINES DEVELOPMENT CO. OF NEVADA **NEVADA**

Lovelock, Humboldt Co., Nev.

Officers: John T. Reid, pres., treas. and gen. mgr.; Paul G. Reid, v. p., sec. and supt.; preceding, with R. C. Moore, J. Theis, Peter Anker and W. H. Rawlis, directors.

Inc. Sept. 1, 1904, in Arizona. **Cap.**, \$750,000; shares \$1 par; issued, \$454,000.

Property: 5 claims, 100 acres, in the Juniper Mountain district, said to show various fissure veins, alongside of quartz porphyry dikes, intrusive in monzonite. Veins run N. 20° W. and are nearly vertical. The vein developed averages 5' wide, is traceable for 2,000' and proven to 170' depth. Small seams of ore found at or near surface show chalcocite, bornite and tetrahedrite, giving average assays of 2% copper, 5 oz. silver and \$1 gold per ton.

Development: by a 500' tunnel. An 800' shaft to explore surface deposits at depth is proposed. Property has been idle for several years, owing to lack of funds and speculative character of claims.

Company is developing some claims under option in the Table Mountain district, Churchill Co., Nev. Two cars of sorted ore shipped are said to have returned 22 and 26% copper. Mine is remote from rail and only assessment work was done.

Company owns 60,000 shares of the Buffalo Valley Gold Mines Co., which is to operate in Lander Co., Nev.

NATIONAL LEASING CO. **NEVADA**

Address: Elmer Fouts, supt., National, Humboldt Co., Nev.

Officers: G. Graham Rice, pres.; C. F. Belser, v. p. and treas.; R. W. Gnekow, sec.; G. E. Farish, mgr. and cons. engr.

Inc. 1917, in Delaware. **Cap.**, \$2,000,000; shares \$1 par; non-assessable.

Company has a 5-year lease on property of the Charleston Hill Gold Mining Co., at National, Nev. It is argued that the gold-bearing vein of the National Mines Co. continues through the National Leasing claims for at least 700', and that a 3,000' tunnel already driven is near the vein. George Graham Rice has underwritten 1,000,000 treasury shares and guaranteed to provide \$5,000 per month for development, accepting stock therefore at 15c per share, less 5%. This money is considered sufficient to do 10,000' of work in 2 years.

The National Mines Co. has produced over \$6,000,000 in gold, but there has been little output of late. In May, 1917, Rice's weekly house organ, Mining & Industrial Age, contained the news that a "new strike of \$100,000 per ton ore just reported" at the National mine, adjoining his leasing property; also that a new ore shoot was indicated by high-grade float near center of "your lease block."

National Leasing has arranged with National Mines to use the latter's equipment and extend its workings to prospect the Leasing ground. All the literature on this new company comes from Rice's office. Early in his share-selling campaign he gave the National Mines yield as \$7,000,000; in August it had increased to \$10,000,000. The Leasing company is a speculation that may have a chance to make good, but there has been as much talk as work about it thus far.

NATIONAL MINES CO.**NEVADA**

Office: 39 Board of Trade Bldg., Chicago. **Mine office:** National, Humboldt Co., Nev.

Officers: J. G. Snyder, pres.; L. G. Campbell, v. p.; C. V. Buckley, sec.; S. C. Scotten, treas.; Perry G. Harrison, supt.; H. L. Hollis, cons. engr.

Inc. in Wyoming. Cap., \$1,000,000; shares \$1 par; non-assessable; 817,427 shares outstanding.

Property: 6 patented claims and a fraction at National, Humboldt Co., shows gold-silver ore in quartz fissure veins, traversing a rhyolite-andesite formation. Orebody runs N.-S. and dips 45-70° W. Geology and vein system fully described in U. S. G. S. Bull. 601.

Development: by 10 adits from 150'-2,500' in length and 3 shafts, 450', 350' and 800' deep. Underground workings, April, 1916, total about 7 miles.

In April, 1917, it was reported that rich ores had been found in new shaft sunk 500' below No. 5 tunnel, but little authentic new is available.

Equipment: includes 2 electric hoists, aerial tram, 100-ton mill for amalgamation and concentration of ore. Mill treated 4,463.4 tons of ore in 1912; 47.3 tons in 1913; 2,763.5 tons in 1914; 18,662.2 tons in 1915; a total production to date of 36,000 tons, or \$6,000,000, mainly from the National gold shoot, intercepted at depth of 40' below the surface and which averaged \$20-\$30 to the pound.

In June, 1917, lease on company's plant was given the adjoining National Leasing Co. for exploration of their ground through the National Mines.

NENZEL CROWN POINT MINING CO.**NEVADA**

Office: 702 Mutual Bank Bldg., San Francisco, Cal. **Mine office:** Rochester, Humboldt Co., Nev.

Officers: Jos. F. Nenzel, pres.; Chas. E. Stevens, v. p. and treas.; O. G. Stevens, sec. and supt.; C. L. Mauritius, asst. sec., with F. W. Aitken and P. G. Fielder, directors.

Inc. Jan. 15, 1913, in Nev. Cap., \$1,250,000; shares \$1 par; increased in April, 1917, to \$2,000,000; shares \$1 par; 1,250,000 issued. Bond issue authorized for \$300,000, to pay for cyanide plant. Registration Surety Co., San Francisco, registrar and transfer agent. Stock is listed on San Francisco Exchange. Annual meeting, second Wednesday in February.

Property: 7 unpatented claims, 110 acres, in Rochester mining district. shows gold-silver ore as contact deposit and in fissures traversing rhyolite and felsite formation.

Development: in 1916, shaft was sunk 200' and 500' of raises and winzes. 1,000' of drifting and 3,000' of crosscutting was accomplished. Five well-defined veins are being opened by drift-tunnels. Ore has been opened to 750' vertically and over 1,000' on dip of veins. General average is \$15 per ton and total reserves are estimated at \$4,000,000.

Equipment: 40 h. p. hoist, 500 cu. ft. compressor, both motor-driven, and 200-ton cyanide mill.

Like several other mines at Rochester, this one seems to have a hopeful future.

NEVADA HUMBOLDT TUNGSTEN MINES CO.**NEVADA**

Address: Lovelock, Nev., or Mill City, Nev.

Officers: C. J. Jones, H. E. Loufek and P. J. Murrish, incorporators. **Cap., \$1,000,000; shares \$1 par.**

Property: claims near Mill City, said to show a deposit 5' wide of ore carrying 4% tungstic oxide, for length of 120'.

NEVADA PACKARD MINES CO.**NEVADA**

Office: Reno, Nev. Mine at Rochester, Humboldt Co., Nev.

Officers: Mark Walser, pres. and mgr.; R. L. Ray, v. p.; Frank Margrave, sec.; H. G. Thomson, supt.

Inc. 1913, in Nev. **Cap.**, \$1,250,000; shares \$1 par; fully paid; non-assessable; 1,164,592 issued. Stock listed in San Francisco, and stand at 30c in Oct., 1917. First dividend paid Dec. 20, 1916, amounting to 5c per share, equal to \$58,234. Transfer office at 53 State St., Boston.

Property: 4 claims, about 80 acres, in the Rochester mining district, said to show ore in silicified schist netted with quartz stringers. It is essentially a highly-altered sericitized rhyolite, varying from a soft and friable talcose or schistose product to an extremely tough silicified variety. Cerargyrite is the valuable constituent of the ore. Sulphides are not common. Ratio of gold to silver is about 1 to 300. Quartz veinlets are some times high in gold.

Development: by 5 tunnels, longest over 600'. Two ore zones have been opened, and a third is considered probable. Power obtained from Nevada Valleys Power Co., at \$8 per h. p. month.

Equipment: is complete. Has 100-ton mill, treatment being by rolls, tube-mills, agitation in cyanide, counter-current decantation, Oliver filters and Merrill precipitation system. Mill feed is about \$7 per ton. Plant is of excellent design and cost \$65,000. Recovery is 95%. Treatment costs \$1.26 per ton, and all charges at property, \$4 per ton.

Production: reported to be over \$114,000 to 1916.

Several changes in management during past year, and rumors of dissension are unfortunate with such a promising property.

NEVADA SUPERIOR MINES CO.**NEVADA**

Office: 625 Dooly Bldg., Salt Lake City. **Mine office:** Jungo, Nev.

Officers: Otto Grantz, pres.; E. R. Reitsch, v. p.; John W. Geiger, sec and gen. mgr.; Dr. Allen C. Eakin, treas., with D. R. Peterson, directors.

Inc. 1905, in Utah. **Cap.**, \$300,000; shares \$1 par; assessable; 155,000 shares outstanding. Income for 1915 was \$164 from royalties.

Property: 21 claims, 420 acres in Humboldt Co., 23 miles from Jungo on the W. P. R. R., shows gold-silver-lead-zinc ore in fissure veins traversing schist and slate. The main orebody, from 2-20' wide, strikes N. W. and is said to give average assays of 8.6 oz. silver, 11.2% lead, 1% copper, 8% zinc. Shipments of crude ore made by lessees in 1915 ran \$15-\$24 per ton. Developed by 2 tunnels, 1,000' and 2,500' long, and 330' vertical shaft.

Equipment: includes 75-ton concentrating mill, steam power, compressor, pump and hoist. Company has been inactive since 1913 owing to lack of funds.

NEVADA UNITED MINING CO.**NEVADA**

Oliver G. Jennings, pres. and treas., 49 Wall St., New York. An inactive corporation. Fully described Vol. XI, Copper Handbook.

PACKARD EXTENSION MINES CO.**NEVADA**

Lovelock, Nev.

Officers: B. F. Shepher, Jr., pres.; H. E. Woods, v. p.; Ray Stoddard, sec.-treas., Reno, with L. D. Richardson and L. A. Hilborn, directors.

Inc. Jan. 6, 1916, in Nevada. **Cap.**, \$1,250,000; shares \$1 par; 750,000 shares issued.

Property: 5 claims, unpatented, 90 acres, in Rochester mining district, Humboldt Co., adjoining the Nevada Packard ground, shows a shear zone of rhyolite with fissure veins, said to be 3-15' wide, with N. E. strike and dip of from 20-30°. Veins carry silver chloride and free gold. David H. Skea, consulting engineer for the Packard Extension, reports that the

claims owned by the company cover the actual extension of the Packard ore shoots on the downward rake in a course to the S. W., and that the great ore zone of the Packard mine should be found in Extension ground at a depth of about 250-300' beneath the surface.

Promoted by F. G. Cox & Co., Los Angeles.

PACKARD NORTH EXTENSION MINING CO.

NEVADA

Lovelock, Nev.

Officers: T. P. Ebert, pres.; Frank Margrave, v. p.; J. W. Kromer, sec. and gen. mgr.

Inc. 1916, in Nevada. **Cap.**, \$1,000,000; shares \$1 par.

Property: 4 claims, adjoins the Nevada Packard ground, at Lovelock Management reports: "Our property is so closely associated with that owned by the Nevada Packard Mines Co., that a description of their vein system is practically a description of ours. Their veins run N. and S. and presumably all enter our ground, though but one outcrops. It is on this vein we are working and upon which our lessee is working. It is our intention to drive a tunnel which will cut all veins at considerable depth." The vein was cut in tunnel B, about 250' from the portal and drifts run N. and S. for 125', in March, 1916. In August, 1916, work on company account ceased and the superintendent, J. W. Kromer, was reported as operating the mine under lease. Property is still in the prospect class.

PROVIDENCE EXTENSION GOLD MINING CO.

NEVADA

Office: Morris, Ill.

Officers: I. F. Hatcher, pres.; W. F. Buck, v. p.; G. A. Leach, sec-treas., with O. M. Barker, directors.

Inc. 1908, in Nev. **Cap.**, \$1,500,000; shares \$1 par; 1,100,000 shares outstanding.

Property: 3 patented claims and a fraction at Seven Troughs, Humboldt Co., Nev., reported by management to show high-grade free milling quartz ore in fissure veins, 4" to 2' wide and to carry from \$14 upwards in gold per ton.

Development: by 170' vertical shaft. Idle, pending refinancing of the company.

Examined by F. A. Wheeler.

RAGGED TOP MINE

NEVADA

Address: care H. M. Byllesby Co., 208 So. La Salle St., Chicago, Ill. Purchase price reported to have been \$250,000. Mine workings said to expose a 50' face of ore, from which 20,000 tons of tungsten ore were shipped to Utah Minerals Concentration Co., Eureka, Utah, yielding a 62% concentrate. A 75-ton concentrator was erected at Toulon in November, 1916.

ROCHESTER BUCK & CHARLEY MINES CO.

NEVADA

Lower Rochester, or Manhattan, Nev.

Officers: C. H. Moyer, pres.; Frank L. Reber, v. p., sec. and treas. with John Fant, C. E. Bugg and Wm. Lane, directors; F. L. Reber, mgr.

Inc. in Nevada. **Cap.**, \$1,000,000; outstanding, \$750,000; shares \$1 par. Annual meeting, first Wednesday in April.

Property: 8 claims, 150 acres, in Rochester mining district, shows contact deposits 6-16' wide between rhyolite and limestone, said to carry gold silver and some lead ore. Was discovered in 1913.

Development: 220' tunnel, with 600' of underground working.

Equipment: includes electric hoist. Property worked by lessees in 1916. Production over \$41,000.

ROCHESTER COMBINED MINES CO.

Offices: L. A. Friedman, Lovelock, and J. W. Wilkey; Packard (Rochester), Nev.

Officers: L. A. Friedman, pres.; O. H. Hicks and H. F. Murrish, v. p.'s; J. O. Nenzel, sec.-treas., with W. J. Flynn, P. S. Vanderkloot, C. H. Jones, Wm. Adams and V. A. Twigg, directors.

Inc. Jan. 6, 1917, in Nevada. **Cap.**, \$3,000,000; shares \$1 par; non-assessable; 2,500,000 issued.

Property: 86 claims, 1,000 acres, at Packard, near Rochester, Nev.

Geology: fault-contact between rhyolite and rhyolite-tuff.

Development: by tunnels to depth of 400'. Orebody is said to be 107' wide and reserves are estimated as worth \$2,000,000. Ore carries silver and gold. A geologic examination is being made.

Equipment: complete, with 300-ton mill, designed by K. Freitag, to be ready in November. Plant includes crushers, ball and tube mills, counter current decantation cyanidation and filters.

Mine reported closed, Dec., 1917, owing to lack of ore for mill.

ROCHESTER ELDA FINA MINING CO.

NEVADA

Offices: 702 Mutual Bank Bldg., San Francisco, Calif., and Rochester, Nev.

Officers: Jos. F. Nezel, pres.; Clay Peters, v. p.; with O. G. Stevens, sec., directors.

Inc. Feb. 8, 1915. **Cap.**, \$1,500,000; shares \$1 par. Annual meeting, last Wednesday in April. Management states operating expenses in 1915 were \$9,500.

Property: 2 claims, 30 acres, adjoining Rochester Mines Co., on the east, said to show contact deposit 4' to 5' in width between rhyolite and felsite, carrying gold-silver ore.

Development: 4 shafts, deepest 190', each on a separate vein and all in ore. Mine is also being developed to a depth of 500' by drifts through the Nenzel Crown Point company's workings.

Equipment: includes a hoist. Property is a prospect undergoing development.

ROCHESTER HOME TRAIL MINES CO.

NEVADA

Address: G. S. Johnson, Co. (Inc.) Reno, Nev.

Officers: G. S. Johnson, pres.; C. C. Higgins, v. p. and mgr.; A. J. Wright, sec.-treas., with E. W. Orr and W. F. Hentschel, directors. A. D. Cox, cons. eng.

Inc. 1916, in Nevada. **Cap.**, \$1,000,000; shares \$1 par; 600,000 issued.

Property: in Rochester district, adjoining the Buck & Charley, a small producer. Home Trail is said to have all the "earmarks" and geologic characteristics of the district. Ore opened assays from \$15 to \$75 per ton in silver and gold. Other richer ore is reported to have been developed.

Is a G. S. Johnson promotion, honestly worked, but receives rather too much publicity.

ROCHESTER MERGER MINES CO.

NEVADA

Office: Rochester, Nev.

Officers: H. G. Humphrey, pres.; C. A. Heller and J. E. McCreary, v. p.'s; C. H. McIntosh, sec.-treas.; with B. R. Binnis, directors:

Inc. Oct. 20, 1915, in Nevada. **Cap.**, \$2,000,000; shares \$1 par; 178,471 issued; non-assessable. Listed on San Francisco Exchange. Annual meeting first Monday in November.

Property: 25 claims, 450 acres, in 4 groups; original Rochester, Rochester Belmont, Widow Florence and Crown Point Extension, 2 groups in the Rochester mining district, Humboldt Co. The original Rochester and Rochester Belmont groups are contiguous and adjoin Rochester Mines Co. on the west.

Examined by O. H. Hershey, H. V. Winchell, W. H. Wiley, A. C. Lawson, and Fred Searles, Jr.

Geology: quartz veins in rhyolite, dipping 35 to 50°, with N.-S. course. Ore is both oxide and sulphide, assaying 50c to \$5 gold, 1 to 70 oz. silver, 1 to 5% copper, 1 to 5% lead and 1 to 6% zinc.

Development: by two tunnels, the Friedman tunnel crosscutting Rochester Merger ground for 1,560' before entering Rochester Mines Co. property and the Pitt tunnel (900' long), 1,200' north of the Friedman, supposed to cut the Broughton vein at a vertical depth of 500' and horizontal distance of 1,200'. The Pitt tunnel is reported by the management to have cut 2 veins, one of which has been drifted on for 265', in ore for 130', width 50' and average assay \$15 per ton. The Friedman tunnel, over 1,500' long, will serve both the Rochester Merger Mines Co. and the Rochester Mines Co. It is said to have cut 10 veins, 12' to 15' in width and drifting is being done on a few of these veins. The four tunnels, on Sept., 20, 1917, were 1,500, 1,430, 550 and 200' long. To a depth of 1,000' workings totaled 7,500'. Surface exploration has been extensive.

Equipment: compressed air hoists, 12-drill Chicago Pneumatic compressor, and electric motors.

ROCHESTER MINES CO.

NEVADA

Lovelock and Rochester, Nev.

Officers: L. A. Friedman, pres. and gen. mgr.; H. J. Murrish, sec.-treas., with W. C. Pitt, J. P. O'Brien, B. H. Conkling and Richard Hartley, directors.

Inc. Dec. 17, 1912, in Nev. **Cap.**, 2,250,000 shares; \$1 par; outstanding May 15, 1916, 2,148,791 shares. Secretary, Lovelock, Nev., and Security Transfer & Registrar Co., New York, transfer agts. Stock listed on San Francisco and Salt Lake City Exchanges and on New York Curb.

Mortgage: 8%, trust deed to C. Uniacke and A. John for \$70,000, dated Nov. 9, 1914, to cover 14 notes for \$5,000 each.

General Balance Sheet (May 15)

Assets:					
	Prop.-Dev.	Equip.	Current	Miscel.	Total
1916.....	\$2,028,157	\$133,586	\$40,722	\$1,133	\$2,203,598
Liabilities:					
	Cap. Stock	Surplus	Current	Total	
1916.....	\$2,148,791	\$24,451	\$30,356	\$2,203,598	

Property: 14 claims, 3 patented, on Nenzel Hill, in the Rochester mining district, Humboldt Co., includes Weaver Mining Co. property bought 1915. Ore on Nenzel Hill was first discovered a decade ago, but little work was done at that time. In 1912 large bodies of \$50 to \$60 silver-gold ore were found and shipments started in a small way; in the Winter of 1913-1914 these shipments attracted attention and the town of Rochester came into existence.

Geology: ore deposits of Nenzel Hill occur as replacement veins along fissures and shear zones in sheeted rhyolite; veins vary from a few feet to 40' in width and range from 100' to 3,700' in length; strike N. to N. 30° E., dip 60° W. The west vein is the main ore carrier, showing an orebody 750' long, and shoot being 20' wide and averaging \$21 per ton, at a depth of 300'. The east vein shows 6-7' of \$25 ore, and the 250' level showed 2' of \$160 ore. For geology see U. S. G. S. Bull. 580, p. 342.

Development: 20,660' of work, mostly by tunnels. In Feb., 1916, work consisted of 950' of shafts, 2,800' of tunnels, 600' of winzes, and several

thousand feet of raises and drifts, with estimated ore reserves of 118,000 tons. The Friedman tunnel, crossing Rochester Merger ground on the west for 1,560' will be used jointly with that company by the Rochester Mines Co. This tunnel cut the veins at a depth of 1,200' several hundred feet below the present workings.

In April, 1917, high-grade ore was cut on 700' level. At 800', north of the Codd winze, 8 to 9' of \$158 ore was reported as opened. This widened to 14' in July. On the 900' level there was 25' of good ore in September. This is known as the Adams vein. A winze is to be sunk to 1,100'.

Equipment: in March, 1915, company completed an up-to-date 10-stamp and cyanide mill in Rochester Canyon, almost 3 miles from the mines, with which it is connected by the Nevada Short Line narrow-gauge road. Mill was designed to treat 100 tons ore daily, but has been treating 120 to 150 tons; stamps, weigh 1,550 lbs. each, drop 100 times per min., extraction reported as about 92.87%; continuous counter-current decantation is employed. This plant was enlarged to treat 200 tons per day, 1916. Ore is carried from mine to mill by a 12,000' aerial tram.

Production: 1913 and 1914 reported as 52,282 tons, yielding \$1,015,345, chiefly in silver; average value for entire production, \$19.52 per ton. In 1915, the mill operated 205 days, treated 23,090 tons ore, lessee and company account, yielding 3,131 oz. gold, and 545,959 oz. silver; ore averaged about \$15 per ton. In 1916, \$373,857.

Costs, per ton, 1916 (5 mos); mining, \$3,221; milling, \$2,288; indirect, \$0.827. **Power:** electric, obtained from the Nevada Valleys Power Co. In August, 1917, the yield was \$75,000, compared with \$58,400 in July. The mill is treating 180 tons of \$14 ore daily, with 93% recovery.

ROCHESTER RAVEN MINES CO.

NEVADA

Lower Rochester, Humboldt Co., Nevada.

Officers: J. J. Morely, pres.; Frank L. Reber, v. p.; T. J. D. Galter, sec-treas. and res. agt.; preceding, with E. S. Howard, Frank Towelly and C. F. Hardley, directors.

Cap., 1,000,000 shares, 25c par.

Property: 3 claims, in Lower Rochester district, operated by lessees who are reported as shipping ore with values of \$34 per ton in gold and silver. Said to have shipped \$10,000 gross worth of ore in first few months of 1916. Geologic conditions are similar to those of district in general. See U. S. G. S. Bull, 580, p. 325.

Plans included driving tunnel to prove orebodies to depth of 600'.

ROCHESTER TREASURE MINING CO.

NEVADA

Address: J. E. McGovern, sec-treas., Rochester, Nev.; J. C. Colligan, pres.; J. W. Kromer, v. p.; John Golden and Harry J. Murrish, directors.

Inc. April 14, 1913, in Nevada. **Cap.,** \$1,500,000; \$1 par; 500,750 issued; non-assessable.

Property: the Old Relief mine, 5 claims, 100 acres in Relief canyon in Rochester district.

Geology: a silver-bearing quartz vein 12 to 25' wide, cutting limestone and running S. E., dipping 55° west with a pay shoot 10 by 25'.

Development: by tunnels 75 to 450' long. Workings to depth of 300' total 1,000'.

A small mine, examined by J. C. Bray.

ROCHESTER UNITED MINES CO.

NEVADA

Office: Phelan Bldg., San Francisco, Calif. **Mine office:** Rochester, Nev.

Officers: Fred Linderman, pres.; W. W. Davis, v. p.; B. W. Linderman, treas.; K. Van Winkle, sec.; with A. D. Cox, mgr., directors.

Inc. in Nevada. Cap., \$1,500,000; shares \$1 par; 1,114,878 issued. Listed on San Francisco Stock Exchange.

On May 3, 1917, a stockholders' committee, comprising above directorate, took over company's affairs, since when all debts have been paid.

Property: 21 claims, 240 acres, in Rochester district, Nev., adjoined on N. by Rochester, Rochester Merger and Rochester Mines; on E. by Rochester Mines and Rochester Combined; and on S. and W. by Rochester Combined.

Development: 200' tunnel and crosscuts 146' and 143' E. and W., June 1, 1917.

Management states that late work in S. drifts from the Friedman tunnel in the Merger and Mines gives strong indication of certain of the veins opened by these companies extending S. through United ground and exploration is aimed to open the probable S. course of these veins. In our conclusions last year we considered that a study of the map showed it very improbable that the Mine's veins cross any of the United claims.

ROCK HILL PLACER CO.

NEVADA

Address: Imlay, Nev. **Officers:** David May, pres.; Wm. I. Mead, v. p.; Jos. S. Jaffa, sec.-treas.

Inc. in Nevada. Cap., \$1,000,000; shares \$1 par.

Property: 22 claims, 440 acres, in Rock Hill canyon, Humboldt Co., Nevada.

RYE PATCH MINING & LEASING CO.

NEVADA

Address: S. A. Greenwood, sec., 423 Douglas Ave., Salt Lake City, Utah. Mine at Rye Patch, Humboldt Co., Nev. C. A. Conklin, pres.; David W. Jeffs, gen. mgr.

Inc. 1910, in Utah, as a reorganization of the Rye Patch Consolidated Mines Co. Cap., \$250,000; shares 25 cts. par, assessable.

Property: 6 claims, patented, held under a 7-year lease. Mine is 14 miles from a railway, and is said to have been worked extensively prior to 1873, with a reputed production of \$12,000,000 in silver.

Development: by a 1,200' tunnel, in which the present company started new work and developed a 14" vein of extremely rich silver ore carrying 4 to 9% copper.

Equipment. includes a 10-stamp mill with a concentrator.

Reported in Sept., 1917, that property had been sold to the American Mining & Exploration Co., F. H. Vahrenkamp, pres.

SAINT ANTHONY MINES CO. (Tungsten)

NEVADA

Operating a 75-ton mill at Toy, 21 miles S. W. Lovelock, on ore from an 8' vein of 3% scheelite. Producing 20 tons daily from another mine near Sodaville, Mineral Co., Nev., the latter ores being shipped to a concentration mill near Luning.

Both properties reported closed, early in 1917.

ST. ANTHONY TUNGSTEN MINES.

NEVADA

See Toy Tungsten.

SEVEN TROUGHS BUCKHORN MINING CO.

NEVADA

Vernon, Humboldt Co., Nev. Operates property showing a 6' vein of gold-silver ore.

SEVEN TROUGHS COALITION MINING CO.

NEVADA

Office: Lovelock, Nev.

Officers: L. A. Friedman, pres.; H. J. Murrish, sec.; with A. M. Adams, M. R. Vanderkloot, and J. T. Goodwin, directors; Frank Bird, supt.

Inc. Sept. 29, 1908, in Nevada, to take over the Seven Troughs Kindergarten Mining Co. and the Seven Troughs Therian Gold Mining Co., together with some other ground. Cap., \$1,500,000; \$1 par; outstanding

August 27, 1915, 1,433,027 shares. Security Transfer & Registrar Co., New York, transfer agent and registrar. Listed in Salt Lake City and on New York Curb.

General balance sheet for fiscal year ending June 30, 1915, showed assets of \$1,516,613, which included: mining property, \$1,242,058; buildings and equipment, \$40,698; total current assets, \$142,931. Liabilities showed capital stock, \$1,443,027; accounts payable, \$655; taxes, \$628; surplus, \$71,629.

Report for year ending April 30, 1916, shows total income \$337,577; total expenses, \$241,136; leaving operating profits of \$96,441. Cash on hand Jan. 1, 1916, \$69,024; current assets, \$122,681.

Dividends: paid in 1915 totaled \$180,380, consisting of four quarterly and one extra dividend in December, all of 2½ cts. per share. Total dividends paid to 1916, \$216,493.

Property: 14 patented claims at Seven Troughs, has high-grade gold-silver ore in a narrow vein which varies in width from 4" up to 20 and 30". Developed to the 1,630' level which is 130' on the dip below the 1,500' level. Management claims 2½' of \$250 ore on the 1,600' north drift, this ore-shoot also showing on the 1,500' level, and the raise between. No ore reserves given. In 1915 the output totaled 4,509 tons of ore, yielding \$416,084; the ore handled by the mill averaged about \$93 per ton.

No engineer's report on the property has ever been made. Management has not replied to requests for information.

In Aug., 1916, the bottom level was flooded, suspending work for several weeks. Ore assaying \$200 per ton was being mined from the 1,700' level. Below this level a winze has been sunk 200'. On the 1,800' level over 200' of drifting has been done. Apparently the mill is still treating rich ore, but returns are not available. The shoot appears to persist at depth, but mine can never be of much profit save to a few shareholders. Later information states that on the 1,600' level the ore is disturbed and of low value.

SEVEN TROUGHS MINING CO.

NEVADA

Seven Troughs, Humboldt Co., Nev. **Officers:** L. A. Friedman, pres.; A. A. Williams, v. p.; R. Nenzel, sec.-treas.; with J. D. Hilger and R. J. Evans, directors. C. W. Poole, gen. mgr.

Inc. Nov. 26, 1906, in Utah. **Cap.,** \$1,000,000; shares \$1 par; outstanding, 897,700 shares. Annual meeting, second Monday in June. Listed in Salt Lake City.

General balance sheet, Jan. 1, 1916, shows assets of \$1,107,107, which includes: property and equipment, \$1,086,502; current assets, \$20,605. Liabilities show a surplus of \$16,691. Income for 1915, \$3,528, was mainly on lessee's production; total expenses were \$4,175, leaving a net loss for the year of \$647, compared with profits of \$1,205 in 1914.

The discord among the company's stockholders was apparently settled in May, 1916, when a new management was put in with the purpose of actively developing the property which during the past few years has been worked by lessees.

Property: 29 claims, 26 patented, including the Fairview mine, for several years one of the heaviest producers of the district, located in the Seven Troughs mining district. Developed by a 700' vertical shaft. Said to show gold-silver ore occurring in fissure veins in basalt.

Equipment: includes a 50 h. p. gasoline hoist. Output in 1915 consisted of 260 tons of ore with a gross yield of \$15,000.

The new management, according to report, intends to sink a winze from the 700' level with the hope of developing ore at depth. In a supplemental report to the annual report for 1915, C. W. Poole, gen. mgr., states

that the lessees operated in 1915 at a loss to themselves of over \$40,000; he claims there is nothing in the mine it will pay the company to work, and that it will not pay to sink deeper.

By Sept., 1917, stoping was being done on the 700 and 800' levels. Ore worth \$400 to \$450 per ton is shipped, while the Darby mill at Mazuma is to treat 2,500 tons of dump ore. Prospects at 800' depth said to be favorable, and a large shoot was found between 600 and 700' on Sept. 20.

SILVER BELL & ALPHA CONSOLIDATED MINES CO. NEVADA
Officers: Lorin Hall, pres., Salt Lake City; Clinton D. Ray, sec.; C. B. Smith, supt., Rye Patch, Nev.

Inc. 1915, in Utah. **Cap.**, \$1,000,000; shares \$1 par; 450,000 in treasury; 100,000 were to be sold June, 1916, to erect a mill.

Property: two noted silver-gold mines at Rye Patch, Nevada, with reported production of \$11,000,000. Mine is 3.6 miles from railway.

Development: by shaft sunk through old workings and tapped by 1,000' working tunnel, with reserves of 200,000 tons of ore in old workings, said to assay 5 to 30 oz. silver per ton with 40c to \$1.40 gold per ton. Company figures \$2 mine and transportation costs and was to erect a mill in 1917. A strike of ore was reported July, 1916, carrying 2,520 oz. silver per ton in brittle silver and black sulphurets.

SILVERFIELDS MINING CO., LTD. NEVADA

Letters returned in 1917 from secretary's address: J. M. Hamilton, Suffolk House, London, E. C., Eng. Mine near Golconda, Humboldt Co., Nev.

Inc. Dec. 27, 1906, in Great Britain, as Golconda Consolidated Co., Ltd., and changed name to present title Feb., 1909. **Cap.**, £250,000; shares £1 par; issued, £143,353, fully paid.

Property: sundry claims, with a third interest in the Honolulu group, balance of which is owned by the Golconda-Nevada Copper Co., in the Kennedy and Battle Mountain districts, 8 miles west of Millers.

Development: by a 250' shaft showing a 3' vein in limestone said to assay, 8% copper, 26% lead, 390 oz. silver and \$4 gold.

Equipment: includes a 25 h. p. hoist and necessary mine buildings. Idle.

TOY TUNGSTEN MINE. NEVADA

Mr. Beck, supt., Toy, Humboldt Co., Nev. **Property:** 6 claims known as St. Anthony mine, formerly owned by Peter and A. M. Anderson, said to show a 5' vein of 4% ore.

Development: 100' shaft, 100' winze and an adit. A 50-ton mill, 2 miles S. E. of Toy, erected 1915, has crushers, steel ball mills and concentrating tables.

WARMACK GOLD MINING CO. NEVADA

Office: S. C. McIntyre, 110 S. Dearborn St., Chicago, Ill. H. Warren, Winnemucca; and G. R. Stevens, supt., Golconda, Nev.

Officers: J. T. Cawthorn, pres.; Harry Warren, v. p.; S. C. McIntyre, sec.; also directors.

Inc. March 31, 1916, in Arizona. **Cap.**, \$200,000; shares \$1 par; non-assessable; all issued. Annual meeting, April 15.

Property: 945 acres of placer ground, 12 miles S. of Golconda, Nev. Examined in May, 1912, by J. A. St. Clair, editor of "Inside Investments." Gravel available is estimated at 22,000,000 cu. yds., with a probable gold value of 61 cts. per yard. Sluicing is under way, but a clean-up of rich gravel is not expected until 1918. Gold in the disintegrated quartz formation is said to "triangular."

If even one quarter of the above value actually occurs it is good ground in California, and it is hoped the owners will find it true.

WILLARD MINES CO.

NEVADA

Lovelock, Nev.

Officers: F. H. Bird, pres.; J. T. Goodwin, v. p.; R. Nenzel, sec.; V. A. Twigg, treas., with L. A. Friedman, D. C. Wheeler, directors. H. H. Hunter, mgr. and supt.

Inc. in Nev. Cap., \$1,000,000; shares \$1 par; non-assessable; outstanding, 662,000. No bonded indebtedness. Annual meeting, third Wednesday in January.

Property: 3 unpatented claims, 8 miles E. of Lovelock, Humboldt Co., Nev., which show a vein carrying pay ore in shoots.

Development: by several shafts, deepest 50', and a 70' tunnel. Shipments averaged \$54 per ton in gold and silver.

Letters returned unanswered, 1917. Property in a district that was boomed in 1915, but the fever subsided in 1916.

WINNEMUCCA MOUNTAIN MINING CO.

NEVADA

Winnemucca, Nev.

Officers: H. A. Swanson, pres.; W. G. Adamson, sec.-treas.; John R. Turner, supt.; Rostoe F. Allen, asst.

Cap., \$2,000,000; shares \$1 par; outstanding, \$1,200,000; non-assessable; no bonded indebtedness.

Property: 25 claims, 2 patented, 7 miles from Winnemucca, Humboldt Co., including 9 claims owned by the Winnemucca and Bonanza companies now merged with the present organization. The claims show a N. E.-S. W. fissure vein, traceable through the property for 3,000'. This vein cuts shale intruded by dikes of diorite and andesite. The orebody varies from 3' to 30' in width, and ore carries gold and small silver values. Dumps contained 3,000 tons of \$15 ore.

In July, 1917, company purchased 6 potash bearing claims, in Coal Canyon, 8 miles from Lovelock, for \$100,000.

Development: by 5,000' of tunnel work. The working tunnel, 425' long, enters a fault zone at a point 29' below an ore-shoot 175' long and 30' wide. The work defines 15,000 tons of indicated ore said to average \$15 per ton.

In 1917 a shaft was sunk below 300' and good ore was reported as developed.

Equipment: includes electric hoist, compressor and a 50-ton cyanide mill. Property is a prospect.

WOLVERINE COPPER CO.

NEVADA

Address: E. S. Deardorf, mgr., Winnemucca, Nev.

Property: 15 claims, 300 acres in Harmony or Sonoma Mts., 5 miles S. E. of Winnemucca, shows 5 veins, carrying copper ore with silver and gold values.

Development: merely a 65' shaft showing gold ore in the bottom. Work on a new shaft was reported to have begun, June, 1916.

Equipment: includes gasoline hoist.

LANDER COUNTY**ANTIMONY KING MINE.**

NEVADA

Owned and operated by J. M. Pine.

Property: 8 miles S. of Austin, in Cottonwood canyon, Battle Mountain district, has been worked intermittently since 1871, and by present owner since 1912.

Ore: antimony, occurs in true fissure vein, filled with white and dark quartz, associated with stibnite and traceable for 900' on the surface. Country rock is a fine-grained silicious limestone, bluish-gray in color, with a little

disseminated pyrite. Geology fully described, U. S. G. S. Bull. 594, pp. 75-76.

Development: by 250' tunnel and 150' shaft, reported to have opened up a 6½' ledge of shipping ore, May, 1917. The commercial value of these antimony deposits has yet to be proved.

ANTIMONY & SILVER MINES CO.

NEVADA

Address: J. H. Stallings, gen. mgr., 2176 S. 7 E. St., Salt Lake City, Utah. **Directors:** Judge A. J. Weber, Dr. O. W. French and G. Y. Bullock.

Property: 3 groups, about 400 acres, in Galena Canyon, near Battle Mountain, Lander county, said to carry large deposits of milling ore averaging \$20 p. t. in gold-silver and high-grade antimony.

Development: consists of 1,500' of underground workings, main tunnel being 350' in length.

A 60-ton amalgamation and concentration mill started operations, Aug. 1917.

AUSTIN DAKOTA DEVELOPMENT CO.

NEVADA

Address: Valley City, N. Dak. **Mine office:** Austin, Nev.

Officers: Frank White, pres.; A. B. Cox, v. p., with C. A. Newman, H. R. Bruns, S. H. Nelson, Chas. E. Garvin and T. Carter Griffith, directors. J. E. Buttree, sec.-treas.; C. F. Littrell, mgr. E. J. Babcock, cons. engr.

Cap., \$1,500,000; shares \$1 par; 1,200,000 shares issued. Total receipts from stock sales during fiscal year ending June 30, 1917, amounted to \$95,145, less promotion expense, \$7,849. Expenditures at the mine were \$87,296.

Property: 800 acres in the Reese River mining district, at Austin, Lander Co., Nev. **Ore:** gold-silver in chlorite zone, in 2 parallel ledges, each 20' thick and cut by several mineralized dikes in granite. Vein system exposed in workings for about 400'. Average assays said to show up to \$2.60 gold and \$300 silver per ton.

Development: by the X-Ray 2-compartment shaft, 330' deep with 2,000' of laterals; the O. K. incline shaft, 350' deep, said to show \$150,000 worth of milling ore; the 250' Dalton shaft, sunk on a 6' vein of milling ore and the 150' Tesora shaft, sunk about 800' from the Dalton.

Equipment: pump, 80-h. p. hoist, ore bins, compressor, storehouse and stable. Company plans further development at depth.

AUSTIN GOLDFIELD MINING CO.

NEVADA

Owns the Watt mine, in New York Canyon, Lander Co., which see.

AUSTIN MANHATTAN CONS. MIN. CO

NEVADA

Idle. Wm. A. Marshall, res. agt., Austin, Nev. The company purchased the principal mining properties, first operated in the early 60's and credited with a production of \$19,000,000, in and adjacent to Austin, Nev., in 1908, and started development work, but on too large a scale commensurate with the limited money on hand. See Copper Handbook, Vol. XI, and Bulletin 208 and 408 U. S. Geol. Sur. Result was a receivership begun in 1911, culminating in a public sale of the property 3 years later. It was purchased by one of the largest creditors, the present owner, H. C. Fownes, German Nat'l Bank Bldg., Pittsburgh, Pa., who placed it on the market after expiration of the redemption period.

Property: 115 claims, 1,200 acres, 73 claims patented, in the Reese River mining district, at Austin, Lander county, shows in the Lander Hill section, a vein system of 5 fissure veins in granite, or quartz monzonite, N. W.-S. E. strike, dip 25° to 60° N. E. Maximum width of veins is 6'. Ore, sulphide of silver, occurs in lenticular shoots.

Development: 6,000' tunnel and shafts. The western portion of the property contains north-south veins yielding gold and silver, developed by the Jack Pot mine to the 400' level.

Mine shows but little ore in sight. Old workings largely caved and

inaccessible. Report on the property made by A. W. Daw, of the firm A. & Z. Daw, London, Eng., states there is a possibility of ore reserves in the principal veins below the main tunnel level; that suspension of operations in 1887 was due to failure to carry development ahead of stoping, to poor ventilation in the deeper workings and to falling price of silver, and that failure of subsequent operations has been due to lack of development work below the old work and to bad management. There is a 20-stamp mill on the property.

BATTLE MOUNTAIN MINES & DEVELOPMENT CO. NEVADA

Office: 617 Merritt Bldg., Los Angeles, Cal. **Mine office:** Battle Mountain, Nev., F. E. Perry, manager.

Officers: M. H. Whittier, pres.; F. B. Sutton, sec.; H. L. Westbrook, treas. **Directors:** M. H. Whittier, C. W. Brown and F. C. Ripley, all of Los Angeles. Is a close corporation and no details of organization are made public.

Operating expenses 1916, were \$85,121 for development work.

Property: 26 claims, 9 patented, in Lewis mining district, Lander Co., Nev., 16 miles south of Battle Mountain. Ore carries silver as stephanite, in shoots in quartz vein. Average value reported as 20 oz. silver and traces of gold and copper.

Development: by 5 tunnels, from 700' to 2600' long with a total of 15,376' of underground work, said to have blocked out 36,000 tons of ore.

Equipment: Includes 200 h. p. Diesel engine, compressor and 100 ton mill using 4 Callow flotation machines.

Management plans to do 6500' of development in 1917 and to remodel its mill.

COPPER CANYON MINING CO.

NEVADA

New York Office: 25 Broad Street, N. Y. **Mine Office:** Battle Mountain, Nev.

Officers and Directors: R. M. Atwater, Jr., mgr.; C. C. Burger, v. p.; L. E. Whicher, treas.; E. N. Skinner and F. Sommer Schmidt, gen. mgrs. H. Pelz, sec.

Inc. Nov. 4, 1916, in Delaware. Cap., 1,000,000 shares at \$1 par value. 500,000 issued. Transfer Office: 25 Broad Street, New York; N. Y. Trust Co., 26 Broad Street, registrar. Annual meeting 3d Tuesday in November.

Property: 16 patented claims of about 300 acres in Copper Canyon, Battle Mountain, Nevada. Formerly owned by the Glasgow & Western Mining Co. Purchase price was paid out of first year's production. First worked 1882.

Claims said to show 3 veins, the Virgin, Superior and Estes, varying from 10' to 30' in width; the first two with a N. S. course and dip of 60° to 80°, carry ore shoots of about 150' in length. The Estes ore body found by present management is 100' long, and 20' wide of high grade ore. The ore is a mixed sulphide and oxide of enargite, chalcocite, chrysocolla, malachite and cuprite assaying from 5%-15% copper.

Development: by two old incline shafts, 200' and 600' and by a vertical shaft just started. The extent of underground workings is 3500' with a greatest depth of 570'. Mine is worked by the fill-stope method.

Equipment: 60 h. p. gasoline hoist; 100 cu. ft. compressor, centrifugal pump, 250 h. p. distillate engine.

Production: began in April, 1916, and produced to Jan. 1, 1917, about 2,000,000 lbs. copper. Shipments of about 50 tons daily of 10% copper are being teamed and trucked 9 miles to rail and sent to the Garfield smelter. Ore reserves are substantial enough to warrant construction of 100-ton mill which is soon to be started.

HIDER NEVADA MINING CO.**NEVADA**

Officers: Fred Redmond, pres.; J. J. Morris, sec.-treas.; above with Mrs. A. F. Pitt, C. W. Pitt and T. E. Fitzgerald, directors.

Cap., 1,000,000 shares; 347,980 issued.

Property: about 23 miles south of Battle Mountain, Lander Co., Nevada, said to show several veins carrying copper ore.

Development: includes 125' incline shaft and a tunnel.

Management expected to ship some ore from the dumps, 1917.

HILLTOP MILLING & REDUCTION CO.**NEVADA**

Hilltop, Lander Co., Nev. **Officers:** Frank LeBar, pres.; Chas. E. Beach, v. p.; E. Ross Carver, sec.-treas. and mgr. Above are directors.

Inc. in Nevada. **Cap.,** \$50,000; shares \$10 par; all outstanding. Annual meeting in January. Company operates a 75-ton 10-stamp cyanide plant. Gross earnings, 1914, \$21,721; operating expenses, \$15,133.

KIMBERLY CONSOLIDATED MINES CO.**NEVADA**

Idle. **Office:** 1200 Liberty Bldg., Philadelphia, Pa. **Mine office:** Hilltop, Nev.

Officers: Frank LeBar pres.; Geo. A. Ford, v. p.; E. Ross Carver, sec.-treas.-mgr., with Chas. A. Beach, S. P. Curtis and John L. Cox, directors. H. Crouch, supt.

Inc. 1910, in South Dakota. **Cap.,** \$5,000,000; shares \$1 par; 4,297,916 shares issued. Stock listed on the San Francisco Exchange. Annual meeting in May. Gross earnings in 1915 amounted to \$9,780.

Property: 18 claims, all patented, 360 acres, at Hilltop, shows gold, silver, copper and lead ore in quartz veins. The vein runs N.-S., dips W., and is said to have been proven for 5,000' in length. A crosscut driven on the 350' level reported to have cut a 12' vein assaying \$9.48 per ton. Developed by 5,000' tunnel and several shafts.

Equipment: includes compressor, ½ mile tram and 25-h. p. gasoline engine, 50-ton mill and cyanide plant.

No 1916-'17 returns.

KIMBERLY SHIPPER MINING CO.**NEVADA**

Office: 714 Kearns Bldg., Salt Lake City, Utah. **Officers:** W. S. Gilsey, pres.; F. L. Sumpter, v. p.; C. W. Fleck, sec.; C. L. Shelley, treas.; with G. H. Gould, directors.

Inc. in Utah. **Cap.,** \$50,000; shares 5c par.

Property: 60 acres at Hilltop, Lander Co., Nev., 20 miles E. of Battle Mt., shows gold-silver ore in shoots. Developed by 800' tunnel and drifts, A shipment to the U. S. smelter in Dec., 1915, yielded \$75 per ton. Samples from a rich shoot opened in April, 1916, reported to have assayed 226.85 oz. gold and 317.2 oz. silver, or \$4,737 per ton.

MARICOPA MINES CO.**NEVADA**

Austin, Lander Co., Nev. Described under Arizona companies.

NEVADA-CALUMET COPPER CO.**NEVADA**

W. H. Bray, mgr., Battle Mountain, Nev. F. D. Nowell, pres.; J. A. Beck, v. p.-sec.

Inc. 1913. **Property:** the Boyd-Martin group, 30 claims, in heart of the monzonite-porphry belt of Battle mountain, shows copper-stained patches thought to represent the outcrop of a big disseminated glance deposit.

NEVADA GOLD MINES CO.**NEVADA**

No recent returns. J. S. Madden, Austin, Lander Co., Nev., mgr. **Inc.** 1915, in Nevada.

Property: 16 claims, including the Gold Park, La Crux, San Pedro, May-Do-So and Cottonwood groups, at Austin, said to show gold-silver-copper ores in well-defined veins. Systematic development work started Nov., 1915.

NICKLAS MINING CO.**NEVADA****Address:** 11 Pine Street, New York.**Officers:** E. N. Breitung, pres.; A. S. Mitchell, v. p.; W. A. Hamilton, sec.-treas., with Max Breitung and H. B. Barling, directors.**Inc.** Sept. 7, 1916, in Arizona. **Cap.**, \$1,500,000; shares \$1 par; non-assessable; 1,300,000 issued. **Bonds:** \$300,000, 6% 1st mtge., sinking fund, serial gold bonds.**Property:** 4 claims, 82 acres, in Galena district, 13 miles S. W. of Battle Mountain, Nev., said to show a quartz vein in granodiorite. Ore contains 9 oz. silver and \$4.60 gold per ton.**Development:** by shaft to 200' below tunnels, lowest of which is 1,000' long. Workings total 3,000'. **Ore reserves:** are given as 30,000 tons of \$10 ore. In a report by H. B. Barling, the estimate is 98,450 tons and for the whole property 700,000 tons. Recent results are said to have been good. Costs are estimated at \$5.80 per ton and profits at \$3.75; a 100-ton mill is to be built.**RUBY SILVER MINING & DEVELOPMENT CO.****NEVADA****Office:** 15 Broad Street, New York; George W. Abel, pres. **Cap.**, 1,000,000 shares, \$1 par; 600,000 outstanding.**Property:** 260 acres in the Lewis mining district, Lander Co., Nev., reported to have "opened a substantial ore-shoot" to a depth of 580', and to have found "excellent values" in the 4 tunnels which have been driven to intersect this orebody at various depths. Property is fully equipped. Management states a 50-ton flotation unit is being added to equipment. The mine has been operating for several years and in May, 1916, was brought out by one of the Broad Street (New York) brokers.

Letters returned in 1917.

TENABO MINING & SMELTING CO.**NEVADA****Office:** 105 Mercantile Bldg., Salt Lake City, Utah. **Mine office:** care A. E. Raleigh, supt., Tenabo, Lander Co., Nev.**Officers:** W. Mont Ferry, pres.; John Pingree, v. p.; John Janney, sec.; E. O. Howard, treas., and Benner X. Smith, directors; Duncan MacVichie, cons. engr.**Inc.** 1909, in Nevada. **Cap.**, \$3,000,000; shares \$2 par; issued, \$1,922,156. Annual meeting, second Monday in February. Union Trust Co., New York, registrar; Windsor Trust Co., New York, transfer agent; Walker Bros. Bank, Salt Lake City, depository. Stock is listed on the unqualified department of the Boston curb.

Company bought, 1909, the property of the Gem Cons. Mining Co., at Tenabo, which in turn had taken over the property of the Reliance M. & M. Co., the Tenabo Mng. & Sm. Co. giving 450,000 shares of stock to the Gem Consolidated for the lands. Company also bought the property of the Tenabo Cons. Mine Co., comprising the Copper Hill and Widows mines, for 300,000 shares of stock.

Property: 223 acres of mineral lands and an 80-acre mill and smelter site, in 4 groups, all with more or less development work. The principal group shows a deposit of low-grade copper ore, stated by company to average 300' in width, outcropping for nearly a mile. The management estimates the ore on this group to run about 3% copper, with small gold and silver values.

The Little Gem mine, about 1 mile from Tenabo, has a contact deposit between rhyolite and sedimentary rocks, carrying copper carbonates and chalcocopyrite, quartz gangue, a 450' shaft, sunk at the very flat angle of 22°, showing an orebody ranging from 2' to 14' in width, reported to have 24,884 tons blocked out, that will average \$18 per ton.

The mine was acquired upon a report by Duncan MacVichie that it contained 7,783 tons of \$13.38 smelting ore and 17,257 tons of \$3.88 concen-

trating ore and that \$25,000 spent on the property would bring reserves up to 100,000 tons.

Another property has a 150' incline shaft, in a vein, apparently widening in depth with 5 parallel veins in a cross-section of about 600'. The property as a whole has about 3,000' of workings, and about \$100,000 has been expended in development and equipment. Twenty-three cars of ore, from the Little Gem mine, gave net smelter returns of \$17,640.

WATT MINE.

NEVADA

Owned by Austin Goldfield Mining Co., and operated by H. Lemaire, under lease, several shipments being made in 1915.

Property: the Cambria or Todd claims on N. side of New York canyon, Reese River district, Lander Co., Nev.

Developments: 300' inclined shaft with 3 levels. Vein in dark quartzite ranges from 4" to 12" wide and consists of white quartz containing tetrahedrite, pyrite, chalcopyrite, and some blende and galena; dip 25° to 45° N. E.; strike N. 45° W. Ore shipped is said to average about \$125 per ton, chiefly silver. To end of 1915, lessee had shipped ore worth over \$15,000.

Equipment: includes a 25-h. p. gasoline hoist.

LINCOLN COUNTY

AMALGAMATED PIOCHE MINES & SMELTERS CORP. NEVADA

Office: 40 Cedar Street, New York. **Mine office:** Pioche, Nev.

Officers: H. R. Van Wagenen, pres.; Wm. B. Randall, v. p.; E. S. Snow, sec.-treas.; Wm. F. Roberts, asst. sec.-treas.; H. S. Van Wagenen, supt.

Inc. July 27, 1911, in Maine, to take over the properties of the Nevada-Utah, Prince Cons., Ohio-Kentucky, and Pioche Cons. companies. It is the operating company of the Cons. Nev.-Utah Corp.; property is described under that title.

Cap., \$1,000,000; shares \$1 par; in treasury Mar. 31, 1915, \$499,500. Annual meeting 1st Tuesday in June. Treasurer's report of Mar. 31, 1915, shows assets of \$1,153,534, which includes property \$499,575, cash \$9,636, mine development \$66,683, machinery and equipment \$35,125, accounts receivable \$3,508, excess liabilities, \$25,901; liabilities: accounts payable, \$16,948, Cons. Nev.-Utah Corp. \$18,118, Pioche Pacific R. R. Co., \$1,442, Pioche accounts payable \$10,520, notes payable (Cons. Nev.-Utah Corp.) \$106,504. Inventory does not include ore on hand or in transit, \$18,753. No 1916 returns.

ARCANE MINING CO.

NEVADA

Letters returned, 1917, from former office: 1605 Walker Bank Bldg., Salt Lake City, Utah. **Mine office:** Pioche, Nev.

Officers: H. W. Rand, pres.; A. M. Cheney, v. p.; S. P. Kinney, sec.-treas.; preceding officers, Frank Holman, Frank Manning, directors. H. E. Freudenthal, supt. **Cap.,** \$100,000, shares 10c par.

Property: five claims, adjoining the properties of the Ohio-Kentucky and Amal. Pioche at Pioche, through which the Susan Duster lode of the Ohio-Kentucky extends, with 45° dip to the south. The ore from the lode on the O. K. property is said to have had an average assay value per ton of 7% lead, 20% zinc, 20 oz. silver and \$2.50 in gold.

Development: 1,200' of underground work has been done. Company said to plan sinking a vertical double-compartment shaft to the 650' level, at which depth it expects to cut the Susan Duster lode, 200' distant from the Arcane-O. K. line. The O. K. company is said to have followed the lode to the property line.

Equipment: power house, blacksmith shop, 40-h. p. gasoline engine and air compressor.

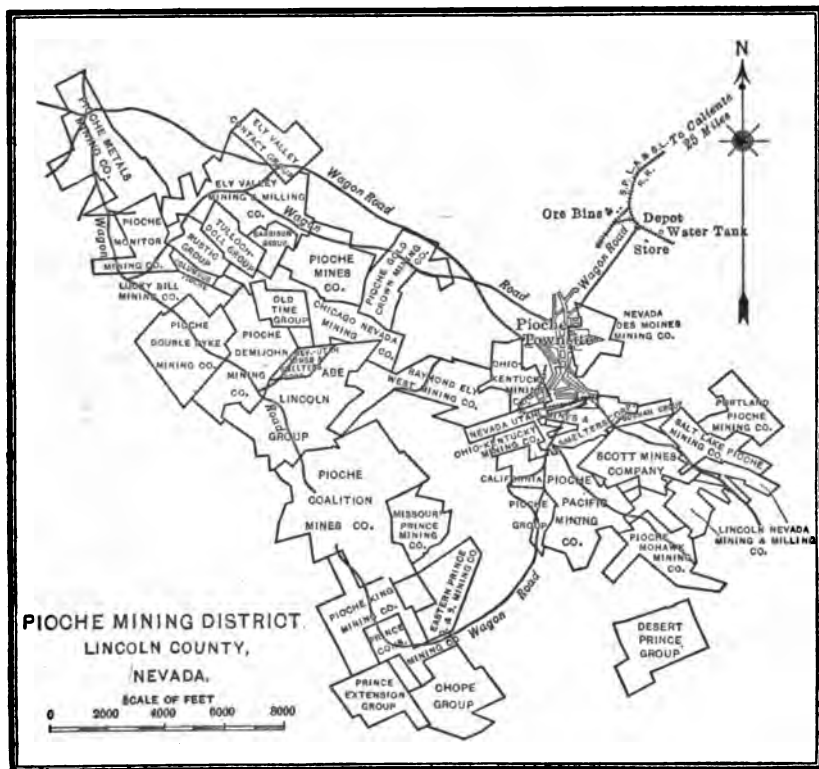
ATKINS KROLL CO.**NEVADA**

Address: 311 California Street, San Francisco, Calif. Company owns directly and leases and controls through subsidiary companies a number of operating tungsten mines in Nevada and elsewhere.

ATLANTA-HOME GOLD MNG. CO.**NEVADA**

Suite 3249, No. 120 Broadway, New York City. Mine office: Atlanta, Lincoln Co., Nev.

Officers: F. R. McNamee, pres.; E. B. Bronson, v. p.; M. Justice, sec.; E. M. Bray, treas.; preceding officers, R. W. H. Smith, and H. A. Geisendorfer, directors. J. J. Stumenbord, supt.



Inc. 1915, in Delaware. **Cap.**, \$2,500,000; shares \$5 par; non-assessable; outstanding 500,000 shares. Security Transfer & Register Co., 66 Broadway, New York City, transfer office. Company was organized to take over the holdings of the Atlanta Cons. Gold Mng. Co.

Property: 11 claims, patented, 180 acres, at Atlanta, Lincoln Co., 47 miles northeast of Pioche, show a contact deposit between porphyry and limestone, that is said to average from \$2 to \$4.50 per ton in gold, and is 50' to 80' wide, proven for a length of 300' and depth of 200'. Ore reserves claimed to be 320,000 tons.

Development: two shafts sunk 300' apart, with drifts and crosscuts totaling 1,600'.

Equipment: includes a steam hoist and compressor. Company plans

continuing shaft sinking to 500' level and also building a cyanide plant. Reports on property have been made by Paul W. Meyers, Geo. Kislingbury and Kirby Thomas.

BRISTOL CONSOLIDATED MINES & SMELTING CO. NEVADA

Frank Sullivan Smith, 60 Wall Street, New York, receiver.

Company originally owned 21 or more patented claims in the Bristol mining district, Pioche, Lincoln Co., Nev. In 1911 practically all this property was transferred to the Day Bristol Cons. Mines Co. In 1914 the latter company went into receivers' hands and the property finally passed to the Cons. California-Nevada Co., which company was recently merged with the Internat'l & Intercontinental Mng. & Ref. Co., holding company (Uvada Copper Co., operating company), which see.

CHEROKEE CONSOLIDATED COPPER CO. NEVADA

Officers: D. W. Jeffs, pres.; W. P. Silver, v. p.; R. T. Thurber, sec-treas., the preceding with M. E. King and R. A. Brown, directors, all of Salt Lake City.

Property: four patented claims and a mill site in Lincoln county, Nev., 30 miles south of Caliente and six miles east of Leight Station on the Salt Lake Route.

Development: three shafts, 150', 90' and 250' in depth.

Company recently organized, July, 1917.

CONSOLIDATED CALIFORNIA-NEVADA MINING CO. NEVADA

Office: 40 Cedar Street, New York, and Pioche, Nevada. Geo. W. Bent, former supt. In receivers' hands.

Inc. 1915, to take over the Day Bristol properties, bought in by bondholders' committee at sheriff's sale in 1915. Company started work at Gypsy mine with 50 men, and shipped 800 tons copper-silver ore in November, 1915, deepening Gypsy shaft, and installing engine, hoist and compressor at Hill-side and Tempest shafts. Company had 8,300' rope tramway in operation.

In Feb., 1916, owing to inability to ship ore already mined and to secure funds from sale thereof, mines closed down and company went into receivers' hands.

The International & Intercontinental Mng. & Ref. Co., inc. 1916 as holding company, with the Uvada Copper Co. as operating company, were formed to operate the properties. (See two companies named.)

CONSOLIDATED NEVADA-UTAH CORPORATION. NEVADA

Office: 63 William St., New York. Mine at Pioche, Lincoln Co., Nev., and Frisco, Beaver Co., Utah.

Officers: Chas. H. Clarkson, pres.; Victor I. Cumnock, treas.; Wm. F. Roberts, sec.; Jos. W. Kay, F. A. Dillingham, W. J. Palmer, Wm. B. Randall, directors. H. R. Van Wagenen, mgr.

Inc. 1913, in Virginia. **Cap.** \$6,000,000; shares \$3 par; issued \$3,936,396; in treasury, \$1,163,604; reserved for bond conversion, \$900,000; authorized bond issue \$90,000, 1st mtg., 6%; issued, \$499,867.

Company is a reorganization of the Nevada-Utah Mines & Smelters Corporation, which went into bankruptcy in 1912 and whose holdings were sold under judgment proceedings for \$100,000 to the new company. Stockholders in the old company who subscribed 50 cts. in cash for each share held and deposited their old stock, received bonds for the cash paid by them and 200 shares of stock in the new company for each \$100 subscribed.

Property: 3 groups of mines, owned through control of subsidiary companies; the Pioche group at Pioche, including several productive mines that are largely developed; the Imperial group at Frisco, including the Comet mine and the Last Chance at Bingham, Utah.

The Pioche property is operated by the Amalgamated Pioche Mines &

Sm. Corp'n, of which Mr. H. R. Van Wagenen, of Trippe & Co., is president; 60% of the stock is owned by the Consolidated Nevada-Utah. The Amalgamated Pioche group comprises 38 claims, 33 patented, also 51 town lots and 1,528 acres miscellaneous lands. The mines at Pioche (formerly owned by the Pioche Con.) include silver-lead properties that were large producers, 1870 to 1876, and suspended operations 1899, being popularly credited with a past production of \$20,000,000 gross, which probably is a high estimate. The May Day mine of this group has a 1,100' shaft and there are 2 shafts on the Yuba mine adjoining. The Meadow Valley claim has a 400' three-compartment incline shaft. The old Independence shaft is said to show a 40' body of sulphide ore between the third and fourth levels.

Development: to March, 1915, consisted of 800' of crosscuts and drifts on the 1,400' level with stopes on the 1,200, 1,300 and 1,400' levels. About 20,000 tons milling ore blocked out between these levels.

Production: for 13 months ending June, 1915, was 4,199 tons zinc ore and 158 tons lead ore shipped to smelter and 13,200 tons milling ore on dumps. Ore shipped assayed 40% zinc, 25 oz. silver, with some gold and lead values averaging \$26 per ton. A new contract was made with the U. S. Zinc Co. for purchase of ore and concentrates after July 1, 1915.

In Oct., 1917, company was actively prospecting at N. 1 mine, a new station being cut on the 420' level to facilitate development N. and E.

The high-grade silver lead ore found by the Greenwood leasers makes this work advisable.

The mill is still idle, awaiting the actual blocking out of a substantial tonnage of ore.

Equipment: includes 700' Leschen aerial tramway, steam power and 4-drill air compressor. New mill put in commission April, 1916, treating 50 tons daily.

Other Property: company also owns several other groups. The Half Moon group of 6 claims, 42 acres, lies 1½ miles west of Pioche. It is understood to be the policy of the new company to lease the upper levels and develop the deeper workings itself. The Telephone claims and parts of Imperial Group are operated by lessees on a royalty basis.

The Jack Rabbit group is connected with the Pioche by a 20-mile narrow-gauge railway, and Pioche is connected with the San Pedro railroad by a 28-mile branch line known as the Caliente & Pioche, completed 1907.

Company owned 48% of the stock in the Day and Bristol mines, formerly operated by the Day-Bristol Cons. Mng. Co.; this property was sold at receiver's sale in 1914 for \$99,200 (see Uvada Copper Co.) and the Cons. Nevada-Utah Co. decided to lose their holdings rather than expend \$150,000 on an unproven property.

The Imperial group, near Frisco, Utah, is a copper property formerly owned by the Imperial Gold & Copper Mining Co. It was purchased at a judgment sale by the old Nevada-Utah to satisfy its claim of \$100,000 against the Imperial Co. Developed by tunnels showing carbonate ores. The Comet mine, belonging to the Nevada-Utah Mining Co., a single claim, adjoining the Cactus, is said to carry a continuation of the Cactus orebodies of the Newhouse Mines & Smelters Co. The mine has a single shaft of 300' depth, sunk on gossan carrying about 1% copper. The adjoining Cactus mine is opened by a 6,000-ft. tunnel and the development of the Comet would necessitate an even longer tunnel or an extensive aerial tram.

The Consolidated Co. also owns all the capital stock of the Pioche-Pacific Railroad Co., and all the capital stock of the Manhattan Copper &

Gold Mining Co., comprising the Manhattan group of 7 unpatented mining claims in the Highland mining district about 10 miles westerly from Pioche, and the Half Moon and Telephone claims, in the Ely mining district, Lincoln county, Nev.

Company controls, through ownership of 309,962 out of 600,000 shares, the Ohio Kentucky Cons. Mining Co., whose sole assets consist of 200,000 shares of Amalgamated Pioche Mines & Smelters Corp'n.

DAY BRISTOL CONSOLIDATED MINES CO.

NEVADA

Property sold Jan., 1915, and transferred to Consolidated California-Nevada Mining Co., which after a brief struggle, went into receivers' hands. The Day-Bristol mine then passed into the possession of the Uvada Copper Co. (operating company for the International & Intercontinental Mng. & Ref. Co., holding company), which see.

DEMIJOHN CONSOLIDATED MINING CO.

NEVADA

Offices: 410 Savings & Trust Co. Bldg., Salt Lake City, Utah. Mine at Pioche, Lincoln Co., Nev.

Officers: Fred W. Price, pres.; J. Thomas, v. p.; W. M. McCrea, sec-treas.; with Owen A. Bailey, F. E. Parish, O. P. Soule, directors. Chas. H. Gitsch, supt.

Cap., 1,000,000 shares; 10c par; assessable; 16,470 shares in treasury, April, 1916. Listed in Salt Lake City.

Property: 9 claims, 7 patented, 2 miles W. of Pioche, said to show lead-silver-gold ore. The ore is making into the lime from the hanging wall of a fissure 40' wide and varies from 1"-2' in thickness. A selected sample assayed 52% lead, 80 oz. silver and 0.12 oz. gold. The main vein traversing the property has a N.-S. strike and dips to the E. Mineralization, though persistent, is not in commercial quantity, save in narrow streak noted.

Development: 300' shaft, drifts, crosscuts and winzes to the 500' level.

Equipment: hoist, air compressor and all necessary machinery. Small shipments made in 1915. Company plans diamond drilling from 500' level to test ore zone along Yuba dike, at greater depth.

EASTERN PRINCE GOLD & SILVER MINING CO.

NEVADA

Cap., \$100,000; shares 10c par. Listed on Salt Lake Exchange. Owns 8 claims adjoining Prince Consolidated in Ely mining district, Pioche, Lincoln Co., Nev. Believed to have extensions of the Prince Consolidated low-grade, iron-manganese deposits, carrying a little silver, lead, zinc and gold.

E. & F. MINING CO.

NEVADA

Idle. Address: care Walker Bros. Bank, Salt Lake City, Utah. Mine office: Pioche, Lincoln Co., Nev.

Officers: A. C. Ellis, Sr., pres.; A. Levy, sec.; Walker Bros. Bank, treas. Arthur Murphy, mgr.

Inc. March 17, 1902, in Utah. Cap., \$100,000; shares 50 cts. par; assessable.

Lands: 12 claims, 11 patented, 240 acres, in the Bristol and Jackrabbit districts, 1½ miles from a railroad. Mine has a 450' incline shaft and 2 tunnels, one of 350', with several hundred feet of lateral workings.

Equipment: includes a 25-h. p. gasoline hoist and necessary mine buildings. Mine produced a little copper ore, with excess of iron, but was shut down 1907. Development work in lower tunnel resumed in 1914 and shipments of ore on dumps, said to run \$20 per ton, planned, 1916. No recent returns.

GROOM SOUTH END MINING CO.

NEVADA

Address: Groom, Nev.

Officers: W. Armstrong, pres.; C. Osborne, v. p.; T. J. Osborne, sec.-treas.

Property: 1 claim in Groom district, 100 miles S. W. of Pioche, Lincoln Co., Nev. In 1916 the output was 1,500,000 lbs. of lead and 25,000 oz. of silver ore, hauled 60 miles by tractor.

Prospects considered good.

HAMBURG MINES CO.

NEVADA

Office: 1118 Newhouse Bldg., Salt Lake City, Utah. Mine at Pioche, Lincoln Co., Nev.

Officers: M. C. Godbe, pres.-mgr.; J. R. Cook, v. p.; J. T. Osborne, sec.; John Pingree, treas.; above with A. H. Godbe, W. H. Pitts and Alex Lloyd, directors. M. M. Johnson, cons. engr.

Inc. June, 1916, in Nev. **Cap.**, 1,000,000 shares; 20c par; 800,000 issued.

Dividends: first dividend of 1c paid March 2, 1917; third paid May 21, 1917, making \$24,000 to date.

Property: 4 claims, 1 patented, 40 acres, in Pioche mining district, Lincoln Co., Nev. Claims show gold-silver-lead ore occurring in quartz filled fissures. Veins vary from several inches to 5' in width and are cut by several N. S. faults.

Development: by 650' tunnel with 100' raise.

Production: 10 carloads of ore shipped in 1916 netted \$8,475. Ten carloads shipped to April, 1917, netted \$14,058.

HILLSIDE COPPER CO.

NEVADA

See Bristol Cons. Mines & Sm. Co.

HOME RUN COPPER CO.

NEVADA

Office: 1118 Newhouse Bldg., Salt-Lake City, Utah. Mine in Bristol mining district near Pioche, Nev.

Officers: M. C. Godbe, pres.; E. S. Woodward, v. p.; H. F. Earle, sec.-treas.; preceding, with A. H. Godbe and Henry Sadler, directors. W. H. Pitts, supt.

Inc. 1912. **Cap.**, \$100,000; shares 10c par. Listed on Salt Lake Exchange.

Property: 8 claims, 3 fractions, 180 acres, 9 miles from railroad, adjoins the Gypsy mine and is said to carry same fissures. Claims show fissures in limestone expanding into replacement deposits and caves carrying rich copper ores with gold and silver values. Development in 1916 on the 65' level said to have opened up a 5' vein of copper ore.

Company also owns Bristol mine.

Development: by 225' shaft with levels at 65', 90' and 150' opening up caves, showing 1,500 tons of ore containing 8.25% copper and 40 to 200 oz. silver.

Equipment: includes gasoline engine, hoist, compressor and necessary buildings.

No 1917 returns, as company's secretary does not answer letters.

INTERNATIONAL & INTERCONTINENTAL

MNG. & REF. CO.

NEVADA

No recent returns securable. **Office:** 60 Wall St., New York City.

Officers: Raoul Madero, pres.; Wm. W. Wilson, v. p.; D. T. Gately, sec.-treas.; with C. C. Graham, A. W. Middleton, Antonio G. Garializo and Wm. H. Hull, directors; Edward M. Brement, treas.

Inc. Feb. 26, 1916, in Del. **Cap.**, \$3,000,000; shares \$5 par; outstanding, 537,500 shares; 62,500 reserved for conversion of bonds. Stocks transferred at company's office. Metropolitan Trust Co., New York, registrar. Listed on New York Curb.

Bonds: \$125,000 ten-year, 8% convertible debenture coupon, dated March 1, 1915, due March 1, 1926. Int. payable quarterly, March, June

Sept. and Dec. 1. Company is a holding company, the Uvada Copper Co. being the operating company.

Balance sheet of March 24, 1916, shows assets of \$3,124,671, which includes: accounts receivable, due from Cons. Calif.-Nev. Co. stockholders and claims against Cons. Calif.-Nev. Co., \$29,082; contract rights, \$1,617,835 (under contract International is entitled to receive 304,757 shares out of 600,000 shares outstanding of the Uvada Copper Co. stock); investment in capital stock of the Cons. Calif.-Nev. Co., \$1,476,215; cash, \$723; organization expense, \$816. Liabilities include: contract liability, \$84,545; notes payable, \$6,560; debenture bonds cffts., issued and reserved, \$33,566.

Reported in March, 1916, that "Negotiations are now pending with Francesco Madero for the purchase by this corporation of certain mining properties belonging to the former in Mexico."

F. C. Richmond, pres. of Uvada Copper Co., writing from Salt Lake City, Utah, 1916, says that he knows nothing of the I. & I. M. & R. Co.

MANHATTAN COPPER MINING & MILLING CO. NEVADA

Idle. Pioche, Lincoln Co., Nev. Company succeeded the Manhattan Gold & Copper Mining Co. and is owned by the Cons. Nevada-Utah Corporation, successor of the Nevada-Utah Mines & Smelters Corporation.

Property: 7 claims, one in the Ely mining district, developed by 120' shaft, showing manganese, iron, silver, lead ore. The other 6 claims are at Stampede Gap in the Highland district of Pioche and show small veins of silver-lead and copper ore. Developed by 130' shaft.

MENDHA-NEVADA MINING CO. NEVADA

Idle and probably dead. **Former address:** Commercial Bldg., Salt Lake City, Utah. **Mine office:** Pioche, Lincoln Co., Nev. T. J. Osborne, pres.; M. C. Godbe, sec.

Cap., \$1,000,000; shares \$1 par.

Property: is said to have produced \$500,000 under its former ownership. The mine is reported to have a vein 3 to 15' thick, averaging 6', practically vertical and showing silver and gold-bearing lead and copper ores on 700' level. Development is by a 900' incline shaft.

Letters returned, 1917.

NEVADA-UTAH MINES & SMELTERS CORP. NEVADA

See Consolidated Nevada-Utah Corporation.

PIOCHE-BRISTOL MINING CO. NEVADA

Address: Jos. J. Daynes, Jr., pres., 1542 S. Fifth St., E., Salt Lake City, Utah; John Stringham, sec.-treas.; Harry L. Parker, supt.

Inc. Feb. 19, 1916, in Utah. Cap., 1,000,000 shares; 5c par; 615,000 shares issued. Stock listed on Salt Lake Exchange.

Property: 6 claims, surveyed for patent, in the Jack Rabbit mining district, adjoining the Day Bristol, near Pioche, Lincoln Co., Nev. Claims said to show lead-silver-copper ore. Shipped 300 tons of ore 1915-16, reported to have netted \$15,000.

Idle 1917. Reorganization of board of directors imminent and mine development to be started soon.

PIOCHE METALS CO. NEVADA

Address: F. B. Cooke, treas., 1009 Newhouse Bldg., Salt Lake City, Utah. Company levied an assessment of 1c a share in March, 1915.

Property: at Pioche, Nev., has been shut down save for annual representation work.

PRINCE CONS. MINING & SMELTING CO. NEVADA

Office: 1118 Newhouse Bldg., Salt Lake City, Utah. **Mine office:** Pioche, Lincoln Co., Nev.

Officers: A. H. Godbe, pres.; G. F. Wasson, v. p.; M. C. Godbe, sec-gen. mgr.; John Pingree, treas.; with D. L. Wertheimer, directors. Jas. Quirk, supt.

Cap., \$2,000,000; shares \$2 par. Stock listed on Salt Lake Exchange. Annual report for 1915 shows total receipts, \$311,234, which includes cash on hand, \$119,650; profit from operations, \$158,544; notes receivable, \$12,923; expenditures amounting to \$154,465, included development, \$69,379; notes payable \$54,070; dividends Nos. 1-4, \$124,924. Net operating profit for the year was \$158,554.

Dividends: to Sept. 1, 1917, total, \$550,000; paid since July 1, 1915.

Property: 14 claims S. W. of Pioche, in Ely mining district, contains large orebodies of iron manganese, outcropping on surface for 800', having an aggregate thickness of 120', width of 500' and proven for a length of 1,200'. The ore occurs as large deposits in bedded planes of lime and shale and is reported to average 3-4% lead, 34% iron, 13% manganese, 3 oz. silver and some gold, 3% lime, 11% insol. and 14% silica, valued at from \$7.50 to \$9.50 per ton. Owing to large percentage of iron, the ore is especially valuable as a flux to the lead smelters, the iron commanding a bonus over the cost of smelting, with silver, gold and lead values coming in as a profit. From this source alone the ore yields \$3-\$4 per ton.

Company also owns the Pioche King group of 9 claims, and about 1,000 acres of patented land at Dry Valley and Bullionville, 12 miles from Pioche, said to contain 120,000 tons of tailings on dumps, showing 5.34% lead, 10 oz. of silver, 0.11 oz. gold per ton and estimated to average \$5 per ton profit. A 200-ton oil flotation mill was erected to treat these tailings in 1916.

The Prince mine is developed by 550' main shaft with several miles of drifts. A body of high-grade lead-silver sulphide ore, said to be 16' wide, is being prospected by diamond drilling on the 550' level and a 3-compartment winze sunk from this level to the 800' level. **Ore reserves:** estimated at approximately 1,000,000 tons.

Diamond drilling was underway, and in July, 1917, a hole put down from the 600' level cut sulphide ore assaying \$19.32 per ton. This work is to be continued to 2,000' depth.

Equipment: includes oil power, hoist, compressor and 9-mile standard gauge railway connecting with the Salt Lake Route from Pioche. Freight rate is \$1.75 per ton.

Shipping 12,000 tons of ore per month in 1916. Employ 80 men. Present management deserves credit for putting the mine on a dividend paying basis, with large ore reserves and \$100,000 cash surplus in less than 3 years, although present high prices are largely responsible for augmented earnings of company.

Monthly production is over 600,000 lbs. of lead and 25,000 oz. of silver.

SILVER COMET MINING CO.

NEVADA

Panaca, Lincoln Co., Nev.

Officers: E. D. Smiley, pres.-mgr.; F. W. Russell, v. p., 811 Center St., Boston, Mass.; M. J. Smiley, sec.; J. W. Baker, treas., with W. A. Burnett, directors, all of Boston, except E. D. Smiley.

Inc. Jan., 1913, in Nevada. **Cap.,** \$500,000; shares \$1 par. Annual meeting in July. Operating expenses for 1914-15 reported as \$30,000; no profits.

Property: 5 unpatented claims, 100 acres, in the Comet mining district, Lincoln Co. **Ore:** gold-lead-silver-tungsten, occurs in nearly vertical fissure veins in quartzite, said to assay \$30 per ton in gold, silver and lead. Developed by 145' vertical shaft, with 950' underground workings.

Equipment: includes a gasoline hoist and 50-ton mill completed in 1915;

the mill contains a crusher, rolls, Huntington mill and a Wetherill magnetic separator. Production was supposed to start in 1916.

UVADA COPPER CO.**NEVADA AND UTAH**

Address: M. M. Johnson, mgr., Pioche, Lincoln Co., Nev.

Inc. 1915 (by F. C. Richmond, pres., Richmond Machinery Co., 117 W. Second St., Salt Lake City, Utah) to take over property of the Day Bristol Cons. Mines Co. Company is the operating company of the International & Intercontinental Mng. & Ref. Co., which see.

Cap., \$600,000; shares, \$1 par; non-assessable.

Initial dividend of 1c a share paid, Sept., 1916, equal to \$6,000. Monthly dividends of 1c are now paid.

Property: 30 claims, 460 acres, 15 miles west of Pioche, includes the May Day, Hillside, Tempest, Gypsy, Vesuvius, National, Inman, Tempest, Oregon Short Line, Iron and Day mines. The Day mine comprises 5 claims on the opposite side of the mountain and was needed in order to drive a tunnel through the mountain, giving direct access to the railroad.

Ore is a mixed sulphide carrying silver, lead, copper, and some zinc, occurring in limestone cut by fissures.

Development: by 2 old shafts, the 700' Gypsy and 500' May Day, both out of commission in 1915. A shaft, being put in condition, July, 1916, will be the main working shaft and will be connected with the 500' level. Old workings exceed 10,000'. In 1916, new work included mining ore on the 300', 350' and 450' levels and sinking a winze from 500' to 630' level.

The future lies in the Bristol property, in which high grade ore persists to 500' depth.

Equipment: 4 hoists, 3 compressors, 5 oil-engines, 4 boilers (400 h. p. total), 2 mile aerial tram, machine shop, assay office, buildings, etc., complete.

Production: in 1916 was 11,000 tons of copper-lead-silver ore. Over 1,000 tons being shipped monthly in 1917, excepting during a period when the tramway was burned.

VIRGINIA-LOUISE MINING CO.**NEVADA**

Address: Pioche, Nev.

Property: a silver-lead and iron mine adjoining the Prince Consolidated. The Prince company, which has a large interest in the Davidson M. Co., had an option on control of the Virginia-Louise, but dropped the option after being convinced that the Davidson owned the orebodies of the Virginia-Louise by right of the apex law.

In July, 1917, the Davidson company was suing the Virginia-Louise, claiming the orebody in the latter property, while in September, the Virginia-Louise was suing the Prince Consolidated for trespass.

At last accounts, H. R. Van Wagenen, A. D. Knowlton, R. T. Walker, and E. H. Snyder were examining the ground for the Prince company. The quantity of ore at stake is considerable.

YUBA LEASING & DEVELOPMENT CO.**NEVADA**

Out of business. Formerly at Pioche, Lincoln Co.

LYON COUNTY*Yerington District***ALBANY COPPER CO.****NEVADA**

Idle. Mine: Morningstar, Lyon Co., Nev. John E. Lutz, pres., treas. and gen. mgr.; E. R. Tutt, v. p.; Wm. G. Williamson, sec.; Ulrich Keck, supt., at last accounts.

Inc. June 29, 1907, in Nevada. **Cap.**, \$200,000, shares 10 cts. par, non-assessable. Annual meeting, last Tuesday in November.

Property: 700 acres, with 400 acres miscellaneous lands, giving total holdings of 1,100 acres, 3 miles from a railroad, in the Buckskin district, showing 3 orebodies, carrying mainly nickeliferous malachite and melacnite, estimated by management to average 3.5% copper, 2% nickel, 0.2 oz. silver and \$2 gold per ton.

Development: includes 5 shafts, of 30', 37', 54' and 253' and 8 tunnels of 30' to 188' length, with total underground workings of 1,400'.

Equipment: includes a 15- h. p. gasoline hoist, good for 800' depth. No recent returns secured.

BLACK DIAMOND COPPER MINING CO. NEVADA

Idle. Address: care Wm. D. Thompson, pres., 524 Monument Sq., Racine, Wis. Mine near Yerington, Lyon Co., Nev. John W. Owen, v. p.; Louis W. Trankle, sec.; preceding officers, W. A. Kohmar and Adam I. Wood, directors.

Inc. April 9, 1907, in Nevada. **Cap.**, \$1,000,000, shares \$1 par; non-assessable; issued, \$621,700.

Property: 8 claims, patented, 4 miles east of Yerington, shows granodiorite carrying fissure veins of 4 to 9' width, one under development.

Development: several shallow shafts and 500' of tunnels. Principal work is on Diamond No. 2 claim, with a tunnel run to cut a considerable body of sulphide and carbonate ore shown on surface where average assays are about 3% copper.

BLACK ROCK MINE. NEVADA

Office: 526 Main St., Racine, Wis. Mine 6 miles east of Yerington, Nev. Property privately owned by Wm. D. Thompson, of Racine, Wis.

Lands: 3 patented claims, 52 acres, in Mason district, show 3 parallel fissure veins in quartz-monzonite, of which 2 of 6 to 10' average width, traceable 2,600', have shafts of 90' and 120', showing chrysocolla and chalcopyrite, bottomed in ore, said to give returns averaging 6%-7% copper per ton.

The property is to be equipped and active work started in 1917.

BLUE JAY MINE. NEVADA

Property: at Yerington, Lyon Co., Nev., consists of 3 patented claims showing prominent cropping zone of shattered granodiorite between two east-west faults. **Ore:** said to carry about 2% copper as chalcocite.

Development: by shaft with 465' drift on 100' level, cutting a body of 2% ore. Two cars of 15% ore from surface pockets have been shipped. New tunnel has not yet reached orebody.

Mine was under option, 1913, to Mason Valley Mines Co., and in 1916 to leasers, but both options were relinquished, "Refusal of Mason Valley smelter to accept ore is chief cause of property's idleness."

BLUESTONE MINING & SMELTING CO. NEVADA

Office: 43 Exchange Place, New York. **Mine office:** Yerington, Lyon Co., Nev. Capt. J. R. DeLamar, owner; W. O. Fletcher, sec.; Chas. A. Weck, supt. Is not incorporated.

Property: The Bluestone mine and a group of 20 claims adjoining the Mason Valley mine. The Bluestone is the oldest property in the district, claims having been patented previous to 1890. Mine has been opened to a depth of 540' and has about 6,500' of workings, including a 1,300' main haulage tunnel, cutting an ore shoot about 300' wide and 500' long at a point 300' below the apex. This shoot is said to carry an 80' paystreak of high-grade ore, ranging up to 20% in tenor, with balance of ore carrying 2.5% copper. Management estimates 1,600,000 tons of ore in sight, averaging 2.6% copper.

Ore is mainly chalcopyrite, associated with considerable epidote, in

a garnet-limestone gangue, there being practically no oxidized ores, even at the outcrop. Ore is uniform in character, and after a light roast is well adapted to magnetic separation. Drill holes prove that ores extend to 750' depth.

Equipment: includes a 50 h. p. hoist and a 35-drill electric air-compressor. A 100-ton mill pulverizes the ore, in rolls, to pass an 8-mesh screen, after which ore is slightly calcined in a tower roaster, to magnetize the pyrite. Roasted ore is then passed through a Wetherill magnetic separator, which takes up the mineral, and discharges the waste, giving a concentrate of about 15% copper. Magnetic separation is claimed to have given a 96% extraction, though 85%, under working conditions, will be satisfactory.

Company built 2½ miles of railroad from Mason to the mine, 1916.

The magnetic concentrating plant ran in 1916 and the furnace was enlarged. Company spent \$250,000 in development and equipment of property. Management is able and property considered valuable.

Production: about 600 tons daily, early in 1916, increased to 1,000 tons, 1917, shipped to Mason Valley smelter.

BURLINGTON-NEVADA COPPER CO.

NEVADA

Address: Yerington, Lyon Co., Nev. Property at Mason Pass, a few miles from Yerington, is developed by a 100' shaft, from which ore was shipped to the Mason Valley smelter, 1913. Equipment includes a gasoline hoist.

BUTTE & YERINGTON COPPER CO.

NEVADA

Office: care W. E. Wright, sec.-treas., 410 Phoenix Bldg., Butte, Mont. Mine at Yerington, Lyn Co., Nev. W. C. Siderfin, pres.; D. C. Bard, v. p.; preceding officers, Dr. Thos. B. Moore, Dr. Donald Campbell, John D. Pope, and Wm. Mitchell, directors; L. W. Trankle, supt.

Inc. Jan. 29, 1907, in Montana. **Cap.**, \$1,000,000, shares \$1 par, fully paid; issued, \$351,520. Annual meeting, third Wednesday in January.

Property: 2 groups of patented claims, one of 14 claims, about 4 miles east of and across the valley from Yerington and south of the Copper Mountain mine. The land has very attractive surface showings, but is without deep development work.

The second group of 9 claims, is in the heart of the camp adjoining the big Mason Valley mine and the Yerington Malachite Co.'s ground. This property is well located and has attractive showings of ore in the tunnels and on the surface outcrops. It has been idle during the past two years.

DAYTON PLACER RECOVERY CORPORATION

NEVADA

Office: E. N. Greenleaf, 609 Kearns Bldg., Salt Lake City, Utah.

Officers: G. T. Hansen, pres.; B. Binnard, v. p. and treas.; E. B. Critchlow, sec.; above, with D. C. McIntyre, directors. G. W. Wood, cons. engr.

Inc. June, 1916, in Utah. **Cap.**, \$500,000; \$1 par; 435,000 issued.

Is treating mill tailings at Dayton, Nev., and making a 90% gold, 80% silver and 50% mercury extraction.

Management estimated 500,000 tons of tailings available with average assays of \$1.50 gold, 3¼ oz. silver and 3 lbs. mercury, or about \$7 per ton. Total cost per ton estimated at \$1.25.

Equipped with 150-ton all slime cyanide mill. Started operations in Aug., 1917.

EMPIRE-NEVADA COPPER MINING & SMELTING CO.

NEVADA

Mine near Yerington, Nev. Wm. Gelder, pres.; G. B. Garrison, sec.

Inc. in Arizona. **Cap.**, \$5,000,000, shares \$5 par. General Development Co. is a small stockholder in this company.

Property: about 500 acres on Copper Flat in 2 groups: 1 about 1 mile W., the other 2½ miles N. W. of Yerington. **Ore:** occurs in bunches and disseminated throughout a body of monzonite-porphry, said to be opened for 3,000' in length and 1,000' wide, carrying copper in the form of silicates, carbonates and oxides, a considerable part of it averaging 2.65% copper.

Development: by 5 shafts, from 80 to 160' in depth, several tunnels and open cuts and also by diamond drilling. Mine is said to have produced about \$150,000 from surface workings. Shipped 6,000 tons of 6% ore to Mason Valley smelter, 1912, and 2,900 tons in 1914. Now making monthly shipments to the Mason Valley smelter at Thompson, Nev. Six sets of lessees working in 1916. Property has small smelting plant, assay office, hoist, boarding house, etc.

No returns, 1917.

HONEST ENDEAVOR MINING CO.

NEVADA

Office: F. D. Goodale, sec.-treas., Central Savings Bank & Trust Co., Denver, Colo.

Officers: B. W. Wooding, pres.; Elmer Hoff, v. p.

Inc. 1907, in Ariz. **Cap.**, \$2,500,000; shares \$1 par.

Property: is under a 5-year lease to Harry J. Newton, of "Dollars & Cents" fame, 323 Denham Bldg., Denver, Colo. Leasing company is reported to be capitalized for \$500,000, and has option to purchase property at \$50,000.

In Feb., 1917, shares were peddled at 5c each with positive assurance of a 50% advance by March, 1917, and another jump to 10c by April.

Property: 11 claims in Buckskin district, west of and across the valley from Ludwig, the railroad terminus, and 1½ miles from Buckskin, in the Yerington district.

Development: by 300' shaft and drifts said to open up 2 veins, showing 2' of sulphide ore with commercial values.

Equipment: includes hoist, compressor, etc.

In our opinion a mine that has not made good in ten years time is worth investigating thoroughly before investing in its stock. Literature sent out by the promoter moreover is most unfavorably regarded. Report by F. H. Colpitts, "E. M.," on the property would be a joke, if it were not intended to draw money from ignorant investors.

LUDWIG MINE.

NEVADA

Owned by Nevada Douglas Copper Co., at Yerington, Lyon Co., Nev. **MASON VALLEY-BLUESTONE EXTENSION MINES.** NEVADA

Address: Salt Lake City, Utah. **Mine office:** Yerington, Nev.

Officers: C. W. Reese, pres.; A. G. Gutheil, v. p.; G. M. Sullivan, sec.; H. C. Jex, treas.; with O. P. Soule, W. E. Evans, and Henry Barney, directors.

Inc. in Utah. **Cap.**, \$100,000; shares, 10c par; 500,000 shares held by Trustee. Is a reorganization of the Mason Valley Extension Mining Co.

Property: 48 acres, 200 patented, in Mason district, Lyon Co., Nev.

Geology: principal formations are limestone, porphyry, and granodiorite, the ore occurring in crushed limestone.

Development: by 350' shaft. Management hopes to find the same ore zone as in the Mason Valley and Bluestone mines, which are yielding 500 tons daily, 1917.

MASON VALLEY MINES CO.

NEVADA

Office: 14 Wall St., New York. **Mine office:** Thompson, Lyon Co., Nev.

Officers: W. H. Aldridge, pres.; Frank W. Holmes and E. O. Holter,

v. p's.; H. F. J. Knobloch, sec.; Henry E. Dodge, treas.; preceding with John F. Alvord, W. Mont Ferry, C. A. Corliss, and C. A. Ayer, directors.

Inc. Jan. 4, 1907, in Maine. Cap., \$2,500,000; shares \$5 par; increased March 14, 1910, from \$1,000,000, shares \$1 par; issued \$2,500,000. Bonded debt is \$869,500 in authorized \$1,000,000 first mortgage 10-year 6% gold bonds, in \$500 bonds convertible previous to April, 1915, into stock on the basis of \$10 per share and redeemable on 31 days' notice at 102½ and accrued interest.

The mortgage contains a sinking fund provision, by which the company is required to pay to the trustee within 60 days after Jan. 1, each year, beginning 1912, 20c for each net dry ton of ore treated during the year preceding, with a provision whereby the sinking fund payments may be reduced proportionately, as outstanding bonds are retired. The directors were authorized by vote of shareholders, March 14, 1910, to issue any part of the unissued stock for acquisition of additional property.

Guaranty Trust Co., New York, and United States Trust Co., Boston, registrars. Bankers Trust Co., New York, and Boston Safe Deposit & Trust Co., transfer agts. Shares listed on Boston Stock Exchange.

Annual report of Dec. 31, 1916, gave cash on hand \$270,742, and total current assets \$387,726, with current liabilities \$50,620. The report shows a deficit of \$71,762 for 1916, which deducted from the surplus, leaves a net credit to that account of \$264,466.

Property: 7 claims, patented, 140 acres, and a fractional claim of 10 acres, known as the Spragg mine, lying south of the Bluestone and about 1½ miles west of Mason. Company also owns a smelter and 1,320-acre smelter site near the railway.

The Gray Eagle property, 14 patented claims, 256 acres, near Happy Camp, Siskiyou Co., Cal., was acquired in Sept., 1916, for 144,250 fully-paid Mason Valley shares, said to be worth \$721,250. The title to the property is in the name of the Gray Eagle Copper Co. (which see), all of which shares are held by Mason Valley. Options on claims nearby have been secured. In 1912, Henry Krumb estimated ore reserves as 450,000 tons, averaging 4.64% copper and \$1 gold per ton. In 1916, O. R. Whitaker estimated as follows:

	Tons	Copper, %	Gold, Oz.	Silver, Oz.
Chalcopyrite.....	440,000	4.68	0.50	0.12
Semi-oxide.....	50,000	5.00	0.06	0.20
Mineralized walls.....	600,000	1.13	0.025	Trace

The mine is to be further developed. Transportation facilities are lacking, and means must be provided to get the ore to the smelter, presumably that of the company in Nevada. W. Koerner is superintendent of the Gray Eagle.

Nevada Property

Geology: strong outcrop of deposit between limestone and andesite, partly covered by rhyolitic tuffs. The latter rocks are comparatively soft and have been eroded into steep escarpments and sharp gulches. Ore is of contact metamorphic character, being in altered limestone of 30 average width. Surface ore shows malachite with a little cuprite, succeeded, at about 100' depth, by cupiferous pyrite, largely massive, with copper in the form of chalcopyrite. The mine is said to have some ore averaging 10% copper, but the average tenor is about 3.5% copper. An average analysis shows 16 to 17% iron, 16 to 18% lime, 12% sulphur and 38% silica.

Development: has been done by means of crosscut tunnels driven from the surface to the ore bearing zone. Drifts have been run N. and S. follow-

ing the general course of the orebodies. Crosscuts have been extended E. and W. from the main drifts. The workings reach a depth of about 550'. The mine has been worked by the shrinkage stope system and good results have been obtained by this method.

The mine has developed a very considerable tonnage of low-grade carbonate and sulphide ores, with a smaller quantity of high-grade ores. Actual development work was begun March, 1907, and workings aggregated 23,107' on Dec. 31, 1914.

A 6,250' tramway, with drop of 600', of 100 tons hourly capacity, connects the mine with the Nevada Copper Belt railway, which line connects with the company's smelter 16 miles distant.

The smelter, built at a cost of approximately \$600,000, is about 2½ miles from Wabuska, on the Southern Pacific railway and about 16 miles from the mine. The plant consists of a sampling mill for custom ores, extensive storage bins, a blast-furnace building, with two furnaces of 1,800 tons daily capacity, a sintering plant, power house, machine shop, plate shop, smithy and carpenter shop. Two stands of 12' converters of the Great Falls type, were installed, 1913.

The smelter was blown in Jan. 16, 1912, and one furnace was in continuous operation to Oct. 20, 1914; during that period 290,586 tons of ore from the company's mine and 321,288 tons of custom ore were smelted from which there were produced 39,787,987 lbs. copper, 22,392 oz. gold and 392,304 oz. silver.

Custom smelting was almost entirely discontinued in August and September, 1914, and economic conditions making it inadvisable to operate upon Mason Valley ore alone, the plant was closed down in October, 1914. Smelting operations were resumed Feb. 13, 1917; and the second furnace put in operation in March.

Statement for 4½ months' operations to June 30, 1917, at the smelter in Nevada shows a gross profit of \$342,215, and \$244,601 net. Ore smelted was 50,645 tons of Mason Valley and 80,666 tons of custom ore, yielding 5,822,130 lbs. copper, 436 oz. gold, and 21,345 oz. silver.

If properly managed company should become a steady dividend payer, as it has a good plant, strategic location and owns a good mine.

MASON VALLEY EXTENSION MINING CO. NEVADA

Re-organized under name of Mason Valley-Bluestone Extension Mines, which see.

MASON-YERINGTON MINES CO. NEVADA

Re-organization of the Utah-Yerington Mines Co.

Office: 1014 Boston Bldg., Salt Lake City, Utah. Mine office: Mason, Nev.

Officers: C. W. Reese, pres.; A. G. Gutheil, v. p.; G. M. Sullivan, sec.; H. C. Jex, treas., with S. McCroskey, C. J. Guild and Ross Thompson, directors.

Inc. in Utah. Cap., \$1,000,000; 500,000 held by trustee.

Property: E. of the Mason Valley Mines Co., property in Mason district, Lyon Co., Nev., said to show 42" of silver, gold, lead, copper ore said to assay over \$55 per ton in June, 1917. Ore occurs in limestone.

McCONNELL MINES CO. NEVADA

Office: c/o O. H. Sonne, pres. Yerington, Nev. Mine office: Mason, Lyon Co., Nev.; S. B. Elbert, sec. and mng. engr.; preceding, Mrs. O. H. Sonne and Mrs. S. B. Elbert, directors.

Inc. Sept 14, 1912. Cap., \$500,000; shares \$5 par; issued, 40,002 shares.

Property: 10 claims, 160 acres, patented, adjoining the Yerington Malachite mine on the west. Claims show limestone, shale and granite

with argentiferous contact deposits in the contact zone near the granodiorite. Property has 4 orebodies, 2 under development averaging 25' in width and carrying about 3.5% copper.

Development: by 400' shaft and 3 tunnels. **Equipment:** includes a 25 h. p. hoist, 7-drill air compressor and 8 buildings.

Production: 1912, was 1,074,289 lbs. fine copper, secured from 16,284 tons of ore smelted and at a total cost of about 14 cts. per lb. No later information received. Property regarded as good.

MINNESOTA-NEVADA COPPER MINES CO.

NEVADA

Address: Otto Taubert, Yerington, Nev.

Formerly the Wabuska Copper Mines Co. Near Wabuska, Lyon Co. Nev.

Property: the Minnesota group, 18 claims, 16 miles from Yerington, said to show a contact deposit, between limestone and granite, of about 20' average width, carrying sulphide ore assaying 1 to 30% copper.

Development: by 2 shafts, 1 of about 500' depth, showing ore said to average better than 3% in copper tenor.

Reported in Aug., 1917, that company was developing a large iron-ore deposit, and proposed erecting blast furnaces for pig-iron production at either Reno or San Francisco.

MONTANA YERINGTON COPPER CO.

NEVADA

Yerington, Lyon Co., Nev. **Property:** a group of claims said to show orebodies in porphyry with 4-7% copper, unlike other Yerington deposits.

Development: 420' shaft. The 160' level east was run 500' to daylight, making a main working tunnel. Crosscut on 400' level said to encounter ledge 6-7' thick, showing shipping ore in face. Under option to Geo. Wingfield, Goldfield, Nev., 1913, and Mason Valley Mines Co., in 1914, but was relinquished. Is being worked by Messrs. Archer, Ehrman and Kremmel, who control the company.

Ore Reserves: estimated at 15,000 tons containing 3% copper. Shaft shows chalcopyrite ore at bottom.

Output in 1916 was 2,050 tons of 6% ore.

NEVADA BONANZA COPPER CO.

NEVADA

Main office: 159 Main St., Salt Lake City, Utah. Mine at Morningstar City, Lyon co., Nev.

Officers: Freeman Morningstar, pres. and gen. mgr.; Sereno B. Tuttle, v. p.; Fred C. Dern, sec.-treas.; Walter C. Tuttle, asst. sec.-treas.; preceding, with Robt. J. Deighton, H. P. Clark, W. D. Mathis, Thos. J. N. Nippur, M. S. Woolley and P. L. Williams, directors.

Inc. 1906. **Cap.** \$2,100,000; shares \$1 par; issued, 1,448,000 shares.

Property: 12 claims, 7 patented, 250 acres, adjoining the Nevada Douglas ground, about a third of a mile from Ludwig, on Nevada Copper Belt railroad, in the Yerington district. J. C. Dick, E. M., of Salt Lake City, reports 3 fissure veins crossing property; the Green Dutchman vein being about 5' wide and assaying well in gold and copper. The vein on the Copper King claim has been developed by a 3-compartment, 115' shaft, said to show copper ore its entire depth.

Property is still in the prospect stage, but further development is expected to make it a mine.

NEVADA-CALUMET COPPER MINING CO.

NEVADA

Out of business. Mine owned by John L. Washing, Box 13, Bridgeport, Conn.

NEVADA-CALUMET MINE

NEVADA

Address: John L. Washing, Box 13, Bridgeport, Conn.

Lands: 17 claims, patented, 340 acres, 4 miles N. E. of Buckskin and

8 miles N. W. of Yerington. Property shows diorite, porphyry and silicious limestone, and has 3 contact deposits, 3-4' wide, showing cuprite, malachite, azurite, chalcocite and chalcopyrite, giving assays of 2-4% copper.

Development: by 2 main shafts, 1,200' apart, No. 2 on the Yellow Metal claims, 60' deep, shows 9' of 2.75% ore. About 300' of work on 400' level, and 225' of laterals on the 500' level, show small bunches and stringers of ore, in a leached zone, with fair indications of workable values at greater depth.

Equipment: includes two 25 h. p. Witte gasoline hoists, and a 20-room boarding house: Property reported on by T. M. Hammond and Arthur Prill.

NEVADA-DOUGLAS CONSOLIDATED COPPER CO. NEVADA

A. J. Orem & Co., 79 Milk St., Boston, Mass. General office: 222 S. W. Temple St., Salt Lake City, Utah. **Mine office:** Ludwig, Lyon Co., Nev.

Officers: A. J. Orem, pres.; James G. Berryhill, L. H. Curtis, vice-presidents; F. M. Orem, sec.-treas.; W. C. Orem, gen. mgr.; preceding officers, J. J. Corum, H. I. Moore, F. J. Curtis and J. G. Berryhill, Jr., directors; Archie J. Orem, gen. supt.; L. L. Turner, mill supt.; N. B. Whitzel, purch. agt., Ludwig, Nev.

Inc. March 4, 1915, in Utah. **Cap.**, \$5,000,000; shares, \$5 par; assessable; \$102,810 unissued. **Bonds**, \$2,000,000; \$299,100 outstanding. Federal Trust Co., Boston, registrar; State Street Trust Co., Boston, transfer agent. Stock listed on Boston Curb.

The company is a reorganization of the Nevada Douglas Copper Co. at the time of its consolidation with the Moore Mng. Co. The new company assumed liabilities of the old companies, \$525,000 of Nevada Douglas and \$57,000 of Moore Co. Nevada Douglas stockholders received share for share in stock of new company and the Moore Co. received 10,000 shares of stock. To date 7 assessments of 10c a share have been levied, the last one in June, 1916. The old Nevada Douglas Copper Co. paid a dividend of \$125,000 in 1913.

The report of the old Nevada Douglas Copper Co., Feb. 28, 1915, showed a property investment of \$4,670,152, exclusive of the Ludwig leaching plant, \$51,992; current assets, \$35,060; profit and loss, \$581,660; current liabilities, \$101,905; accrued liabilities, \$17,150; deferred credit items, \$367,548.

Report of Nevada Douglas Cons. C. Co., dated Dec. 31, 1916, shows receipts, \$451,438, of which \$438,883 was from ore sales. Expenses totaled \$158,294 for mining, \$40,443 for milling, \$47,062 for interest, depreciation, etc., \$66,895 for maintenance and general. Net income was \$139,931. Income for quarter ended, June 30, 1917, was \$41,122 net.

Balance sheet shows \$303,552 current working assets, less \$105,058 deferred debit items; and \$202,451 current liabilities, plus \$7,279 accrued (not due) less \$10,246 deferred credits.

Property: about 950 acres, with 2 mill-sites, 80 acres, and miscellaneous lands, including water-rights, giving total holdings of about 1,070 acres on the western slope of the Mason mountains. Lands include former holdings of the Ludwig Copper Mng. Co., the Douglas C. Mng. Co., which succeeded the Douglas M. & S. Co., the Nevada Douglas Copper Co. and the Moore Mng. Co. Holdings of the Nevada Douglas C. Co. consisted of 4 separate and distinct mines, the old Douglas mine, the Amalgamated group and the Casting Copper mine, being the original holdings of the company, and the Ludwig mine. Country rock consists of limestone

intruded by granodiorite with large contact orebodies and fissure veins. There is also one claim at Buckskin, 7 miles distant, which carries fluxing ore.

The Moore Mng. Co. owned the Moore group of claims, a prospect with about 450' of development work and "considerable oxidized ore blocked out in a way that it cannot be measured." Property of the old Western Nevada Copper Co., described in Vol. X, has been fully paid for by Nevada Douglas.

The Ludwig mine, about 1 mile N. W. of the Douglas, includes 2 claims, on which the mine is opened, and a 40-acre tract in Smith Valley, on which there is a well and pumping station. The Ludwig was opened 1865, and was a shipper for some years of small quantities of high-grade ore, production including some very handsome malachite and azurite, a portion of which was sold to lapidaries, and considerable bluestone was produced also for the mines of the Comstock Lode.

The ore occurs in a fissure vein with a white limestone footwall and a silicious limestone hanging wall, which changes to a garnetiferous limestone, heavily impregnated with sulphides in places. Where crushing has permitted surface waters to work downward, large bodies of carbonates and copper glance ores are found as replacements in the footwall limestone. The vein proper has an average width of about 30' and has been developed along its course for 1,300' and to a depth of 800' by levels, along hanging wall, every 100'. The orebody on the 700' level is 50' wide and 300' long and runs 6% copper. The shoots, or pipes, of high-grade secondary ore, running from 16 to 30% in copper, form chamber deposits in the limestone near the porphyry contact, proven down to 800' level. Ore reserves are estimated at 200,000 tons of 2% copper ore.

In addition to copper ore, the Ludwig has a very large deposit of gypsum, on the footwall, said to 3,000' long, 500' wide and 400' deep, which figures seem high. This deposit of gypsum is of commercial value, and some has been mined and shipped.

The Douglas mine is working a typical contact metamorphic deposit in which garnetized limestone carrying copper sulphides and their resultant oxidized ores occur in very irregular orebodies in limestone which have a tendency towards a horizontal rather than a vertical extension. The mineralized area is about 700' wide and 2,000' long with numerous parallel fissures which seem to control the mineralization. This mine has been developed by a main working tunnel and a deeper haulage tunnel with numerous crosscuts and drifts netting the property. The working tunnel, 4,290', has an average depth of 120' beneath the surface and the ore is in places continuous to the surface. Four 50' winzes show the downward extension of the ore. Claimed to have 75,000 tons of ore blocked out.

The Casting Copper mine shows a large area of garnet-epidote limestone constituting low-grade carbonate ore, which will be extensively mined. This mine has a vertical 350' shaft and a 500' tunnel. Claimed to have 100,000 tons blocked out. When shipments were being made to the smelter the ore averaged 5% copper as compared with 3% in the Douglas mine.

At the Amalgamated mine very little development work has been done, but the surface exposures indicate the existence of similar large contact metamorphic deposits.

Ore reserves: in all properties are estimated at 550,000 tons blocked out, and 2,000,000 tons partly blocked. A report says that "Engineers estimated probable ore several times the latter amount." Present ore carries 3% copper, with a fair quantity of high-grade material.

Property as a whole has about 8 miles of workings.

Equipment: includes four 100 h. p. hoists, good for 1,000' depth each, with a 52-drill Imperial air compressor. Electric current is taken from the Truckee River General Electric Co. Water is secured from artesian wells in Smith valley, brought to the mine by a 17,000' pipe line.

A 250-ton leaching plant, begun 1914, was in full operation September, 1917. The sulphide and oxidized ores are treated separately and by entirely different methods. The chief value in the process lies in the fact that not only the copper, but the iron and sulphur as well, are made use of as valuable marketable products, and that in the treatment of 50 tons of sulphide ore, enough sulphuric acid is obtained at an abnormally low cost to treat 200 tons of oxidized ores. This plant cost \$475,000, and is expected to treat ore at cost of \$1.25 to \$1.50 per ton.

A brief outline of the process is as follows: sulphide ores are submitted to an acid treatment under pressure in a closed receptacle, in which operation the sulphides of copper and iron are converted into the sulphates of the metals and taken into solution. This solution is then decanted off and passed through the electrolytic cells or over scrap iron, where the copper is removed. The remaining iron sulphate solution is then carried to an evaporating tower, where the water is evaporated off and the ferrous and ferric sulphuric crystals are allowed to crystallize out. These iron sulphate crystals are then introduced into a dryer and submitted to a temperature sufficiently high to drive off all the water of crystallization, after which the dried sulphates are submitted to a roast in the Wedge muffle furnaces; sufficient heat being applied to decompose the sulphates. The greater portion of the gases coming off in the form of sulphur trioxide, which is collected in the absorption towers and made into sulphuric acid to be used in the leaching of oxidized ores. The remaining residue of ferric oxide is then drawn off and prepared for market. The leaching of the oxidized ores is carried on in Pachuca tanks, where the ore is agitated with air and leached with the sulphuric acid obtained from the preceding sulphate roast. The solution is then decanted and passed through electrolytic cells, where the copper is taken out, after which the water is evaporated off and the sulphate crystals dried and roasted in the muffle furnace, as before outlined. The total cost per ton for mining and treating sulphide ores is \$5.18. As the general average of the ore to be treated is a little above 3% in copper, the ore will have a gross valuation of \$15 per ton in copper. The total cost of producing a ton of iron and sulphuric acid by this method should not exceed \$2, and with sulphuric acid at this price, oxidized ore running as low as 1% in copper can be treated at a profit.

Production: for 1916 was 11,135 tons of 7½% copper ore, sent to Utah smelters. Freight charges were \$8 per ton. Output in 1917 is 200 tons daily to the Thompson smelter, 250 tons to the leaching plant and 50 tons to Utah smelter, from which a total of nearly 17,000,000 lbs. copper per year is anticipated.

Employs 500 men.

If the leaching plant is a success it will prove the salvation of the company. The policy of handling the property has not met with favor in the East and as a result financing and development have been slow. Management is believed to be competent and making every effort to put property on a dividend basis. Estimated that \$1,000,000 has been spent on the property since 1912, of which \$475,000 went to the leaching plant, \$193,000 to offices, shops, buildings, etc., the remainder in development, new property, etc. The year 1918 should show the property's merits.

NEVADA PROGRESSIVE GOLD MINING CO.

Mine office: Wellington, Lyon Co., Nev.

NEVADA

Digitized by

Officers: C. M. Woodbridge, pres.; F. H. Woodbridge, sec.-treas.; J. G. Hudson, mgr.

Property: 400 acres mineral land and 600 acres miscellaneous land at Wellington, shows gold-silver-lead ore, said to assay from \$10-\$147 per ton. Developed by 2 shafts, 100' and 300' deep. At last accounts, June, 1917, mine was producing after being idle for some time. Property is 8 miles from Masonic, Lyon Co., Nev.

NEVADA QUEEN COPPER CO.

NEVADA

Idle. Office: 405 Mining Exchange Bldg., Colorado Springs, Colo. Mine near Yerington, Lyon Co., Nev.

Officers: Duncan Chisholm, pres.; John Matthew, v. p. and treas.; R. G. Riddett, sec.; preceding, with H. Hironemous and D. P. Randall, directors.

Inc. Oct. 5, 1906, in Colorado. **Cap.**, \$1,500,000; shares \$1 par; non-assessable; issued, \$1,107,350. Is operated as a close corporation. Annual meeting second Monday in October.

Property: 28 claims, patented, 467 acres, lying immediately north of the Nevada Douglas and Yerington Central Copper companies. Developed by shafts of 186' and 210', showing copper ore said to assay 1.5 to 28%. Management plans operating if arrangements can be made with the Nevada Douglas Co. to treat the ore in its leaching plant.

NEVADA UNION COPPER MINES CO.

NEVADA

Office: F. D. Goodale, 407 Central Savings Bank, Denver, Colo. **Mine office:** E. E. Hoff, supt., Yerington, Nev.

Officers: F. D. Goodale, pres. and treas.; Paul Esch, v. p.; M. H. Muller, sec., with Robert Kettmor, J. B. Braidwood and A. M. Goodale, directors.

Inc. in Colorado. **Cap.**, \$600,000; shares 10c cash; non-assessable; 3,500,000 issued.

Property: 12 claims, 200 acres, in Yerington district, Nev.

Development: by several shafts, one 120' deep, and some lateral work. The Union Blue is the principal vein, being described as a porphyry intrusion between diorite walls. At 120' depth, a drift opened 3' of 2% ore. Further sinking is to be done. On surface between a streak of high-grade ore and one of white talc there is said to be 32' of mineralized diorite porphyry.

Prospectus says that this looks like a sure winner and soon should be in the class of the big dividend payers, which is not evident from the facts so far known.

NEW YERINGTON COPPER CO.

NEVADA

Office: 1511 Walker Bank Bldg., Salt Lake City, Utah. **Mine address:** Yerington, Lyon Co., Nev.

Officers: Chas. N. Strevell, pres.; Joseph E. Caine, v. p.; W. B. Outcalt, sec.; J. H. Paterson, treas., with W. B. Outcalt, H. P. Clark, H. C. Edwards and W. H. Caine, directors; T. L. Walden, supt.

Inc. Aug., 1911, in Utah. **Cap.**, \$1,000,000; shares \$1 par; assessable, at rate not to exceed 1c for each 90 days. Listed on Salt Lake Stock Exchange. Is a reorganization of the Yerington Copper Co., whose stockholders received 1 share of new for 2 shares of old stock.

Property: 12 claims, 4 miles due east of Yerington, shows porphyritic granite cut by diorite dikes. There are 3 distinct, nearly parallel veins, 50 to 300' apart, following the dike contacts. The oxidized ores extend downward about 100' and are underlaid by enriched glance changing in depth to shoots of chalcopyrite and pyrite.

Development: chiefly on the middle, or Yerington vein by a 450' in-

cline shaft. The 250' level exposes an ore shoot 1 to 3' thick from which shipments have been made intermittently. The east drift shows a soft vein carrying a narrow shoot 3 to 5' thick of chalcopryrite ore in an altered gangue. The west drift shows another shoot of 8% ore. The Marsal 520' tunnel on the same vein encounters another ore shoot at 340', that is 1½ to 3' wide and has 3% ore extending to top of 90' raise. In 1914 company did about 1,350' of development work on the main tunnel and on the 100-300' levels. Shipments thus far have not quite covered expenses. Shipments in 1914 averaged from 9-13% copper.

Equipment: includes a 40 h. p. gasoline hoist, 320 cu. ft. compressor run by a 60 h. p. gasoline engine and a pumping plant jointly owned with the Blue Jay Co. Property regarded as promising.

NORTHERN LIGHT COPPER CO.

NEVADA

Idle and probably dead. Yerington, Lyon Co., Nev.

Property: 6 claims, 20 miles east of Yerington, said to have produced some copper ore. No recent returns secured.

OAKLAND COPPER BELL MINE

NEVADA

Owens group of claims in the Pumpkin Hollow section of Yerington district, Lyon Co., Nev., developed by a 40' shaft showing 3' of ore, said to carry 7% copper with 5 oz. silver and \$2 gold. Closed down many years.

PEER GOLD MINING CO.

NEVADA

Clyde Garrett, Gurney Gordon and Harry Cutler, chief stockholders, Reno, Nev.

Property: in Pine Nut range at Como, 8 miles south of Dayton, shows wide vein in andesite. High-grade ore discovered Jan., 1916, showed values of \$73 to \$150.

Probably idle. Letters returned.

RENO-YERINGTON COPPER CO.

NEVADA

Officers: E. L. Brown, pres.-mgr., 944 West 6th Street, Reno, Nev.; Victor Cokefair, v. p.; M. C. Brown, sec.; Farmers & Merchants Natl. Bank, treas.; preceding with Walter Harris, O. H. Sonne, Will McDonough, directors.

Inc. Jan. 25, 1907. **Cap.**, \$1,000,000; shares \$1 par; non-assessable; 750,000 shares outstanding.

Property: 5 unpatented claims, about 100 acres, north of the Bluestone mine, at Yerington, Lyon Co., Nev., said to show sulphide ore in granite with easterly dip, averaging 3% copper.

Development: by 700' tunnel and 100' incline shaft sunk on the contact.

Equipment: includes hoist and buildings.

Property was bonded, 1913, to Geo. Wingfield, but the bond was relinquished and property reverted to original company.

SMITH VALLEY MINES CO.

NEVADA

E. J. Cooper, Receiver, Yerington, Nev. H. L. Van Valen, representing the stockholders, 410 Advertising Bldg., Chicago, Ill.

Inc. 1912, in Nev. **Cap.**, \$2,000,000. Placed in receivers' hands Oct. 30, 1914; debts were about \$17,000. Reported Jan. 5, 1916, that obligations "are being rapidly paid off; it is expected that the Receiver will be discharged in about 60 to 90 days from present date."

Property: 23 claims, 467 acres at Yerington, said to show gold ore in a contact deposit between andesite and porphyry; width of ore, 6" to 3' with average assay reported of \$16.80 per ton. Claims 60,000 tons ore in sight.

Developments: 200' incline shaft, with 900' of workings. **Equipment:** includes 25-h. p. gasoline hoist and a 6-drill compressor.

Letters returned in May, 1917. Presumably receiver had cleared up debts, **UNION COPPER CO.**

NEVADA

Yerington, Nev. Title changed to Standard Copper Co., in 1912.

UTAH-YERINGTON MINING CO.**NEVADA**

Reorganized as the Mason-Yerington Mines, which see.

WALKER RIVER COPPER CO.**NEVADA****Offices:** 45 Broadway, New York and Yerington, Nev.**Officers:** M. M. Upson, pres.; David Provost, v. p.; Wm. Gelder, sec-treas., with W. H. Alexander, gen. mgr., W. T. Mayer and J. A. Martin, directors. J. E. Gelder, supt.; J. H. Banks, New York, cons. engr.**Inc.** June, 1915, in Nevada. **Cap.**, \$1,000,000; shares \$5 par; outstanding \$750,000 com. and \$22,000 pfd. In treasury \$228,000 pfd., 7% cumulative.**Transfer office:** 15 Exchange Place, Jersey City, N. J. Registrar & Transfer Co., New York, registrar. Annual meeting, first Monday in June.

Balance sheet as of June 21, 1917, showed cash assets totaling \$99,496, of which \$77,735 was from sale of 15,547 shares of pfd. stock. There was owing \$57,191, \$34,939 being for mill construction.

Property: 15 claims, 250 acres, including mill site, near Yerington, Lyon Co., being developed in conjunction with the Empire Nevada mine. Claims show a low-grade porphyry copper deposit said to cover an area 1,000x4,800' so far as drilled.**Ore:** is said to assay Cu, 3%; S, 0.5; SiO₂, 72%; Fe₂O₃, 5%; Al₂O₃, 11%; CaO, 2%; MgO, 1%.**Development:** 175' vertical shaft and a 900' tunnel through the orebody. drilling is said to have proved the orebody to extend to 500' depth. Present work is done by quarrying.**Ore reserves:** management claims 550,000 tons 2½% ore proven by drilling and surface and underground work. At the Pennington shaft in 1917 there was reported to be 10' of 6% ore and 40' of 4% ore.**Equipment:** includes a 40-ton leaching plant built to use the Midland wet chloride process.**Production:** in 1915 lessees shipped 5,000 tons of 3 to 5.9% copper ore. Total production to date, 10,000 tons.

Company planned drilling an additional 200 acres during 1917. Property has been examined by Louis A. Wright and John H. Banks.

YERINGTON BULLION MINING CO.**NEVADA**

Idle, and mail returned from former address, Ludwig, Nevada Co., Nev.

Officers: A. J. Schmidt, pres.; J. A. Knox, sec-gen. mgr.; J. M. Moyle, treas.; with J. A. Sisk, E. W. Brush, F. S. Stanley and Henry Hertz, directors. W. F. Pfefer, supt., at last accounts.**Inc.** May 31, 1909, in Nev. **Cap.**, \$2,500,000; shares \$1 par; 1,000,000 shares preferred stock, fully paid and non-assessable; 300,000 shares issued; 1,500,000 shares common or promotion stock; assessable, 1,275,759 shares issued.**Property:** 56 mining locations, 1,120 acres, 2 miles N. of the Nevada Douglas property in Yerington district. Developed by 400' main working shaft and 2 tunnels 300' long, E. and W. of the shaft on the 300' level, showing a deposit of sulphide ore with gold and copper values.**Equipment:** includes a smelter, 2 hoists, compressor and tools.

Company is apparently without funds and its literature is of a suspicious character. Letters returned, 1916.

YERINGTON CONSOLIDATED COPPER CO.**NEVADA****Office:** 312 McCornick Bldg., Salt Lake City, Utah. **Mine:** Mason, Lyon Co., Nev. **Officers:** Frank J. Hagenbarth, pres.; John Dern, v. p.; M. B. Johnson, sec.**Inc.** Feb 11, 1917, in Utah. **Cap.**, \$100,000; shares 10c par; non-assessable; issued, 725,000 shares. Debentures, \$100,000 at 6%, authorized. Annual meeting second Monday in July.**Property:** 14 claims, patented, in 2 groups, known as the Copper King

and Copper Deposit, the former, lying between the Bluestone and Mason Valley mines, developed by a 70' shaft and 2 tunnels of 500' and 600', showing carbonate ores.

YERINGTON MALACHITE COPPER CO.

NEVADA

Office: 414 Judge Bldg., Salt Lake City, Utah. **Mine office:** Yerington, Lyon Co., Nev.

Officers: Grant Snyder, pres. and gen. mgr.; H. J. Mayer, v. p.; Gideon Snyder, sec.-treas.; with S. M. Levy and W. T. Snyder, directors.

Inc., Oct., 1906. Cap., \$5,000,000; shares \$5 par; assessable; issued, 666,333 shares.

Property: 11 claims, patented, adjoining the Mason Valley mine, show 3 mineralized zones of 20 to 150' width, proven on surface for a distance of 2,000'. Orebodies are fissure veins in limestone, carrying oxidized ores to a depth of about 100' below which ore minerals are mainly chalcopyrite, associated with epidote and garnet.

Development: by numerous short tunnels, shafts, etc., totaling 3,800', on the vein with the Mason Valley workings. Ores as mined average about 6% copper. An examination, 1917, reported to have revealed 800,000 tons of 2% oxide ore to a depth of 100'; where the sulphide zone commences.

Equipment: includes a 125-h. p. General Electric motor, steam hoist good for 600' depth. Rand Imperial compressor, and Hendrie & Bolthoff hoist. Electric power is taken from the Truckee River Power Co. There are several mine buildings.

Production: was begun May, 1912, and company shipped ore, returning 174,407 lbs. copper to the Mason Valley smelter, in 1913. No later output reported.

YERINGTON MINES & EXPLORATION CO.

NEVADA

Office: Yerington, Lyon Co., Nev.

Officers: C. S. Durand, pres.; B. F. Kurz, v. p.; V. B. Durand, sec.; Geo. F. Willis, treas., with W. S. Weaver and Wm. Cramer, directors.

Inc. Feb. 27, 1909, in Nevada. Cap., \$1,000,000; shares \$1 par; non-assessable; issued \$735,000. Annual meeting, first Monday in March.

Property: 24 claims, unpatented, including the Effie May group of 2 gold claims, the Copper Flat group of 10 copper claims, and the Mohawk group of 12 gold-copper claims, latter being the principal property, located 1 mile N. W. of Yerington.

The **Mohawk** group is developed by a 125' incline and several shallow shafts of 20' to 80' depth, sunk in the copper-bearing formation. Development was under way at incline during 1917. A 15-h. p. gasoline hoist has been added and development work is now in progress. A carload in 1916 yielded 4.45%.

The **Copper Flat** group, 1 mile E. of Yerington is developed by about 20 pits and shallow shafts, deepest 60', showing malachite and cuprite of about 6% copper tenor. Shipments in 1917 averaged 6.46% copper.

The **Effie May** group is a gold prospect developed by a 135' shaft, with about 2,000 tons of ore blocked out. Property is on the Nevada Copper Belt railway.

YERINGTON MOUNTAIN COPPER CO.

NEVADA

Offices: J. G. Kirchen, mgr., Reno, and W. L. Taylor, supt., Golconda, Nev.

Officers: J. G. Kirchen, pres.-mgr.; E. M. Kirchen, v. p.; P. S. Booth, sec.-treas., with H. J. Toner, W. A. Krasselt, H. R. Cooke and E. J. Haug, directors.

Inc. Feb. 10, 1912, in Nevada. Cap., \$3,000,000; shares \$1 par; non-assessable; issued \$2,300,000. First Natl. Bank of Tonopah, Nev., and U. S. Corporation Co., New York, registrars and transfer agents. Listed on New York Curb.

Property: 46 claims, 920 acres, in the Mountain View district, 9 miles N. W. of Schurz and about 12 miles E. of Yerington, fissures in granite-diorite, that run N. 40° E., and dip 65°. Ore minerals are mainly chalcocite, with chalcopyrite, chrysocolla, malachite, cuprite and occasional native copper. Ore assays 4½ to 8% copper, 2 to 4 oz silver and 80c to \$2 gold per ton.

In July, 1916, company purchased the Adelaide mine, near Golconda, Humboldt Co., Nev., from the Glasgow & Western Dev. Co.

At the Adelaide mine there is a contact deposit in limestone and granite, opened by a 300' shaft and 1,450' of tunnels, with a total of 6,500' of openings. In Aug., 1917, the orebody on the 200' level was 20' wide, and monthly shipments were 200 tons of 5% ore.

Development: at the Yerington by a vertical 300' main shaft, and 1,200' of tunnels, with about 8,000' of openings. A crosscut below the Levine tunnel in 1916 was developing a good body of ore. The Azurite tunnel was 1,000' long, June, 1916; it is being driven from the other side of the mountain to cut ore exposed in the Levine tunnel and at 400' greater depth. Tunnel discloses ore in bunches and streaks. The Beach tunnel yields a good grade of shipping ore of about 5.5% copper.

Equipment: includes Fairbanks-Morse and Ingersoll-Rand gasoline hoists, 2 Chicago Pneumatic compressors, pumps, etc.

Production: in 1916 was from 400 to 600 tons per month.

MINERAL COUNTY

ANDERSON GROUP.

NEVADA

Address: Luning, Nev.

Property: 5 claims, 4½ miles east of Luning and adjoining Nevada Champion Copper Co. ground. Development by tunnels and 120' shaft.

Was under lease and bond to Nevada Champion Copper Co. in 1916.

ARGENTUM MINING CO. OF NEVADA

NEVADA

Company inactive. Mines and mill leased to F. C. Beedle, Belleville, Nev., 1916-17, who is operating the mine and shipping 25 tons of silver ore daily. Mr. Beedle also has bond and lease on the holdings of the Mt. Diablo M. & M. Co. and the Esmeralda Water & Mfg. Co.

Property: Northern Belle and Holmes Mines, with mill and water rights and the Lucky Hill Mine (owned outright by Threlfall) in camp of Candelaria, Mineral Co., Nev., 9 miles from Redlich, on Tonopah & Goldfield R. R.

Ore: gold-silver. Country rock is lime with rhyolite intrusions; ore occurs as oxides in lenses as an alteration of lime and rhyolite, carrying chlorides and from 60c to \$1 in gold values. Vein system said to be 4,000' long and proven to cover entire ground.

Development: 60 miles of old workings, consisting of shafts, tunnels and crosscuts.

Ore reserves: estimated after a resurvey and sampling, 400,000 tons in mines and ore dumps, besides 2,000' of unprospected mineralized ground on the Lucky Hill.

Equipment: 40-stamp mill and cyanide plant. Company plans erection of new 60-ton mill and aerial tramway for ore haulage.

AURORA CONSOLIDATED MINES CO.

NEVADA

Is a subsidiary of the Goldfield Cons. Mines Co.

Office: Goldfield, Nev. **Mine office:** Aurora, Mineral Co., Nev.

Officers: Geo. Wingfield, pres.; J. H. Miller, v. p.; A. H. Howe, sec-treas.; J. W. Hutchinson, gen. mgr.; with H. M. Hoyt, Chas. E. Knox and F. M. Manson, directors. R. A. Hardy, supt.

Inc. in 1912, in Utah. **Cap.**, \$100,000; shares 10c par; 685,550 shares issued. June 30, 1914, 87% of the issued stock of the Aurora Cons. Mines Co. was sold to the Goldfield Cons. Mines Co. for \$763,000, by Jesse Knight and associates.

Property: at Aurora, Nev., shows gold-silver ore in fissures in andesite.

Development: 400' vertical shaft, connecting with main working tunnel, 4,500' long.

Mill and cyanide plant: 40-stamp with daily capacity of 500 tons, weight of stamps 1,580 lbs.

Operations for 1916 show a net profit of \$39,781 from the treatment of 173,270 tons of ore. Ore in sight Jan. 1, 1917, is stated to be 336,978 tons; the profit per ton is not given by the company. Neither tonnage nor value checks the original estimates made of the mine, but there is promising ground yet unexplored.

AURORA MINES CO.

NEVADA

Address: 300 Severance Bldg., Los Angeles, Cal. **Mine office:** Aurora, Mineral Co., Nev.

Officers: Wm. R. H. Weldon, pres.; C. H. Chrisman, v. p.; F. C. Langdon, sec.; John H. F. Peck, treas.; preceding officers and J. Frank Mercereau, directors. Wm. B. Davis, supt.

Reorganized March, 1913, in Nevada. **Cap.**, \$1,000,000; shares \$1 par; issued \$900,000. Annual meeting March 19th.

Property: 13 claims, patented, 150 acres, located in the Esmeralda mining district, Mineral County, comprise some of the mines worked in early days for high-grade gold-silver ore in fissure veins.

Development: several tunnels. The Monarch tunnel cut the veins at 300' depth, and 260' of drifting was done. Work was then started on a tunnel 350' lower, already 900' long. At present the tunnel has a length of 1,570' with 400' farther to go to cut the veins. There has been no production to date.

BI-METALLIC MINE

NEVADA

Owned by M. G. Bradshaw, Crown King, Yavapai Co., Ariz., and P. A. Simon, Mina, Mineral Co., Nev. Mine is located at Candelaria, Columbus district, Mineral Co., Nev. Management claims gross earnings from ore sales in 1914 were \$33,000, with operating expenses of \$17,000.

Property: 3 claims, 47 acres, unpatented, shows a vein in slate; course of vein is N. 5° W., dip 65°. Ore occurs in shoots and lenses, and is said to average 28 oz. silver.

Development: 2 incline shafts, 280' deep, equipped with gasoline hoist. Mine was closed down in 1914, owing to drop in silver, but owners plan resuming operations.

BLACK EAGLE MINING CO.

NEVADA

P. E. O'Brien, mgr., 2740 Telegraph Ave., Berkeley, Calif.

Property: Black Eagle mine and mill at Rawhide, Mineral Co., Nev., said to show gold ore. Employs 20 men. Treating 50 tons daily at the mill at last reports.

BLUE LIGHT COPPER CO.

NEVADA

Address: care C. W. Marsh, pres., Washington, D. C. **Mine office:** Mina, Mineral Co., Nev.

Officers: Henry L. Dollman, v. p.; F. M. Baker, Carson City, Nev., sec.; Wm. C. Osborne, treas.; preceding officers, Chas. N. Van Cleave, Chas. E. Test and Richard Stegemeier, directors.

Inc. Oct., 1907, in Nevada, as successor of Blue-Light Mining Co. **Cap.**, \$2,500,000; shares \$1 par; non-assessable.

Property: 14 miles from Mina, developed by 600' shaft from which several carloads of rich carbonate ore have been shipped. Shaft has reached sulphide zone, but workings have not yet passed through leached material. Mine is equipped with hoist, buildings, etc. Examined 1913 by R. W. Hadden. No 1917 returns secured.

CALAVADA COPPER CO.

NEVADA

Suite 3249, No. 120 Broadway, New York. Mine near Luning, Mineral Co., Nev.

Officers: E. B. Bronson, pres.; B. E. Page, Los Angeles, Calif., v. p.; F. C. Hart, sec.-treas.; H. A. Geisendorfer, Luning, Nev., mgr., with H. Richardson, Boston; C. T. Bender, Philadelphia; and W. D. Kent, directors.

Inc. 1913, in Delaware. **Cap.**, \$2,500,000; shares \$5 par; full paid, non-assessable. No bonds; 180,300 shares held in treasury. Security Transfer & Registrar Co., New York, transfer agent.

Financial statement of March 1, 1917, showed mine development, \$114,435; mine equipment, \$16,421; development fund, \$90,090; accounts receivable and cash, \$12,254; current mine accounts, \$7,000; profit and loss were given as \$16,234.

Development: 1,000' shaft, Copper Mtn., 100' Cyclone shaft and prospect tunnels. Underground workings total 4,000'. Since February, 1915, 3,483' were done, including 300' of shaft sinking from the 700' down. Cross-cutting and drifting on the 700' and 1,000' levels now being done, and a winze has been sunk on the 1,000' for 30' in red oxide, carbonate and native copper which is said to average 10%.

Property: Copper Mountain Group, known as the Luning Unit, 21 patented and 10 unpatented claims, 500 acres, in Sante Fe mining district, 8 miles E. of Luning, Mineral Co., Nev., on the So. P. R. R., and the Darwin Unit, 9 patented claims, 180 acres at Darwin, Inyo Co., Calif. This group is not being developed at present.

Ore: copper occurring as oxide and carbonate in vein, 40' to 150' wide, with sulphides at depth, in contact deposit between granite and limestone. Considerable oxidized ore has been developed between the 700' and 1,000' levels which is sufficiently high-grade to mine and ship at a profit under normal conditions. Ten carloads from development work were shipped to the Tooele smelter in Utah, which ran from 6 to 10½% copper with small amounts in gold and silver.

Equipment: 60 h. p. hoist, Ingersoll-Rand air compressor, mine and office buildings. Plans deepening the main shaft and shipping all visible ore in 1917, while copper prices are high.

DUNLAP COPPER MINE

NEVADA

Idle. Mina, Mineral Co., Nev. R. W. Hadden, cons. engr., 1807 Harvard Blvd., Los Angeles, Cal.

Property: 10 claims, 200 acres and mill site in Silver Star mining district, 10 miles east of Mina. Claims show quartzite and quartzite breccia with mineralized zone 700' wide and 2,000' long, carrying ore-bearing reefs with oxides, carbonates, and native copper, values ranging from 1½ to 20% copper.

Development: by several thousand feet of tunnel, open cuts and winzes, mostly in ore, but none showing sulphide, as water level is not reached. Concentration test on 10 tons yielded product with 44% copper, \$8 gold and 8½ oz. silver.

Equipment: includes compressor, blacksmith shop, etc.; 250,000 tons of ore said to be available, but not blocked out. No recent returns secured.

EXCELSIOR MOUNTAIN COPPER CO.**NEVADA**

Hawthorne, Mineral Co., Nev.

Officers: Frank D. Qualey, pres.-gen. mgr.; J. H. Suits, sec.-treas.; George Brodigan, W. R. Jackman, W. B. Tait, directors; Wm. Winkelman, supt.

Inc. June, 1905, in Arizona. **Cap.**, \$1,000,000; shares \$1 par. Annual meeting, June 7.

Property: 13 claims, 260 acres, in process of patenting, 16 miles S. E. of Hawthorne, in Whiskey Flat district, Mineral Co., Nev., said to have promising surface showings of copper for a distance of several thousand feet along a contact between granite and limestone. Has 4 shallow shafts and 2 tunnels, with one 1,500' tunnel showing ore averaging 4% copper and \$2 gold per ton. Total of underground workings about 3,000', said to prove ore to a depth of 600'.

Equipment: includes 50 h. p. gasoline engine and 6-drill compressor. Development in 1913 included a connection between No. 1 and No. 2 tunnels, claimed to be in ore of commercial character. Property closed down during past two years, but management planned resumption 1916. No later returns.

GOLDEN PEN CONSOLIDATED MINING CO.**NEVADA****Address:** Rand, Nev.; J. H. Miller, supt.

Company formed in 1915 by Jesse Knight of Provo, Utah, to purchase the Golden Pen mine at Rand, Mineral Co., Nev., for \$150,000.

A peculiar feature of the purchase permitted former owners to retain a pay-shoot 38' long in center of mine. Past record shows rich shipments. See Vol. XII.

IDEAL COPPER CO.**NEVADA****Office:** 634 Bridge St., Grand Rapids, Mich. **Mine office:** Luning, Nev.

Officers: S. J. Hufford, pres.; H. D. Keefer, v. p.; Henry Riechel, sec.-treas., with Henry Smith, J. I. Keller, directors.

Inc. Jan. 12, 1915, in Nevada. **Cap.**, \$600,000; shares \$1 par; 4,000 shares issued. Annual meeting, 2nd Tuesday in January.

Property: 16 claims, in 2 groups, unpatented, 360 acres, about 4 miles from Luning, formerly owned by the Wagner Azurite C. Co., and listed Vol. XI. The Atwood group, which is the principal property, shows a contact zone of about 600' width, traceable 2,000', between an altered granite footwall and limestone hanging, with N. W.-S. E. strike and dip of 50° N. The outcrop carries silver and gold-copper ores with a quartz gangue.

Development: 2 tunnels, 1,700' and 350' long, with a total of 2,185' of workings.

The Nevada-Wisconsin group shows several dikes of 50 to 100' width of which one is said to show 2 to 11% copper sulphide ore. Developed by shaft.

In 1916, 400' of shaft work was done (timbered and piped), also 350' of crosscutting with track and pipe, the work costing \$6,000.

Equipment: includes 40 h. p. steam plant with 15 h. p. hoist, 3-drill straight-line air compressor, 100-ton leaching plant and 10-stamp mill. Owing to excess of lime in the ore, the leaching plant proved a failure and was closed down. Property considered promising.

IRON DIKE MINE**NEVADA****Address:** care W. R. Smith, Mina, Nev.

Property: 10 claims in Gold Range mining district, Mineral County, about 5 miles from Mina, shows fissure veins in lime-porphyrification.

A tunnel, 1,016' long, Jan. 1, 1916, was expected to tap the vein at 417' vertical depth.

No later returns.

IROQUOIS COPPER CO.

NEVADA

Goldfield, Nev.

Officers: H. B. Lind, pres.-mgr.; J. M. Fenwich, sec.-treas., with M. A. Lind, directors.

Cap., \$12,000; shares \$1 par. All the stock is owned by the Nevada & Boston Copper Company, a Wyoming corporation.

Property: 10 unpatented claims, about 180 acres, in New York Canyon, Sante Fe mining district, Mineral County, 4½ miles E. of the S. P. R. R. and 7 miles S. E. of Luning.

Development: by crosscut tunnels, said to show an orebody averaging 4% copper and \$2 silver per ton. Shipments commenced in 1914 and to date amount to about 2,000 tons of ore carrying from 5-12% copper. Mine being worked by lessees in 1917.

JUMBO COPPER MOUNTAIN MINING CO.

NEVADA

Office: Ben Gill, sec., Goldfield, Nev. J. K. Turner, supt.

Inc. November, 1917, in Nevada. **Cap.**, \$2,500,000; shares \$1 par; assessable. Company is a subsidiary of the Jumbo Extension Mng. Co. (which see), holders in the latter receiving one new share for each Jumbo Extension share held, free of charge. Vendors of the Copper Mountain mine took \$25,000 worth of shares in the new company at 25c each.

Property: the Copper Mountain mine, 15 miles from railroad at Nolan, Mineral Co., Nev.

Development: by 80', 200' and 300' shafts. A crosscut from No. 1 has opened 3' of 7% and 5' of 4% ore and from No. 2, 3' of 8% and 4' of 4% ore. The higher grade is being extracted for shipment.

The Murphy tunnel has opened 4' of 4% ore. Other shallow workings have exposed 5% ore. Lessees on block 5 are shipping over 8% ore from a vein 4' wide. From No. 1 lease the company can ship 7% ore at once. Considerable concentrating ore is available and a mill with flotation is planned.

LAST HOPE MINE

NEVADA

Owned and operated by Chas. Koegel, Chas. Huber and C. Pike. Mine adjoins the Queen Regent Mines Co. on the W., at Rand, Mineral Co., Nev., and is reported to carry an extension of the Queen Regent vein.

Development: by 250' double-compartment shaft.

Shipments: in 1915, said to have averaged \$80 per ton, amounted to \$30,000. No recent returns.

LOUISIANA CONSOLIDATED MINING CO.

NEVADA

Offices: Room 2851, No. 120 Broadway, New York, and Mt. Montgomery, via Mina, Mineral Co., Nev.

Officers: Walter E. Trent, pres.; T. F. Bonneau, v. p.; L. A. Dessar, sec.-treas., with Capt. A. B. Wolvin and H. C. Cutler, directors. H. C. Cutler, cons. engr., Reno, Nev.

Inc. May 17, 1912, in Nevada. **Cap.**, 1,000,000 shares; 10c par; outstanding, 600,000; 200,000 shares set aside for bond conversion. Registrar & Transfer Co., New York, transfer agt. and registrar. Listed on New York Curb and San Francisco Exchange. Annual meeting, Dec. 10.

Bonds: authorized, not issued, \$40,000, 1st mortgage, 7%, dated May 1, 1916, due May 1, 1921; redeemable in 5 years or before at option of company at 115; convertible into stock at 20c per share. Balance sheet of May 1, 1916, shows assets, \$268,200, which includes: property, \$100,000; treasury stock, \$40,000; treasury bonds, \$40,000; improvements, \$80,000;

developments, \$5,000; cash, \$3,200. Liabilities show: capital stock, \$100,000; bonds, \$40,000; surplus, \$128,200.

Property: 3 claims and a fraction, 65 acres, including the Louisiana, or Tip Top mine, at Mt. Montgomery, Oneota district, 5 miles from the S. P. Narrow Gauge R. R., running from Mina, Nev., to Keeler, Cal. Also has an option on the Brownie mine, 5 claims, 100 acres, 1,500' W. of the Louisiana. Property formerly belonged to the old Thorndyke-Bley Mining Co., now dead.

In Jan., 1917, the old Tybo mine, 50 miles east of Tonopah, was leased for 20 years, 30% of the profits to be paid the owners. The Tybo is credited with a production of \$3,300,000 in silver-lead-gold ore from about 300' level.

Ore: gold-silver occurs in N.-S. veins, dipping 60° E., with andesite footwall and rhyolite hanging-wall. Company's claims cover 4,500' along strike of veins; two veins in each mine, the footwall vein, 6' wide, and hanging-wall vein, 2½' wide. In the Louisiana, veins are 5' apart, but at times come together, forming ore widths of 12' to 16'. Veins are 20' apart in the Brownie mine.

Development: tunnels, with 1,000' of underground workings. In the Louisiana mine most of ore above 120' level has been mined; a 100' winze and 60' drift below tunnel level said to show \$7 to \$9 ore. Management claims Louisiana mine should produce 10,000 to 20,000 tons of ore for each 100' in depth, with a profit of \$3 to \$4 per ton; and the Brownie mine 25,000 tons of ore for each 100' in depth. Brownie ore said to average \$7 to \$9 per ton.

Ore reserves: claims 5,000 tons blocked out and 10,000 tons partially developed ore.

Louisiana is said to have produced \$120,000, of which 75% was in gold; 25% in silver; all from above 120' level.

Equipment: includes 10-stamp mill, cyanide and bullion refinery plants. Capacity, 75 tons per day; steam plant using fuel oil; 75 k. w. generator and electric hoist. Water is obtained from 2 springs, 2 miles from the mill.

Company also purchased the Pearl and Zenda silver-gold mines in Kern Co., Cal., in 1917. Ore reserves estimated at 300,000 tons in sight averaging \$3 a ton. Mill capacity being enlarged to 250 tons daily.

Walter A. Trent, reporting on September operations at the Tybo lead-silver-gold-zinc property in Nevada, states that the mine was dewatered about August 19 and the workings cleared and ready for ore extraction by Sept. 1. During September, there was removed in the course of development work, without attempt at stoping, 1,000 tons, averaging \$40 a ton in lead-silver-gold (allowing nothing for about 11 per cent zinc), of which 1,475 tons was stored on the dump for milling, and 325 tons shipped to the smelters in Utah and having a gross value of \$20,000. The smelter receipts on the 325 tons shipped showed \$5,000 profits over and above all mining and development expense for the month, sorting, transportation, smelting charges and smelter deductions. The company installed a new machine shop, oil house, pipe lines, bunk houses, and other modern equipment, and purchased the 100-ton Atkins-Kroll concentrator which is now in course of removal from Sodaville, Nevada, to Tybo. Satisfactory progress is also reported from the Zenda-Pearl gold property in California.

LUCKY BOY CONSOLIDATED MINING CO.

NEVADA

Address: care J. H. Miller, Hawthorne, Nev.

Officers: Jesse Knight, pres.; John H. Miller, v. p. and gen. mgr.; W. Lester Mangum, sec. Company controlled by the Knight Investment Co. Total dividends paid to date, \$125,000.

Property: the Lucky Boy mine, under the town of Lucky Boy, about 5 miles from Hawthorne, shows silver-gold-lead-copper ore in a vein in limestone near granite. Ore contains galena and tetrahedrite with quartz and some calcite, in lenses and shoots, in a vein which runs N. 80°-85° E. and dips 65°-75° S. Geology fully described in U. S. G. S. Bull. 594, p. 153.

Development: by 1,000' Hubbard shaft with drifts E. and W. at 100' intervals and by a deeper drainage tunnel, 6,200' long.

The big oreshoot, which produced \$800,000 in 8 months and half as much more in the next year, has been mined out except where narrow. No stopping ore was cut in the lower channel, but there is much unworked ground in the mine and much virgin territory in the property. Lessees now working at 6 or 7 places are extracting 2 to 3 carloads of ore a month, which yields a substantial profit to the company.

Equipment: includes air compressor, electric motors, machine drills and useless 10-stamp mill.

LUNING-IDAHO MINING CO.

NEVADA

Office: 204 Nixon Bldg., Reno, Nev. **Mine office:** Luning, Mineral Co., Nev. **New York office:** Room 1641, 42 Broadway.

Officers: Robt. B. Todd, pres. and gen. mgr.; R. G. Withers, v. p.; G. M. Todd, sec.-treas., with A. D. Cox, director.

Inc. April 29, 1910, in Nevada. **Cap.**, \$1,500,000; shares \$1 par; 1,100,000 issued.

Operating expenses for 1916, \$20,000.

Property: 13 claims, 260 acres, in the Pilot range in the Santa Fe mining district, shows several fissure veins in granite and quartzite, said to carry 5½% copper, 2 oz. silver and about 60c gold per ton.

Development: by shafts, open cuts and tunnels, with about 1,500' of underground workings to depth of 200'. Longest tunnel driven about 682' across the mineralized zone is near the hanging-wall granite.

Equipment: includes F. M. Co. hoists, Rix compressor and drills. Shaft will be sunk to 500' to reach the sulphide zone.

Shipments started in November, 1917. A flotation mill is planned. Property reported on by M. H. Jacobs, J. C. Skuse and S. B. Parish.

MOGUL MINING CO.

NEVADA

A. S. Proskey, mgr., Rawhide, Nev.

Owns the Regent mine, which has produced 3,000 tons of \$20 to \$200 ore from above the 150' level. See description of company in North Carolina.

MORRIS SYNDICATE MINES

NEVADA

Address: W. C. Losey, Spokane, Wash.

Property: 6 unpatented claims, 23 miles N. E. of Mina, Mineral County, Nev., and near the Olympic mine, a producer.

Geology: shoots 2 to 20' wide reported to occur in contact vein in rhyolite and andesite. Ore said to assay \$30 gold per ton. Developed by 60' shaft.

NEVADA CHAMPION COPPER CO.

NEVADA

Office: 617 Pacific Bldg., San Francisco, Cal. Wm. Miller, pres.; C. N. Miller, sec.-mgr.

Inc. 1907, in Arizona. **Cap.**, \$1,500,000; shares \$5 par.

Owns 130 acres patented land, 3 miles from Luning, Nev. Developed by a 3-compartment shaft, 400' deep. Claims to have large bodies of 3% copper ores and to be shipping 6% copper carbonate ore.

NEVADA CONSOLIDATED MINES & SELLING CO.

NEVADA

Idle. Mine address: Hawthorne, Mineral Co., Nev.

Officers: Alex. Brown, pres.; Chas. L. Newton, v. p.; C. C. Matthews, sec.; F. G. Carey, treas.

Lands: about 1,000 acres, including a gold property formerly owned by the Huntoon Valley Mining Co., 45 miles south of Hawthorne, and copper claims 10 to 20 miles S. W. of Hawthorne. The copper property, developed by 3 crosscut tunnels to 440' below the outcrop, is said by the company to have a vein carrying disseminated pyrite and chalcopryrite, averaging 2½% copper and \$4 gold. This vein has apparently been lost in the lowest tunnel. Country rock is granodiorite. The mine has 1,500' of workings. Officers are said to stand well, but the company's past advertising is not liked.

NEVADA COPPER CO.

NEVADA

Office: 572 Bullitt Bldg., Philadelphia, Pa. **Operating office:** Tonopah, Nev. **Mine office:** Mina, Mineral Co., Nev.

Officers: Jas. S. Austin, pres.; J. H. Whiteman, v. p.; C. A. Higbe, sec.-treas. Company is controlled by the owners of the Tonopah Mining Co. Owns the Dunlap mines, 12 miles east of Mina, which see.

Idle since 1910.

NEVADA COPPER HILLS MINING CO.

NEVADA

Idle, and possibly dead.

Office: 18 South Mulberry St., Mansfield, Ohio. **Mine office:** Luning, Mineral Co., Nev.

Officers: at last accounts, A. H. McCullough, pres.; F. W. Lenhart, v. p.; T. J. Foster, sec.; Chas. Ritter, treas.; Rowland Lea, gen. mgr.

Inc. Oct. 24, 1907, in Nevada. **Cap.**, \$1,500,000; shares \$1 par; non-assessable; issued, \$745,000. Farmers Savings & Trust Co., Mansfield, Ohio, registrars. Annual meeting, first Monday in December.

Lands: 10 claims, 200 acres, in the Fitting district, 9 miles north of Luning. The property is reported, by Mr. Lea, to have replacement ore-bodies in limestone over a width of about 600', with a N.-S. strike, and a dip of 6°.

Ore: oxidized, with occasional native copper and some bornite with chalcopryrite in the bottom workings. Orebodies average 2' thick and 28 of them are opened up for a length of 400' and a depth of 100' according to the company's secretary. Ore is stated to assay 1 to 70% copper, from a trace to 8 oz. silver and from a trace to \$3 gold per ton.

Development: by 225' shaft and a 330' tunnel.

Equipment: includes a 25 h. p. hoist, and 6 buildings. Presumably pursuing a "watchful waiting" course and ignores all requests for information.

NEVADA NEW MINES CO.

NEVADA

Office: 146 No. Virginia St., Reno. **Mine office:** Rawhide, Mineral Co., Nev.

Officers: E. W. King, pres.-gen. mgr.; Thos. J. Flynn, mine supt.; H. Davis, mill supt.

Company took over the property of George Graham Rice's old promotions, the Rawhide Coalition M. Co., Rawhide Queen M. Co. and the Black Eagle M. & M. Co., in Regent district, said to carry free gold and ruby silver, in a 4" vein, opened on the 500' and 600' levels. Developed by shafts and crosscuts.

Equipment: includes 10-stamp amalgamation and concentration mill, 35-ton cyanide plant, compressor, and gasoline power. Reported treating 60 tons of \$22 ore per day in 1914. Recent production figures not available as company has not replied to requests for information.

NEVADA ORE & COPPER CO.**NEVADA**

H. H. Hill, supt., Acme, via Mina, Mineral Co., Nev.

Property: a group of claims in the Fitting district, said to show copper ore in replacement deposits. Developed by shaft and extensive workings, opening up lead ores. Reported in April, 1916, that a mill would be built.

NEVADA PACIFIC MINES CO.**NEVADA**

L. P. Patrick, pres., Goldfield, Nev. **Mine office:** Mina, Mineral Co., Nev.

Property: the Mayflower group in New York canyon, N. E. of Mina, shows copper ore 150' wide, exposed by surface work, from which 15 tons daily were shipped to the Wabuska smelter in 1913. Reported under bond and lease to the U. S. Smelter Co.

NEVADA RAND MINES CO.**NEVADA**

Address: Box 152, Reno, Nev. **Mine office:** Rand, Nev.

Officers: Charles Huber, pres.; Charles Koegel, v. p.-supt.; W. V. Ruderow, sec.-treas., with J. J. Turney, directors.

Inc. July 8, 1916, in Nevada. **Cap.,** \$1,000,000; shares 10c par; non-assessable; 796,700 issued. Annual meeting, July 9.

Property: 5 unpatented claims, 70 acres, in Rand district, Mineral Co., Nev., said to show a fissure vein in andesite, with pay-shoot said to be 200' long and 40' wide. Ore contains silver chloride with \$5.25 gold and a total value of \$15 per ton.

Development: by shaft to 450' depth, with total workings of 1,800'. Ore reserves estimated at 30,000 tons, 1,200 tons of \$17 ore on the dump. In 1914 high-grade ore worth \$30,000 was shipped. Mine examined by S. E. Montgomery of Reno, in Aug., 1917, who advises erection of 25 to 50-ton cyanide mill. Total costs are estimated at between \$4 and \$5 per ton.

Company appears to have a promising mine in a district that has produced extremely rich ore.

Ten-stamp mill being erected late in 1917.

NEVADA REGENT MINES CO.**NEVADA**

Provo, Utah.

Officers: Jesse Knight, pres.; J. H. Miller, v. p.; W. Lester Mangum, sec.-treas.; P. H. O'Neil and A. S. Proskey, directors.

Inc. June, 1915, in Utah. **Cap.,** \$1,000,000; shares 10c par.

Property: in Regent district, Mineral Co., Nevada.

NEVADA STANDARD COPPER CO.**NEVADA**

Officers: Wilbert E. March, pres., P. O. Box 24, Mina, Nev.; C. E. Korthe, v. p.; L. H. Marsh, sec.-treas., with B. H. Wyant and Matthew W. King, directors.

Inc. 1912, in Nevada. **Cap.,** \$100,000; shares \$1 par; non-assessable; 82,355 issued.

Property: 11½ claims and a mill-site, near Luning in Santa Fe district, Mineral Co., Nev., 8 miles N. E. of Mina, on the Goldfield branch of the S. P. R. R. Claims cover low rounded hills at about 6,000' elevation. The rocks are leached porphyries underlain at 20' depth by low-grade oxidized copper ores. Ore contains bornite, chalcocite and chalcopyrite. Assays reported from 1.1 to 25% copper, with small gold and silver values.

Development: by 192' shaft on the Green Mystery claim, which at 45' cut a fault plane fissure that widened to 20' on the 104' level. Crosscutting in 1915 on the 192 level to the North opened up 11' of low-grade copper ore. A level at 104' cut a 24' shear zone carrying low-grade ore. Management considers it a typical porphyry, or disseminated copper deposit. There is reported to be a bed of copper-bearing conglomerate between

porphyry and lime. An incline is being sunk to explore this conglomerate, and at 60' it is reported as "looking fine." Property examined by W. R. Brown, W. H. Wiley and C. W. Clark.

Equipment: includes a 4 h. p. gasoline hoist, pump, blacksmith shop and buildings for men. There are 3 springs, 2½ to 5 miles distant. A 25 h. p. hoist is to be installed. \$2,915 spent on development in 1916.

NEVERSWEAT MINE**NEVADA**

Owned and operated by E. C. Watson of Luning, Nev.

Property: 3 unpatented claims, about 50 acres in Santa Fe mining district, New York canyon section, Mineral Co., Nev., shows copper-silver ore in a contact deposit in limestone monzonite formation. The orebody from 2'-20' wide and from 50'-200' long, strikes N., dips W. and is said to give average assays of 9% copper and 1-7 oz. silver.

Development: includes main tunnel being driven to the contact. Production totals about 1,500 tons. Recent work has been almost entirely by lessees. Examined by F. B. Weeks for U. S. S. R. & M. Co. and by Walter Wiley for Sherwood Aldrich.

NOBLE TUNGSTEN MINE**NEVADA**

See Silver Dike mine.

OLYMPIC MINES CO.**NEVADA**

Address: Omco, Mineral Co., Nev.

Officers: E. G. McConnell, pres.; A. Corrigan, v. p.; G. J. Panario, sec.; 460 Montgomery St., San Francisco, Cal.; Italian-American Bank, S. F., Cal., treas.; above with Jas. P. Nelson, directors. F. J. Siebert, mgr.; J. G. Greenan, supt.

Inc. May, 1916, in Nevada. **Cap.**, \$200,000; shares 10c par; 1,200,000 issued.

Property: 9 claims, 160 acres, formerly known as the Royal George group, 25 miles N. E. of Mina, Mineral Co., Nev., in the Bell mining district.

Ore: gold-silver occurs in a fissure vein in rhyolite to 150' depth.

Development: by 225' incline shaft with total of 2,500' underground workings, estimated by manager to block out 28,000 tons of ore. Total ore reserves estimated at 40,000 tons of \$23 ore.

Equipment: includes 25 h. p. gas engine and compressor. 70-ton mill completed and operating in 1917.

PACK SADDLE GOLD MINES CO.**NEVADA**

Address: Carson City, Nev.

Officers: E. H. Walker, pres.; H. R. Mighels, v. p., with F. M. Baker and Alex. McDonald, directors. Geo. L. Hedges, supt., Schurz, Nev.

Inc. April 11, 1916, in Nevada. **Cap.**, \$1,000,000; shares \$1 par; 630,000 shares outstanding.

Property: 7 claims, about 120 acres, in Mineral County, four miles from Reservation Station, said to show a quartz vein in andesite, with N. E.-S. W. course and giving average assays of 2½% copper and several dollars in gold.

Development: by 224' tunnel. Further development planned for 1917.

PILOT COPPER CO.**NEVADA**

Office: 10 Wall St., New York City.

Officers: W. B. Andrew, sec.-treas.-gen. mgr.; Chas. P. McColm, v. p.; above with C. W. Lynch and L. C. Warner, directors. J. C. Skuse, cons. engr.

Inc. 1917 in Arizona. **Cap.**, \$7,500,000; \$1 par; 3,095,000 treasury shares; balance pooled. U. S. Corporation Co., N. Y., transfer office. Listed on

New York Curb. Is practically a reorganization of the Nevada Champion Copper Co.

Property: 8 claims, 130 acres, 3 miles from Luning, Mineral Co., Nev., said to show large bodies of 3% copper ore.

Development: by 450' 3-compartment shaft and 2 tunnels. Management estimates 225,000 tons of 2½% copper ore blocked out. In 5 months in 1916, mine produced \$45,000 gross. Is erecting a leaching plant to treat its own and custom ores.

PILOT RANGE MINE

NEVADA

Luning, Mineral Co., Nev. Mrs. Fermina Serrias, owner and mgr. Mine bonded 1913.

Property: known as the Spanish Woman's mine, 40 claims, unpatented, 800 acres, in the Santa Fe district, 8 miles from the Southern Pacific railroad, shows syenite, andesite and limestone. Ores are azurite, malachite, bornite and chalcopryrite, reported to average 6% copper, 2 oz. silver and \$2 gold per ton.

Development: by shafts and tunnels with total of over 750' of workings.

Equipment: includes steam plant and several mine buildings.

Shipments of about 50 tons daily made to the Thompson smelter in 1914, and intermittently to Hazen sampler, in 1916.

PITTSBURGH-DOLORES MINING CO.

NEVADA

Yerington, Nev.

Officers: H. S. McKee, pres., Pittsburgh, Pa.; A. Vignos, v. p.; R. J. Palmer, sec.; H. W. McIntosh, treas.; E. J. Schrader, gen. mgr.; J. B. Perry, mine supt.; C. R. Olson, mill supt.

Inc. 1912 in Arizona. **Cap.**, \$1,500,000; shares \$1 par; issued 1,000,000. Bonds: authorized and outstanding, \$175,000. Annual meeting in March.

Property: 16 unpatented claims at Rockland, Mineral Co., 27 miles S. of Yerington, comprises the claims of the old Rockland mine, discovered in 1868. Ore was at first hauled to Pinegrove for treatment, but a 10-stamp mill was installed in 1870. Fire destroyed the mill soon after and the property remained idle until it came into possession of Gov. Bladell, who erected another 10-stamp mill, which was in turn destroyed by fire. In 1902 the Nevada Chief Mining Co. acquired the property and began cyaniding the ore with indifferent success until in 1912 the present company took over the mine.

Ore: quartz, containing 1% pyrite with gold and silver values, occurs in a fissure vein from 1½ to 9' wide, with rhyolite hanging-wall and granodiorite footwall. Vein strikes N. E., dips 40° E., and carries pay ore in shoots. Ore treated averages about 0.44 oz. gold and 3.4 oz. silver, value about \$10.50.

Development: by tunnels, greatest depth of workings being 1,300' and horizontal extension about 13,000'. Ore is extracted by the fill method. stulls being used in timbering. A Sullivan angle compressor furnishes air, and power for operating mine and mill is taken from the Truckee River General Electric Co.

New work, 1916, consisted of 2,900' of raising and 2,150' of drifting.

The remodeled mill, using continuous counter-current decantation, with capacity of 60-100 tons daily, went into operation June, 1915. Blake crusher and Humphrey rolls prepare ore for treatment, trommels aiding in separation and distribution of sizes, and a 5'x18' Allis-Chalmers tube mill, driven by a variable-speed motor and silent chain drive, delivers the slime, crushed in solution, to the treatment tanks. The tube mill has Belmont ribbed liners and uses mine rock for pebbles. Three Dorr agitators and

5 thickeners, operated continuously, give time and treatment for extraction. Solution, after clarifying through vacuum filter leaves, is precipitated in zinc boxes, and the precipitates melted directly in a tilting Case furnace to bullion having a fineness of 850 to 900 in silver and 5 to 6 in gold. Extraction is 90.4%. A ball mill has been recommended to replace rolls, screens, etc.

Owing to the distance of the property from the railroad, 27 miles, transportation of supplies is expensive, \$12 per ton.

Production: for 18 months to Dec., 1916, was 27,268 tons of ore, including some from dumps and tailings, yielding \$230,370. Mining costs were \$3.50 per ton, including development, and average milling cost was \$2.75. In 1916, \$18,749 was spent on construction work.

QUEEN REGENT MERGER MINES CO.

NEVADA

Office: 337 Monadnock Bldg., San Francisco, Cal.

Officers: J. D. Brown, pres.; H. B. Wade, sec.; J. E. Kerr, gen. mgr.; Wm. P. Miller, cons. engr.

Inc. 1911 in California. **Cap.**, \$2,000,000; shares \$1 par; 761,000 shares issued.

Property: 5 unpatented claims, bought June, 1915, for \$60,000, in Rand mining district, Mineral Co., Nev., 18 miles E. of Nolan, on the E. side of Walker Lake. Tract is said to cover 4,000' of the main fissure of the Rand district.

Development: by 500' main working shaft with crosscuts at each 100' level and 2 prospect shafts, each 100' deep. Vein on 1st and 2nd levels is 30'-40' wide in places, between andesite footwall and rhyolite hanging wall. On the 2nd level a 4' vein cut at 406' carried sulphides, and an 8' cross vein cut at 460' disclosed copper ore unlike the Rand, carrying sulphides with gold-silver-copper-lead, the copper content being 7% to 15%. On the 500' level dacite replaced the andesite.

Cost of sinking the 500' double compartment shaft was but \$12.41 per foot for all items, except overhead.

Property promising and management efficient.

RESERVATION HILL M. & M. CO.

NEVADA

Address: Carson City, Nev. **Mine office:** G. L. Hedges, supt., Schurz, Nev.

Officers: R. A. Trimble, pres.; W. E. Baldy, v. p.; R. A. MacKay, sec-treas., with H. R. Burlington and J. E. Monahan, directors.

Inc. 1907 in Nevada. **Cap.**, \$1,000,000; shares \$1 par; non-assessable; 788,000 issued.

Property: 2 claims, 80 acres, 1 mile from Reservation station, Nev., partly under lease to Californians.

Ore: carries silver and lead.

Development: by short tunnel and shallow shaft, the latter said to show 21" of ore that assayed high in silver, lead and gold.

A prospect.

SHIPPER COPPER MINING CO.

NEVADA

Luning, Mineral Co., Nev. Frank Everett, pres.; Jas. E. Quinlan, mgr.

Property: 2 claims, 4 miles S. E. of Luning, developed by a 400' shaft, shows a small vein of high-grade copper ore in dolomite. Shipments from which are reported to have yielded 8% copper. Management plans early resumption of development work.

SILVER DIKE TUNGSTEN MINE

NEVADA

Owned and operated by Atkins, Kroll & Co., San Francisco, Calif. Is a tungsten property, 11 miles from Sodaville, Mineral Co., Nev. Operations suspended and equipment sold to Louisiana Cons. Co.

SPARTA MINING CO.**NEVADA**

Mina, Mineral Co., Nev. W. E. Bell, pres.

Cap., \$1,000,000; shares \$1 par. Listed in Salt Lake City.**Property**: 19 unpatented claims in Gold Range mining district, with about 300' of development work, said to show 3,000 tons silver-lead ore. Is a prospect.**TODD MINING CO., R. B.****NEVADA****Office**: 203 Nixon Bldg., Reno, Nev.**Officers**: Robt. B. Todd, Sr., pres.; W. M. Gardiner, v. p.; V. C. Baker, sec.; with L. E. Aubury, H. F. Norcross and C. W. Bradley, directors.**Inc.** Jan. 12, 1916, in Nev. **Cap.**, \$250,000; \$1 par; 120,000 issued. Is the successor of the Luning Gold Mines Syndicate.

Operating expenses in 1916 were \$6,000.

Property: 18 claims, 300 acres, adjoining Luning Idaho group, in Santa Fe district, 5 miles N. E. of Luning, Nev. Claims reported to show quartz diorite cut by a 4' fissure vein dipping 45° with N. W.-S. E. course. Ore is partly sulphide, and is said to assay \$25 per ton in gold and silver.**Development**: by 300' shaft with others 100 and 120' deep; also two 700' tunnels and other shorter ones. Workings total 5,000'. About 7,000 tons of ore blocked out and now being mined for shipment.**Equipment**: aerial tram and mill contemplated.**Production**: \$25,000 to 1913. Shipping ore in 1917.**WALL STREET COPPER CO.****NEVADA****Address**: W. S. Norris, Luning, Nev.

Controlled by A. H. Howe, W. Norris and C. Evans of Goldfield, Nev.

Property: said to be one of the best in the Luning district, having shipped \$600,000 worth of ore in 18 months to Sept., 1917. Present production is 600 tons per month. Development amounts to 8,000' and the vein in one stope is 4' wide.**WEDGE COPPER CO.****NEVADA**

Luning, Nev. H. H. Hunter, managing director, Lovelock, Nev. Mark Walser and H. O. Howard, directors. Knud Freitag, cons. engr.

Inc. March, 1916, in Nevada. **Cap.**, \$1,000,000; \$1 par.**Property**: 6 claims, 8 miles from Luning, Mineral Co., is developed by crosscut tunnel cutting copper ore at 800' depth. Said to show 2' of 2% ore in a 6' vein.

In April, 1917, rich ore was reported as cut in No. 1 tunnel, and in September ore was to be sent to smelter.

NYE COUNTY**AFTER ALL MINES CO.****NEVADA****Address**: Tonopah, Nev.**Officers** Chas. E. Knox, pres.; Herman Zadig, v. p.; M. E. Albert, sec.-treas., with J. H. Evans and E. A. Keenan, directors.**Inc.** March 27, 1917, in Nev. **Cap.**, \$1,000,000; shares \$1 par; 700,000 shares issued; assessable. Annual meeting, April 3rd.**Property**: 8 claims, about 72 acres, formerly owned by the Umatilla Tonopah Mng. Co. and the Montana Tonopah M. Co. in Tonopah mining district.

Arrangements have been made whereby the mine will be developed by the Tonopah Extension Co. from the 1,540' level of the Victor shaft to the sideline of the After All property, the latter company to share the expense.

BELMONT BIG FOUR MINING CO.**NEVADA****Address**: Belmont, Nye Co., Nev.**Officers**: F. W. Spear, pres.-mgr.; L. W. Spangler, v. p.; Dr. Childs Morton, sec.-treas.

Inc. March -15, 1917, in Nevada. **Cap.**, \$125,000; shares 10c par; non-assessable; 700,000 shares outstanding. Bonds authorized, \$250,000.

Property: 16 claims, 300 acres, 8 miles west of Belmont. Claims are reported to carry molybdenite ores in a N. S. fissure vein in granite, which is 20' wide and dips at 30°, the molybdenite being disseminated through quartz which also carries silver and copper values. Ore reported to average 2% molybdenite.

Development: 150' and 400' tunnels. Company now building 100-ton mill with flotation plant. Spent \$5,000 in development in 1916.

BELMONT MILLING CO.

NEVADA

Dissolved Feb., 1917, and all property and assets taken over by the Tonopah Belmont Dev. Co., which see.

BIG PINE MINING CO.

NEVADA

Address: Manhattan, Nye Co., Nev. Operated by Mushett and Wittenberg.

Property: Big Pine claim covering the gold mineralized schist belt for 1,000'.

Development: the Mushett & Wittenberg 200' vertical shaft, sunk 350' from north end line of claim. Between the shaft and north end lines the ore found is mined by glory-hole methods, dropped to the 200' level and hoisted through the shaft. Dimensions of the glory-hole late in 1915 showed ore equal to 240,000 tons from surface to the 200' level. South of the shaft the known extent of the ore zone to the 200' level is 400' long and 60 to 75' wide, equal to 370,000 tons. Average daily tonnage hoisted is 375.

Mill: equipped with a 5x20' tube mill, which treats 125 tons daily, plates, classifiers, etc. Heads average \$5.60, tailing 40c per ton; 90 h. p. used in mine and mill. Tube mill consumes 170 lbs. pebbles per day. Operating costs are reported the cheapest in Nevada, totaling 45c.

BUCKEYE BELMONT MINES CO.

NEVADA

1055 Spitzer Bldg., Toledo, Ohio.

Mine office: Tonopah, Nev.

Officers: A. B. Tillinghast, pres.; W. B. Kober, v. p.; W. B. Voorhees, sec.; preceding officers are directors. E. F. Rowley, treas.; Letson Balliet, mgr. and supt. of properties.

Inc. 1908, in Nev. **Cap.**, \$2,000,000; shares \$1 par; nonassessable; outstanding \$700,000. Annual meeting 1st Thursday in Jan. Private corporation. Stock unlisted. Is a holding company, operating property formerly owned by Belmont Extension Mng. Co., now defunct, and holding interests in the Buckeye Eagle and Buckeye Tonopah companies. Reported in Oct., 1915, to have taken an option upon a drift gravel property in Plumas Co., Cal.

Property: 15 claims, 13 patented, 300 acres, at Tonopah, adjoining the Tonopah Belmont on a portion of the east end line.

Ore: quartz with silver sulphides and gold occurring in fissures in trachyte. Veins strike E. W. and dip 30°.

Development: 3 shafts, 125', 900', and 1,234' deep, with 5,000' underground workings. Operations in 1916 consisted of developing the 900' and 1,200' levels.

Equipment: includes 2 electric hoists, of 52-h. p. and 120-h. p., one 40-h. p. gasoline hoist and two 8-drill air compressors.

Plans for 1917 and 1918 are to deepen shaft and continue development on the 900' and 1,200' levels. There are two large veins of low-grade ore with several rich stringers. No production to date.

BUCKEYE EAGLE MINING CO.

NEVADA

Tonopah, Nev. Control held by Buckeye-Belmont Mines Co. Same officers and directorate as that company.

BUCKEYE TONOPAH MINING CO.**NEVADA**

Tonopah, Nev. Control held by Buckeye-Belmont Mines Co.; same officers and directorate as that company.

CARRARA MINING, MILLING & LEASING SYNDICATE NEVADA

Jules V. Baird, supt., Carrara, Nye Co., Nev. Company owns the Shindel and Hampton-Sutton properties and Bull Moose mine, the latter said to have been acquired from the Bull Moose M. & M. Co. in 1915 for \$156,000, in Bullfrog district on Bare Mountain, 2 miles N. of Carrara and near Beatty, Nye Co., Nev.

In the Bull Moose mine, gold ore occurs in stringers of calcite in a belt of dolomitic-limestone about 100' wide. Values average \$9, with highest values on the footwall. The Shindel orebody, 3' wide, and uncovered for over 40' contains rich pockets and stringers of gold in calcite, claimed to run as high as \$100 per ton.

Development: 130' Shindel tunnel; 2 incline shafts and tunnel on the Bull Moose.

Equipment: includes compressor and 10-stamp mill. Shipments in 1914 to Western Ore Purchasing Co., netted \$60 per ton after deducting \$21.50 for freight and treatment charges. Employs about 5 men.

CASH BOY CONSOLIDATED MINING CO.**NEVADA**

Tonopah, Nev. A. S. Ross, pres.; G. B. Thatcher, v. p.; E. H. Mead, sec.-treas.-mgr., with H. C. Price, L. A. Blakeslee, directors.

Inc. March 21, 1914, in Nev. **Cap.**, \$2,000,000; shares \$1 par, all outstanding, assessable; 6th assessment, 1c per share, called Aug. 16, 1914. Annual meeting November 21. Listed on New York Curb and San Francisco Exchange. Company is a reorganization of the Tonopah Cash Boy Cons. Mng. Co., which suspended operations in 1914 with debts of \$3,476 and 76,870 shares in the treasury. Financial statement of Cash Boy for period Nov. 21, 1914, to March 21, 1917, shows receipts of \$100,694, which includes: assessments, \$100,000; ore shipments, \$6,147; royalties, \$74. Cash on hand, \$9,870.

Property: several fractions, patented, 30 acres, at Tonopah, Nye Co., adjoin the Tonopah Merger on the west, Tonopah Victor on the south, and Tonopah Extension on the north.

Ore: gold-silver, occurs in a 3 to 10' ore shoot, E.-W. course and dip about 35° in rhyolite. Average assays said to be about \$25 per ton. About 250 tons were shipped up to April 8, 1917, and 6,000 tons of \$12 to \$15 ore blocked out.

Development: 1,480' vertical shaft, with most of the recent work on the 1,350' and 1,450' levels, where drifting and crosscutting is being done, but with unsatisfactory results.

A 180' winze was sunk from the 1450' level, striking ore 11' wide in bottom. Drifting both ways on ore shoot is progressing.

Equipment: includes a 75-h. p. electric hoist and a 3-drill air compressor.

Production: for 1915 amounted to 150 tons ore, said to assay \$15 per ton. There are no ore reserves. Property is a prospect.

COMMERCIAL MINES AND MILLING CO.**NEVADA**

Operates the Stray Dog, Indian Camp and Jumping Jack Claims. From the 85' level of the Jumping Jack 100 tons are extracted daily. Treated in the War Eagle mill of 20 stamps and a pebble mill. H. M. Thompson, supt. Manhattan, Nye Co., Nev.

DEXTER-UNION MINES CO.**NEVADA**

Idle.

Address: Manhattan, Nevada.

Officers: S. R. Moore, pres.; H. H. Brown, v. p.; Percival Nash, sec.-treas., with J. E. Monahan and R. Fred Brown, directors.

Inc. 1912 in South Dakota. **Cap.**, \$1,000,000; shares \$1 par; 800,000 shares issued.

Property: 16 patented claims, 270 acres, in Manhattan mining district. Ore contains gold and silver and is said to average \$15 per ton. Lessees reported to have produced \$40,000 worth of ore from the Union No. 4 claim.

GOLDEN CHARIOT MINING CO.

NEVADA

Address: Jamestown, Nye Co., Nev. Carl Feutsch, pres.

Property: 24 miles from Las Vegas & Tonopah R. R.

Ore: said to contain high values in copper, gold, and silver. Ore will be shipped to a point 6 miles south of Goldfield.

GREAT WESTERN CONSOLIDATED MINING CO.

NEVADA

In 1915, control of this company was acquired by the Greenwater Copper Mines & Smelter Co.

Property: 11 unpatented claims, about 300 acres, at Tonopah.

Development: by a 2-compartment shaft, 1,150' deep, which enters one of the ore-bearing formations at about 1,000'. Considerable exploration work was done on the 860' level, but it is said to have been all in cap rock and commercial ore was not found. The new management intends to explore the ground thoroughly by crosscutting. Water hindered exploration during the early part of 1917.

GREENWATER COPPER MINING & SMELTER CO.

NEVADA

Lloyd E. Marsden, sec.-treas., Room 515-E, 30 Church St., New York.

Chas. R. Miller, pres.; M. R. Ward, v. p.; preceding, with Max E. Bernheimer, Chas. Gold, W. G. Denham, Clyde Milne, Oscar A. Daube, F. I. Mallory, B. H. Campbell and W. H. Drayton, 3rd, directors. John McGee, supt., at Tonopah.

Inc. Dec. 12, 1906, in Delaware. **Cap.**, \$25,000,000; shares \$5 par. Was a securities holding company only, and owned stock in a number of Greenwater promotions, all dead, described Vol. VIII, Copper Handbook. Company, on Dec. 31, 1910, had \$144,727 invested in choice bonds, after losing about \$170,000 through the failure of Chas. Minzesheimer & Co., New York brokers, who failed Oct. 15, 1910.

Reorganized Oct., 1914, and capitalization reduced to \$500,000; shares 10c par; 3,000,000 issued. Stock listed on the N. Y. Curb. Annual report Dec. 31, 1916, showed cash assets of \$52,630, less expenses and loss on \$4,960, leaving \$47,670 net. Corporation Trust Co., Jersey City, N. J., transfer agents. Annual meeting 2nd Friday in February.

In August, 1911, company took over the O. K. and Supply groups, gold mines at Dale, Calif. Considerable work was done on the Supply mine. In 1915 a crosscut on the 700' level cut the Armenian and Jeane veins, showing practically no values. Two winzes were sunk and drifts extended on the 800-1,100' levels of the Supply vein with negative results. The values decreased with depth and on the 1,200' level no pay ore was found. All development and prospect work gave unsatisfactory results and the property was abandoned in Oct., 1915.

In November, 1915, the company acquired stock control of the Tonopah Bonanza Mining Co. and the Great Western Cons. Mining Co., at Tonopah, Nev.

The cost of shares and assessments in first-named company to end of 1916 was \$31,867, and of latter company \$14,910. For the Ruby claims, 125,000 treasury shares at par, 10c each, was paid.

Property: 25 claims, is extensively developed and located on the trend of known ore veins. Company now hopes to recoup losses sustained in California operations. Holdings described under their respective titles.

GYPSY QUEEN MINING CO.

NEVADA

Office: 265 Russ Bldg., San Francisco, Calif.

Officers: C. F. Wittenberg, pres.; F. A. Burnham, treas.

Inc. in Nevada. Cap., 1,250,000 shares. Four assessments have been called. Listed on San Francisco and Salt Lake City exchanges.

Property: 53 acres in Tonopah mining district, Nye Co., Nev., said to show silver ore. Ledge is from 1 to 5' wide. Formation is rhyolite, quartz and trachyte.

Development: by 1,370' shaft. On the 1,350' level a crosscut was run S. E. for several hundred feet. At 247' from the shaft a 4' vein was cut with ore from 8" to 18" in width. A winze, being sunk on this vein, was down 80' in March, 1916.

HALIFAX TONOPAH MINING CO.

NEVADA

Offices: 1008 Kearns Bldg., Salt Lake City, and Tonopah, Nev.

Officers: F. M. Smith, pres.; Thos. Kearns, v. p.; F. J. Westcott, sec.; C. B. Zabriskie, treas.; preceding, with Clyde A. Heller, directors. B. F. Edwards, gen. mgr., Syndicate Bldg., Oakland, Cal. J. W. Sherwin, supt.

Inc. Sept. 27, 1902, in Utah. Cap., \$2,000,000; outstanding, \$1,895,000; shares \$1 par. Stock transferred at company's office. Registrar & Transfer Co., 19 Nassau St., New York, registrar. Annual meeting, 2nd Tuesday in October. Listed on San Francisco Exchange.

Property: 4 patented claims, 81 acres, adjoining the central portion of the Belmont property on the east.

Ore: gold-silver, occurring in trachyte. For geology of Tonopah district, see U. S. G. S. Prof. Paper, 42, or Jim Butler company following.

Development: by vertical shaft, 1,734' deep, with the deeper levels at 1,000', 1,200', 1,400' and 1,700'. The 1,000' crosscut picked up the easterly extension of the Belmont vein and ore shipments were made. After considerable work the vein was lost through faulting.

In 1916 a vein reported to be about 20' wide was encountered on the 1,200' level. This vein has been stoped and drifted on and furnishes the bulk of the ore shipped.

Company drove a long crosscut for ventilation purposes on the 1,200' level to connect with the Buckeye-Belmont workings. Is raising and crosscutting from the 1,700' level, 1917.

Production: shipping about 200 tons weekly to the West End smelter.

The West End Consolidated Co. is reported to be in charge of development work, taking treasury stock in payment.

HASBROUCK MINE

NEVADA

Formerly owned by the Hasbrouck Mining Co., but abandoned after doing considerable work and bought at sheriff's sale by Geo. Kernick of Tonopah. Located 5 miles south of Tonopah. Shipments of gold ore were made during 1915.

Probably idle. No returns received.

HOTCREEK SYNDICATE TRUST

NEVADA

Idle. Property at Hotcreek, via Tonopah, Nye Co., Nev. Victor Barndt, trustee; John Lawton Butler, sec. Is not incorporated.

Property: 32 claims, unpatented, in Rattlesnake canyon, shows limestone and andesite, carrying replacements in limestone near porphyry contacts, and fault planes; orebodies reported by company to be 2 to 25' in width and traceable from 400' to more than 2,000'.

Development: by about 1,000' of workings, showing copper ores said to average 2 to 3% copper, 5 to 10 oz. silver and \$1 gold per ton. Ore at water level is disseminated chalcopyrite, of concentrating grade.

JIM BUTLER TONOPAH MINING CO.

NEVADA

Office: 501 Bullitt Bldg., Philadelphia, Pa.

Officers: Clyde A. Heller, pres.; Wm. M. Potts, v. p.; K. Kitto, sec.-treas.; R. G. Wilson, asst. sec.-treas.; C. B. Taylor, gen. counsel.

Directors: Clyde A. Heller, Wm. M. Potts, R. G. Park, H. W. Davis, S. D. Sinkler, T. W. Synnott, M. B. Cutter and J. C. Fraley; Fred'k Bradshaw, gen. supt.; L. R. Robins, mng. engr.; Clyde Jackson, supt.

Inc. Nov. 13, 1903, in Delaware. Cap., \$2,000,000; shares \$1 par; all issued; 281,979 in hands of Trustee for company. Initial dividend 10% paid Aug. 2, 1915. Distributions in 1916 were two of \$171,802 each and similar amounts in 1917.

Treasurer's statement for 12 months ended Sept. 30, 1917, shows: receipts, \$1,216,077; \$889,914 from ore sales and silver; disbursements for operation, \$386,491; and dividends, \$343,604. Cash and loans at Sept. 30, 1917, totaled \$485,982.

Company continues to make good profits, those for May, 1917, being \$50,137 from 2,925 tons of ore. In October, \$28,242 from 3,500 tons.

Property: 16 patented, 2 unpatented claims, 241.7 acres, at Tonopah, Nev.; also Ophir King group, 91.69 acres, bought at sheriff's sale Nov., 1914, for \$1,750.

Geology: of Tonopah is complex; a series of volcanic rocks, partly lava flows, partly intrusive sheets and masses of quickly varying thickness overlie one another irregularly. The productive veins are in the Mizpah "trachyte," overlaid by the Midway andesite and intruded by the West End rhyolite. The veins are cut through by the Midway andesite and do not commonly outcrop, but terminate against the Midway andesite at depths up to 1,200'. They are fissure veins which for some distance lie on or in planes of contact between eruptive rocks. Values are in gold and silver. See U. S. G. S. Prof. Paper, No. 42. The company holdings are identical in character to those of its neighbors, the Tonopah Mining and Belmont companies.

Development: is through the Desert Queen and Wandering Boy shafts. Development for fiscal year 1917 was 5,012', costing \$8.59 per foot.

Ore reserves: Sept. 30, 1917, consisted of 18,320 tons positive ore, 5,000 tons possible ore, a total of 23,320 tons, compared with 19,158 tons in preceding year; 43,594 tons were mined in the fiscal year. Further exploration of the orebodies and of virgin territory is expected to add largely to this amount. These reserves do not include any ore in the ground in dispute with the West End. Recent geological development in various parts of the mine are not encouraging. Three holes were bored from surface 915', 740', and 840', with negative results.

Ore is milled for cost plus 5% (plus 50c p. t.) by the Belmont Milling Co., with 91.45% recovery in 1915.

Recent production and Costs per ton:

	Ore, Tons	Value per Ton	(A)	Mng. Dev.	Trans.	Trmt. Chge.	Gen. Exp.	Total Oper.	Oper. Profits
1917...	40,297	\$26.12	\$1.79	\$5.17	\$0.71	\$5.33	\$0.73	\$11.94	\$12.39
1916...	46,489	19.78	1.56	4.80	0.83	4.79	0.38	10.80	7.73
1915...	48,533	19.25	1.74	4.29	1.08	5.02	0.28	10.40	7.11
1914...	34,722	21.45	2.14	5.36	1.07	5.58	0.32	12.18	7.13

(A) Deductions by ore purchasers.

The \$3,000,000 apex suit of the Jim Butler against the West End Co. for trespass and ore extracted was decided July, 1916, in favor of the West End Co. by the State Supreme Court. The suit is pending, and the West End continues to mine ore, but the revenue is impounded, the total amount being \$339,530.

JOLLY JANE LEASING CO.

Has 3-year lease on the Jolly Jane claim, of Pioneer Extension Mines Co., which see.

KANSAS CITY-NEVADA CONS. MINES CO.

Office: 411 Commerce Bldg., Kansas City, Mo.

NEVADA

NEVADA

Mine office: Bruner, Nev.

Officers: E. C. Sooy, pres.; E. M. Ridenour, 1st v. p.; B. H. McGarvey, treas.; R. E. Bruner, sec.; H. W. Bruner, gen. mgr., with Jas. B. Welsh, Wm. J. Morse, H. G. Chambers, directors.

Inc. 1915 in Nev. **Cap.**, \$6,000,000; shares \$1 par; 1,500,000 shares in treasury, Feb., 1916. Company gave 100,000 shares for the property of the Big Henry Gold Mining Co.; 2,000,000 shares to redeem the outstanding stock of the Phonolite Paymaster Mng. Co.; 800,000 shares to redeem the outstanding stock of the Phonolite Silent Friend Mng. Co., and 1,600,000 shares for the Duluth Gold Mng. Co. holdings, in the Bruner district, Nye Co., Nev.

The Paymaster property has about $\frac{1}{2}$ mile of underground workings. In the main 1,000' tunnel and orebody, 110' long, has been opened up, reported to carry gold-silver ore averaging \$20 per ton. A. E. Swain, cons. engr., reports that one ore-shoot on the 125' level is over 340' long. The 2-compartment shaft is 375' deep and levels are being driven 125', 250', and 375' below the tunnel level, which goes through the hill for over 1,000' and has exposed considerable milling ore.

A 50-ton mill is to be erected. Water will come over Ione valley, a distance of 8 miles.

Control of this property is in good hands, same company operating the El Tigre silver-gold mine in Sonora, Mexico.

MacNAMARA MINING & MILLING CO.

NEVADA

Offices: 565 Mills Bldg., San Francisco, and Tonopah, Nev.

Officers: J. L. Joseph, pres.; Mark Wulfsohn, v. p.; E. W. Elliott, sec.-treas.; J. W. Sherwin, supt.

Inc. 1914 in Calif., as a reorganization of the MacNamara Mining Co. **Cap.**, \$1,500,000; shares \$1 par; assessable. Transfer office and registrar: 565 Mills Bldg. Listed on San Francisco Exchange.

The MacNamara Mining Co. completed a mill on its property, Dec, 1912, and in 1913 treated 28,000 tons of \$8.41 ore at a loss. The management got into bad repute with the stockholders because no statements of operations were given out and stockholders were at a loss to know what had become of the money in the treasury. To provide working capital the company was reorganized under its present title and the stock was put upon an assessable basis. Two assessments of 3c and one of 2c per share have been levied. The property of the MacNamara Mining Co. was sold to the new company for 1,340,076 shares of the latter's capital stock.

Property: 2 patented claims, 12 acres, at Tonopah, said to show gold-silver ore in quartz vein in andesite.

Development: 800' shaft.

In 1914 the property was operated for 8 months; the mill treated 15,776 tons of \$11.08 ore, with 93.3% recovery.

Production: was 10,544 tons of \$7.04 ore; cost for 7 months were \$10.34 per ton. The shutdown was attributed to lack of development, shortage of money, and low price of silver. Property was not operated in 1915.

In Feb., 1916, arrangements were made with the West End Cons. Mining Co. by which the MacNamara Company could develop on its side of the property line a body of ore which the West End has exposed in its stoping operations near the line; work to be done through West End workings to avoid the necessity of MacNamara driving a 500' crosscut. The joint exploration was continued during 1916 and 1917.

Equipment: includes 100-h. p. electric hoist, compressor, 10 stamps and cyanide plant.

There is said to be a considerable tonnage of low-grade ore remaining in the mine which can be worked at a profit at present high price of silver,

Late in 1917 the mine and mill were reopened. Good developments on the Ohio vein in the West End mine adjoining led to exploration for this shoot in November. The first month's run yielded silver worth \$23,400.

MANHATTAN BIG FOUR MINING CO. NEVADA

Harry B. Ruhl, sec., Goldfield, Nev. L. K. Koontz, pres.; J. H. Thatcher, v. p.; C. Wilson, treas., with W. G. Saunders, directors.

Inc. 1906, in Nevada. **Cap.**, \$1,000,000; outstanding, \$784,000; shares \$1 par. Listed on San Francisco Stock Exchange.

Property: 60 patented claims at Manhattan, Nye Co., Nev.

Development: to 500' level by shafts. High-grade ore was extracted by early lessees and the ore remaining is exceedingly low-grade. About the only way to treat it profitably would be to mine the entire Big Four hill by steam shovels and even this method is uncertain. At last accounts Mushett and Wittenberg were trying to find the extension of the high-grade orebody.

Owens 100-ton mill, closed down 1913, but active, 1917.

MANHATTAN CONS. MINES DEVELOPMENT CO. NEVADA

Address: Tonopah, Nev.

Mine office: Manhattan, Nev.

Officers: W. J. Douglass, pres.; A. J. Zwort, v. p.; C. C. Boak, sec.-treas.; with E. J. Erickson, J. H. Miller, and R. P. Stenson, directors. M. N. Page, supt.

Inc. 1913, in Nevada. **Cap.**, \$1,500,000; shares, \$1 par; assessable; 1,350,000 issued.

Property: 5 patented claims, 82 acres, in Manhattan district, Nye Co., Nev. Litigation with White Caps company was settled in 1917, after 5 years.

Geology: ore occurs as shoots up to 42' wide in contact and chamber deposits in lime-shale. Assays from \$18 to \$30 per ton.

Development: by 300' shaft and 2,000' of workings, said to have blocked out 10,000 to 15,000 tons of \$16 ore. Rich pockets of gold and manganese were found on No. 2 level. East orebody on No. 2 level said to be 28' wide of good value.

Equipment: 50-h. p. electric hoist, 6-drill compressor, and triplex pump.

MANHATTAN DEXTER MINING CO. NEVADA

Manhattan, Nev.

Officers: S. R. Moore, pres.; C. F. Wittenberg, v. p.; Percival Nash, sec.-treas.

Inc. in South Dakota. **Cap.**, \$1,500,000; shares \$1 par. Stock listed on San Francisco Exchange.

Property: 1 patented claim, at Manhattan, Nye Co., Nev., operated intermittently by lessees in 1915-17. Union No. 9 claim has 5 sets of lessees, who are mining gold ore. Dumps are also leased and ore is treated at the Big Pine mill.

MANHATTAN MUSTANG MINING CO. NEVADA

Manhattan, Nye Co., Nev. Property is mostly held by Tram-Chase lessees, who are mining rich ore.

MANHATTAN RED TOP MINING CO., REORGANIZED NEVADA

Office: 126 Russ Bldg., San Francisco, Cal.

Mine office: Manhattan, Nev.

Officers: H. Zadig, pres.; W. E. Colburn, v. p.; C. E. Hudson, sec.-treas.; also directors. J. E. Connors, supt.

Inc. Oct., 1912, in Nevada. **Cap.**, \$1,500,000; shares, \$1 par; 1,000,000 issued; assessable. Cash on hand, \$6,000.

Property: 60 acres in Manhattan district, Nye Co., Nev.

Development: by shaft, over 100' deep, sunk in blue limestone. Is exploring for gold-silver veins.

Equipment: 40-h. p. hoist, Ingersoll-Rand compressor, drills, etc., electric power.

A prospect whose shares have been largely traded in on the San Francisco Stock Exchange.

MERCURY MINING CO.

NEVADA

G. D. Abbott, sec., 1022 Crocker Bldg., San Francisco, Calif.

Mine office: Ione, Nye Co., Nev.

Officers: C. A. Norris, pres.; F. W. Bradley, v. p.; G. D. Abbott, sec.-treas.; W. E. Goldsworthy, supt.

Inc. May 7, 1910, in Nevada. **Cap.,** \$1,000,000, all outstanding; shares \$1 par. Annual meeting second Wednesday in January.

Balance sheet for 1916 shows assets: \$53,470, which include: property and plant, \$33,573; supplies, \$2,164; stock, \$3,150; cash, \$9,692; surplus, \$4,891. Liabilities include operating accounts, \$49,898; reserve account, \$3,572.

Comparative Operating Statement:

	Gross Earnings	Operating Expenses	Operating Profits
1916.....	\$31,099	\$33,042	\$1,943(d)
1915.....	44,127	26,299	17,828
1914.....	16,110	17,868	1,758(d)

(d) Deficit.

No dividends have been paid.

Property: 10 patented claims near Ione, said to show cinnabar ore. Company has one 25-ton Scott furnace.

Production: in 1911-12, 9,467 tons ore, 2,480 flasks mercury; in 1913, 7,715 tons ore, 1,013 flasks mercury; in 1914, 2,100 tons ore, 384 flasks mercury; in 1915, 5,375 tons ore, 47 flasks mercury; in 1916, 7,314 tons ore, 399 flasks mercury. Flasks contain 75 lbs.

MIZPAH EXTENSION CO. OF TONOPAH

NEVADA

Offices: Bullitt Bldg., Philadelphia, Pa., and Tonopah, Nev.

Officers: C. E. Knox, pres.; Lambert Ott, v. p.; C. F. Griffith, sec.; W. P. M. Braun, treas., with J. F. Braun, H. W. Davis, and M. B. Cutter, directors. W. H. Blackburn, supt.

Inc. in Del. **Cap.,** 2,000,000 shares; 1,702,092 issued. Listed on San Francisco and Salt Lake City Exchanges; traded in on New York Curb:

Property: 24 claims at Tonopah, adjoining the Tonopah Mining and Tonopah Belmont properties on the N. E. Mine being worked by Tonopah Mining Co.

Ore: silver. For geology see U. S. G. S. Prof. Paper 42, Geology of the Tonopah Mining District, by J. E. Spurr.

Development: 1,000' shaft, with a winze from the 1,000' to the 1,340' level. Work during 1916 was mainly on the 1,000' level with no startling developments.

MONARCH PITTSBURG MINING CO.

NEVADA

Tonopah, Nev.

Officers: H. C. Brougher, pres., 6150 Harwood St., Oakland, Calif. W. J. Douglass, v. p.; R. B. Govan, v. p.; E. J. Erickson, sec.-treas.; with O. A. Daube, directors. B. H. Smith, supt.

Inc. in Nevada. **Cap.,** \$1,500,000; shares \$1 par; fully paid; assessable; assessment No. 8, 1c per share, levied June 21, 1917. Stock transferred at company office. Listed on San Francisco Exchange.

Balance sheet for 1916 shows assets \$1,584,925, which includes: mine property, \$1,524,971; treasury stock, \$55,137; supplies, \$374; cash on hand, \$4,303. Liabilities include: assessments paid \$82,394; unpaid accounts, \$2,359. Receipts for 1916, \$31,118; of which assessments furnished \$28,090 and cash, Jan. 1, 1916, \$1,550. Disbursements were: labor, \$12,130; vouchers, \$14,684.

Property: 3 patented claims at Tonopah, adjoining Tonopah Extension on south and west. Claims show veins with silver ore.

Development: by vertical shaft, 1,100' deep. Work in 1916 was confined mainly to the 850' and 1,000' levels, amounting to 1,916' at a cost of \$10.59 per foot.

Geological conditions were studied early in 1916, and it was decided to prospect in the extreme western ground, also north of the shaft. Highly-silicified West End rhyolite was in the 1,003' drift, and soon a typical Extension breccia was cut. Work along the contact for 180' disclosed a vein 43' wide of low value. A 90' raise opened ore that will sort to \$27.37 per ton. In 1917 several small ore-shoots were opened and shipments made to the West End mill.

MONITOR-BELMONT MINING CO.

NEVADA

Address: Belmont, Nye Co., Nev.

Officers: G. A. Nelson, pres.; W. W. Hughes, mgr.

Property: 33 claims in Belmont district, 51 miles from Tonopah, Nev. District first opened in 1864 and yielded over \$15,000,000 of silver to 1885. Mines were then closed until 1906, but it took 8 years to secure title to the present holdings. A mill was erected in 1915 and started treating old dumps in 1916.

Geology: quartz veins and lenses in slate and limestone, at or near their contact with intrusive silicious granite. Intruded rocks have been altered to mica schists and jasperoid, the minerals occurring in the quartz as bunches. Ore is chiefly an argentiferous, antimonial copper ore, with lead and silver chloride, etc.

Development: by 500' shaft. At 300' the vein is said to be 3 to 20' wide of milling grade and of good length. Exploration is now under way.

Equipment: hoist, compressor and 120-ton mill, including ten 1,600 lb. stamps with flotation plant.

With modern plant and treatment facilities and with high silver prices, this company ought to be fairly profitable.

MONTANA-TONOPAH MINING CO.

NEVADA

Tonopah, Nev.

Officers: Chas. E. Knox, pres., 300 First Nat. Bank Bldg., San Francisco; Henry D. Moore, v. p.; M. E. McCrate, sec.-treas.; with Hugh H. Brown, Dudley Baldwin, E. B. Waples, J. M. Wynn, Thos. J. Lynch and A. H. Lawry, directors.

Inc. in Utah in 1902, re-incorporated Jan. 31, 1912, in Del. **Cap.**, \$1,000,000; shares \$1 par; outstanding, 998,942. Seven dividends paid to April, 1914, total \$530,000; none since. Company is one of the oldest of the Tonopah district, and has had a very checkered career.

Property: 15 claims, about 190 acres, traversed by the Mizpah fault and showing silver ore.

Development: 865' shaft and over 15 miles of workings. Mine was closed down and the 40-stamp mill ceased operating on Nov. 15, 1914, due to exhaustion of ore reserves and low price of silver. Since then a number of lessees have been working in the mine. Management controls the Commonwealth Mining & Milling Co. of Arizona, whose mine is closed permanently.

Late in 1916 company acquired the Lost Burro mine, 50 miles W. of Ubehebe district, on western edge of Death Valley, Calif. A mill was started in July, 1917, treating \$15.50 gold ore.

NEVADA SMELTING & MINES CORP.

NEVADA

Has no operating property.

Office: Room 515 E., 30 Church St., New York. Mines near Tybo, Nye Co., Nev.

Officers: Max E. Bernheimer, pres.; L. A. Dessar, v. p.; Werner Mueller, sec.; A. W. Joseph, treas.; preceding with M. Eisenberg, Chas. Lee, L. E. Marsden, N. P. Payne, H. Rawitzer, C. J. Roberts, directors.

Inc. May, 1906, in South Dakota. Cap., \$5,000,000; shares \$5 par. Stock listed on the New York Curb. Empire Trust Co., New York, registrar. Balance on hand, March 31, 1914, was \$860.

Company realized \$4,090 on 80,000 shares of Greenwater Copper Mines & Smelter Co. stock in 1914, retaining 272,000 out of the 3,058,775 issued shares of the Greenwater Co.; also owns a controlling interest in the Tybo Cons. Mining Co., owning silver-lead properties at Tybo, Hot Creek district, Nev.

ORIGINAL MINING CO. OF MANHATTAN NEVADA

Address: Tonopah, Nev.

Officers: W. J. Douglass, pres.; F. J. Conley, v. p.; C. C. Boak, sec.-treas.; above with C. H. McIntosh and Geo. W. Short, directors.

Inc. 1911 in Nev. Cap., \$1,000,000; shares \$1 par; assessable; 450,000 issued.

Property: 4 claims, 2 patented, 80 acres in the Manhattan mining district, Nye Co., Nev.

Ore: low-grade gold occurs in vein in lime shale contact. Average assays given as \$1-\$6 gold per ton.

Development: by 200' vertical shaft with 1200' of underground workings. Idle.

ORIZABA MINING & DEVELOPING CO. NEVADA

Offices: Goldfield and Orizaba, Nevada. Company is controlled by the Diamondfield Black Butte Reorganized Mng. Co.

Officers: L. K. Koontz, pres.; L. L. Patrick, v. p.; Harry B. Ruhl, sec.-treas.; with P. V. Rovnianek and A. V. Rovnianek, directors.

Inc. 1915. Cap., \$1,000,000; shares \$1 par; 700,000 issued.

Property: 6 claims, in process of patent, 120 acres, at Orizaba, Nye county, shows gold-silver-copper-lead ore in veins 2-7' wide, occurring on a contact between limestone and granite. The main vein strikes S. 20° E., with dip 70° S. W.

C. D. Wilkinson reported on the property in Oct., 1915, and estimated 1,500 tons of \$20 ore exposed in the mine and 1,200 tons of \$12 ore on the dumps. Developed by 95' shaft with 140' east drift on that level. A prospect. Reported under option, May, 1917, to the General Mines Co.

PIONEER CONSOLIDATED MINES CO. NEVADA

Pioneer, Nev.

Officers: Wm. J. Tobin, pres.-mgr.; A. E. Blakesley, v. p.; Richard F. Tobin, treas.; Chas. J. Clayton, sec.; with Roland G. Holt and J. K. Turner, directors; E. A. Danielson, supt.

Inc. May 5, 1909, in Wyo. Cap., \$5,000,000; shares \$1 par; 3,881,562 shares outstanding, Jan. 1, 1916. Stock is listed on San Francisco Exchange. Central Sav. Bank & Trust Co., Denver, transfer agents. Annual meeting. Jan. 4th, at Cheyenne, Wyo. Statement for year ending Jan. 1, 1917, shows receipts from bullion shipments, \$11,240; stock sales, \$16,262; misc., \$2,408. Expenditures totaled \$30,349; bills payable, \$4,311; loss on year's operations, \$4,444.

Property: 12 claims, 8 patented, 180 acres, at Pioneer, Nye Co., shows decomposed rhyolite, porphyry and quartz.

Ore: occurs as a contact deposit between quartzite and limestone, of 30' average width, values being in gold with a little silver. The mine has been operated since organization of the company, but results have been retarded owing to lack of sufficient funds and failure to pick up the main Pioneer vein, believed to contain high-grade ore.

Development: by 430' vertical tunnel and over 15,000' of workings. In 1916 development work totaled 1,000' of drifting and crosscutting. New work is progressing on the 200-300' levels in 1917.

Equipment: includes electric power, 3-drill compressor, 40-h. p. hoist and 10-stamp 30-ton amalgamation and cyanide mill. The mill operated 10 months in 1916, on \$5 ore. The Nevada California Power Co. discontinued furnishing power to this part of Nevada in Dec., 1916, and company plans installation of its own power plant. Recovery by amalgamation is 60%, tailings being impounded for future treatment.

Total production to date reported at \$500,000.

Four lessees are operating on a 15 to 30% royalty basis.

PIONEER EXTENSION MINES CO. NEVADA

Office: 107 Boston Bldg., Denver, Colo. **Mine Office:** Pioneer, Nye Co., Nevada.

Officers: H. A. Riedel, pres.; T. S. Ellis, sec.; Col. A. J. Trone, treas.-gen. mgr.; Edwin S. Giles, supt.

Inc. in Arizona. Cap., \$1,500,000; shares \$1 par; 400,000 shares in treasury.

Property: the Jolly Jane claim, 20 patented acres, adjoining the Pioneer Cons., at Pioneer.

Development: by 200' shaft. A crosscut was driven from this level through rhyolite to prospect a contact 175' E. of the Jolly Jane shaft. Mine reported under 3-year lease to Jolly Jane Leasing Co., from 1916. A prospect.

RALSTON MINING CO. NEVADA

Tonopah, Nev.

Officers: Chas. E. Perry, pres.; Wm. Foreman, v. p.; T. A. MacDuff, sec.-treas.; J. H. Evans, R. J. Highland, directors.

Inc. July, 1916, in Nevada. Cap., \$1,000,000; shares \$1 par.

Property: the K. C., or Gori McBride group, east of the Halifax and adjoining the East End mine. The property was paid for with 601,000 shares at 3c.

RED TOP MINING CO. NEVADA

Address: N. K. Franklin, supt., Manhattan, Nye Co., Nev. Sinking a double-compartment shaft in limestone and crosscutting on 110' level, 1917.

Equipment: includes pump and compressor.

RESCUE-EULA MINING CO. NEVADA

Offices: 265 Russ Bldg., San Francisco, Cal., and Tonopah, Nev.

Officers: Chas. D. Laing, pres.; Herman Zadig, v. p.; with J. W. Dorsey, Joe Joseph and Wm. Edwards, directors. Chas. D. Olney, sec.; J. J. McQuillan, gen. mgr.; H. D. Moore, supt.

Inc. in Nev. Cap., \$1,500,000; outstanding, \$1,300,000; shares \$1 par; assessable. Stock transferred at company's office. Registration Surety Co., San Francisco, registrar. Listed on San Francisco and Salt Lake City exchanges and traded in on New York Curb. Assessment No. 10 was levied in Jan., 1915; total assessments to that time, \$135,000.

Profit per year ended June 30, 1917, was \$56,133. A dividend of 2½c per share was paid on June 8, equal to \$35,539. The surplus was \$33,245.

Property: the Rescue, Eula, Last Thought and Maggie May claims, 80 acres, at Tonopah, said to show silver-bearing ore in veins. Developed by an 1,100' shaft. Early in 1916 a body of milling ore was opened on the 950' level, which in July had been drifted on for 170'; 4 raises, highest 130', are said to be in ore. The 800 level is not the limit of the ore-body above the 950' level; it has now been opened up below this level.

Shipments are made to the West End mill and prospects are considered good.

ROUND MOUNTAIN MINING CO.

NEVADA

Offices: 1011 First National Bank Bldg., San Francisco, and Round Mountain, Nye Co., Nev.

Officers: L. D. Gordon, pres. and gen. mgr.; J. R. Davis, v. p.; H. G. Mayer, sec.-treas.; with W. H. Weber and W. H. Eardley, directors. R. H. Ernest, supt.; E. J. Hannah, mill supt.

Inc. March, 1906, in Nev. Cap., \$1,000,000; increased to \$1,500,000 in 1914; shares \$1 par; outstanding, \$1,320,630. Stock transferred in company's S. F. office. Anglo-California Trust Co., San Francisco, registrar. Annual meeting 3rd Monday in February. Listed on San Francisco and Nevada Exchanges.

Dividends: total \$363,965; the last one, 4c per share, was paid in August, 1913.

Balance sheet at end of 1916 showed assets totaling \$1,987,603, including \$1,655,384 for property, \$261,021 for plant, \$24,042 for supplies, and \$17,890 cash. Liabilities included bills payable, \$20,000; due Round Mountain Power & Water Co., \$120,000, and net realization undistributed, \$347,603.

The financial year has been changed to conform with the calendar year, and from April 1, 1915, to Dec. 31, 1916, results were as follows: revenue from mine and placer workings, \$503,508; expenditure on operations, \$298,686; depreciation, \$35,631; amount allowed under Federal Income Tax Law as depletion of ore deposits, \$23,970; making total deductions of \$358,287. The profit was \$145,221 in 21 months.

Property: 985 acres, 347 patented, at Round Mountain, 60 miles N.E. of Tonopah, the nearest railroad point. Claims show large low-grade gold-silver deposits mined both by lode and placer operations. The deposits are replacements along fissures and sheeted zones in rhyolite, with E.W. strike, dip 15°, average width of lode ore, 8'.

In 1914 company took over the Round Mountain Sphinx Mng. Co., thus ending several years of litigation involving apex rights in the Los Gazoabo claim. Several properties were acquired during 1916.

Development: by 1,000' incline shaft with about 10 miles of workings. Management reports a large tonnage of \$2 to \$7 ore blocked out in the mine. Lode operations toward the end of 1916 resulted in a loss. Extra exploration disclosed a large sulphide orebody at 900'. Selective mining was then undertaken, which raised the grade to \$7.10 per ton in 1916 from \$5.68 in 1915, \$6.57 in 1914 and \$5.28 in 1913. Four years lode mining indicated that operations were conducted at a small profit with the 180-ton mill and not less than 500 tons should be treated daily. Large low-grade deposits exist at surface and underground. They are the result of dissemination of gold throughout strongly silicified zones in the rhyolite mass of the mountain. In many places the rhyolite is much altered. Past operations in the better parts of this ore yielded \$4 per ton. Enrichments occur throughout and the mass will be profitable, so a large expenditure on its exploitation is justified. The ore is free milling and should yield 90% of the gold by simple amalgamation. Large scale tests are to be made. Costs in 1916 were \$5.56 per ton.

Company has several hundred acres of placer ground and estimates 8 years required to work it; 67 acres have been tested and show values of \$1 per yd. Two monitors are used, tearing down and sluicing 1,200 to 1,500 yds. a day; main tail race is 2,700' long with two 600' laterals. The high pressure pipe line is 45,000' long, is spiral steel, commencing with 30" and reducing to 20", 18" and 16"; head 600' with 400 miner's inches of water.

Total cost of the Jett Creek pipe line, water rights and placer equipment was \$192,888. Operations started in June, 1915.

Placer operations are restricted by the water supply; from April 1 to Dec. 31, 1916, there was hydraulicked 122,055 yds. of gravel, yielding 65.9c. per yd. at a cost of 51.7c., leaving 14.2c. net per yd. The total to date from placer work is 175,477 yds., averaging 79.7c. per yd., of which 32.6c. is profit.

Equipment: includes two 50 h. p. hoists, Imperial type compressor, elec. power, and 180 ton stamp mill.

Production: to end of 1916 was \$3,004,229 from 398,897 tons of ore, of which \$752,934 was profit. In 1915-16 the mill treated 67,452 tons of ore.

Company has an efficient management and has made a good record. The future depends on milling a large quantity of low-grade ore at low cost and profit from placer mining.

SHOSHONE POLARIS MINING CO.

NEVADA

Out of business since 1911. See Vol. XII.

SUNSET MINING & DEVELOPMENT CO.

NEVADA

Office: 265 Russ Bldg., San Francisco, Cal. **Mine office:** Rhyolite, Nev. Co., Nev.

Officers: Edw. S. Van Dyck, pres.-treas.; Herman Zadig, v. p., with O. A. Newcomer, directors; Chas. D. Olney, sec..

Inc. Dec. 9, 1912, in Nevada as a reorganization of the Tramps Consolidated Mining Co., Bullfrog Sunset Mining Co. and Denver Bullfrog Annex Mining Co. **Cap.**, \$5,000,000; shares \$1 par; issued, \$1,750,000. Listed on New York Curb as a prospect. Security Transfer & Registrar Co., New York, transfer agent and registrar.

Property: 20 acres, patented, in the Bullfrog district, said to show ore occurring in fissure veins in rhyolite, with dip of 30°. Veins vary from 6' to 20' in width.

Development: by 5,000' of tunnels; total underground work about 18,000'.

Reported in August, 1917, that company was to work its Denver mine near Rhyolite, repair and sink its 600' shaft 100' deeper.

Equipment: includes an electric hoist, 6-drill compressor and a 100-ton cyanide plant, making an extraction of 93% on a consumption of 0.6 lb. of cyanide per ton of ore treated. Company claims to have treated 12,000 tons in 1915, averaging \$4.40 per ton. Mine barely paid expenses the first year, but having now doubled the milling equipment it should show better results. Total cost for mining and milling in 1915 on a 50-ton per day basis was \$3.74.

TONOPAH BELMONT DEVELOPMENT CO.

NEVADA

Office: 500 Bullitt Bldg., Philadelphia, Pa. **Mine office:** Tonopah.

Officers: C. A. Heller, pres.; W. M. Potts, v. p.; J. K. Kitto, sec.-treas.; R. G. Wilson, asst. sec.-treas.; C. Berkeley Taylor, gen. counsel; C. Ducheneau, aud.; J. C. Fraley, H. C. Brougner, M. B. Cutter, C. A. Heller, R. G. Park, W. M. Potts, S. D. Sinkler, T. W. Synnott, C. B. Taylor, directors; F. Bradshaw, gen. mgr.; G. H. Garry, cons. geol. T. F. M. Fitzgerald, supt. of mine; A. H. Jones, supt. of mills; F. W. Holler, supt. of Surf Inlet companies, Surf Inlet, B. C.; L. R. Robbins, min. eng.

Inc. 1902 in N. J. **Cap.**, \$1,000,000; shares \$1 par; increased, 1906, to \$2,000,000, but \$500,000 was later cancelled, leaving \$1,500,000 outstanding. Stock transferred at company's main office. Fourth Street Nat'l Bank, Philadelphia, registrar. Annual meeting, last Tues. in May, at Camden, N. J. Listed on Philadelphia, San Francisco and Salt Lake exchanges and traded in on New York and Boston curbs.

Comparative General Balance Sheet: Tonopah Belmont Dev. Co. and Belmont Milling Co., year ending March 1:

Assets—		Ore On					
	Property	Invest's	Def. Chgs.	Supplies	Hand	Current	Total
1917..	\$1,360,717	\$20,125	\$1,078,525(c)	\$212,800	\$89,159	\$1,255,044	\$4,016,370
1916..	1,563,189	27,500	360,888(a)	188,813	108,499	1,473,522	3,722,411
1915..	2,141,473	29,453	100,040(b)	157,735	139,796	1,425,441	3,993,938

(a) \$351,325 advanced for development of Surf Inlet and other mining properties, under purchase options. (b) \$74,750 advanced for development of Surf Inlet mine. (c) \$901,074 for Surf Inlet mine and plant, also \$173,254 for other properties.

Liabilities—		Capital	Current	Res. For	Special	Surplus	Total
	Stock			Deprec.	Reserve		
1917.....	\$1,500,000	\$136,820	.....	.....	.....	\$2,379,550	\$4,016,370
1916.....	1,500,000	137,670	.....	.....	.....	2,084,741	3,722,411
1915.....	1,500,000	96,176	\$217,749	\$216,727	.....	1,963,286	3,993,938

Comparative Operating Account: year ending March 1:

	Metal	Oper.	Oper.	Total	Deduct's	Surplus	P. & L.
	Receipts	Expense	Profit	Income	(a)	Surplus	Surplus
1917	\$2,365,991	\$1,112,349	\$1,253,642	\$1,436,474	\$941,391	\$495,083	\$2,379,550
1916	2,160,522	1,184,865	975,657	1,047,768	796,756	251,012	2,084,741
1915	2,806,369	1,318,306	1,488,063	1,562,695	1,568,500	(b) 5,805	1,963,286

(a) includes dividends; \$750,018, \$750,016, and \$1,462,504. (b) Deficit.

Dividends: 20c. in 1906; 20c. in 1907; none in 1908-09; 15c. in 1910; 90c. in 1911; \$1 in 1912; \$1.10 in 1913; \$1.10 in 1914; 50c. in 1915; 50c. in 1916; 37½c. for 9 months in 1917. Total to date, \$9,330,558.

Properties: 11 claims, 161.5 acres, adjoining Montana Tonopah and Tonopah Mining on the east, at Tonopah, Nev.; the Surf Inlet Gold Mines, on Princess Royal Island, B. C.; option on this property was exercised Dec. 31, 1915; the partly developed Bull Moose gold mine, near Carrara, Nye Co., Nev., taken under a 2-year option, the Biddlecome mine, near the Bull Moose, taken under a long-term option.

Reported in April, 1915, that an option had been taken on the Potosi gold mine of the Tunkey Mining Co., in Nicaragua, 20 miles from the Tonopah Mining Co.'s Eden mine. If the option is exercised it is proposed to organize a \$2,000,000 company, of which Tonopah-Belmont will own 51% and the Tunkey Mining Co. 49%. Reported in May, 1916, that an option had been taken on the Emma gold mine, in the Cone mining district, Dolores Co., Colo.

The Exploration Department in 1916-17 examined 53 properties out of 200 submitted and secured options on the Eagle Shawmut mine in Tuolumne Co., Cal.; the Emma mine in San Juan district, Colo.; and several claims E. of the Belmont at Tonopah, Nev.

The Eagle-Shawmut is opened to 2,300', and has produced gold worth \$4,500,000. Future of this mine lies in the downward extension of the main ore shoot of the main vein. This shoot has been continuous from surface to 2,300' depth. On No. 16 level, the lowest, the shoot consists of a series of closely jointed or overlapping lenses of sulphide ore, with a length of 490' on the vein, 10' wide and worth \$7.50 per ton. Positive and probable reserves amount to 159,000 tons. At least 400 tons daily should be treated when development warrants it. The mill is to be remodeled.

The Emma mine, at Dunton, Dolores Co., Colo., is operated through tunnels on the vein, the lowest, No. 5, being 3,285' long. This shows 1,240' of ore in 5 shoots. Future lies in ore below this tunnel and exploration must be by shaft.

Geology: (at Tonopah) the district is made up of a thick series of rhyolitic and andesitic rocks, which is faulted in a very intricate manner, together with the accompanying veins. The deposits are quartz veins, in part filled and in part replacement, intersecting the earlier andesite and to some extent entering into the underlying rhyolite. Principal ore minerals are argentite and polybasite, with small amounts of pyrite, chalcopyrite, galena, zinc blende and gold. Veins vary in width from 3' to 25'. The principal producer of the Tonopah Belmont has been the Belmont vein, cut off near 1,500' depth by the Mizpah fault; the veins now producing are not as productive as they were.

Development: at Tonopah, by 3-compartment vertical shafts. The Desert Queen workings had an 1,427' shaft and 36,758' of workings, March 1, 1917. The Belmont workings have a 1,718' main shaft and 121,116' of workings. New work amounted to 19,276' in fiscal year ending March 1, 1917, compared with 21,362' during the previous year.

Ore reserves: totaled 98,694 tons, March 1, 1917, compared with 142,164 tons the previous year. Recent developments at 800' and 1,100' have been satisfactory. In July there was treated 10,782 tons of ore, yielding \$98,738 net. In October, 10,087 tons of ore yielded 116,758 oz. silver, 1.138 oz. gold and \$51,876 profit.

Equipment: includes the old reduction mill at Millers, Nev., operated as a custom mill and the 60-stamp mill of the Belmont Milling Co., at Tonopah; operations started July, 1912. For a detailed description of this plant see Trans. A. I. M. E., August, 1915. To treat custom ore, this mill is being enlarged. Nov., 1917.

Production: Tonopah plant, year ending March 1:

	Tons Milled	Value p. Ton	Oper. Mine	Costs p. T. Extr.	Profit %	p. Ton	Production—Oz.	
							Gold	Silver
1917	144,762	\$17.54	\$4.65	\$2.76	93.35	\$8.64	27,831	2,629,466
1916	165,157	13.88	3.92	2.68	92.97	6.59	31,112	2,968,565
1915	181,424	16.74	4.02	2.56	92.99	....	40,591	3,714,862
1914	172,398	21.08	4.35	3.05	94.45	8.83	44,465	4,251,746
1913	60,359	24.21	4.35	3.66	94.43	12.42	38,371	3,826,399
1912	87,349	20.84	4.85	3.36	.....	14.31	45,069	4,535,762

The Millers plant treated 47,795 tons of custom ore, yielding a profit of 35c per ton to the company. This plant is being dismantled and re-erected at the Eagle Shawmut mine in California.

To offset the decreasing production of the original claims at Tonopah, the company has been branching out, acquiring new properties, thus making the company a permanent organization independent of the life of the Tonopah mines. With silver at around \$1 per oz., the Belmont can make large profits, yet it is apparent that reserves are not keeping pace with the ore milled.

Management is highly efficient and publishes results in great detail.

TONOPAH BONANZA MINING CO.

NEVADA

Control of this property was acquired, 1915, by the Greenwater Copper Mines and Smelter Co., which see.

Property: 15 unpatented claims, 380 acres, at Tonopah, Nev., increased 1916 by acquisition of the Desert King Mining Co.'s property, 40 acres, adjoining on the S.E. The claims which lie in the western section of the district, had a 2-compartment shaft, 1,100' deep, when new company took

over the property and some crosscutting had been done on the 600' level, but no commercial ore had been developed.

Latest advices state that in April, 1917, the shaft was 1,650' deep and a pump was being installed.

TONOPAH EXTENSION MINING CO. NEVADA

Office: 30 Church St., New York. Mine office: Tonopah, Nev.

Officers: M. R. Ward, pres.; S. A. Brown, v. p.; W. G. Benham, sec-treas.; J. G. Love, asst. sec-treas.; John G. Kirchen, gen. mgr., Tonopah; S. A. Brown, B. H. Campbell, J. G. Kirchen, W. R. Rose, M. R. Ward, directors.

Inc. 1902, in Ariz. Cap., 2,000,000 shares; \$1 par; non-assessable; outstanding, 1,282,801. Original capital of 1,000,000 shares was increased June, 1915, to 2,000,000 and issue authorized of 156,294 shares for acquiring Tonopah Merger and 173,074 shares for Tonopah Victor Co. U. S. Corporation Co., 34 Nassau St., New York, transfer office and registrar. Annual meeting, in May. Listed on San Francisco and Nevada Stock Exchanges and on the New York Curb.

Comparative General Balance Sheet: year ending March 31:

Assets—						
	Property & Equip.	Supplies	Invest's	Bullion & Cash	Other Current	Total
1917.....	\$1,692,766	\$134,965	\$179,945	\$319,586	\$12,238	\$2,339,500
1916.....	1,636,283	97,892	209,470	206,507	156,387	2,306,539
1915.....	1,217,246	79,048	130,462	190,606	128,208	1,745,570

Liabilities—				
	Cap Stock	Current	Surplus	Total
1917.....	\$1,282,802	\$246,184(c)	\$810,514	\$2,339,500
1916.....	1,272,801	194,126(a)	839,612	2,306,539
1915.....	943,433	134,450(b)	667,687	1,745,570

(a) Includes dividend No. 18, payable April 1, 1916, \$127,267.40. (b) Includes dividend No. 14, payable April 1, 1915, \$70,756.54. (c) Includes dividend No. 22, paid April 2, 1917.

Comparative Profit and Loss Statement: year ending March 31:

	Receipts Metal	Total Income	Oper'g Expenses	Admin. & Gen.	Treat. & Trans.	Profit For Year
1917.....	\$1,707,174	\$1,663,918	\$963,020	\$43,863	.....	\$673,394
1916.....	1,532,900	1,555,639	859,089	66,017	46,112	584,421
1915.....	1,289,817	1,341,620	662,269	50,140	32,319	596,892

Dividends: (calendar year) 15% in 1905; 15% in 1906; -5% in 1912; 15% in 1913; 20% in 1914; 32½% in 1915; 54% in 1916; and 15% in 1917.

Total dividends to June, 1917, \$1,877,552. Present rate, 10c. per share quarterly, increased to 15%, July 1, 1916.

During the fiscal year 1910-11 the company acquired the properties of the Red Rock Cons. Mining Co., McKane Mining Co. and Pittsburg Tonopah Extension Mining Co. and in June, 1915, properties of the Tonopah Merger Mining Co. and the Tonopah Victor Mining Co.

The Sully claims of 77 acres was bought for \$10,000 in 1916.

Property: 628 acres in the Tonopah mining district, Nye and Esmeralda counties, Nev., adjoins Tonopah Mining Co. on the W. and West End Cons. Mining Co. on the N.

Geology: ore carries silver and gold in quartz veins in rhyolite, trachyte and volcanic breccia. The ore minerals are argentite, stephanite, polybasite, some proustite and pyrargyrite. There are 3 main veins, from N. to

S., the North Merger, O. K. and Murray, of which the Murray is the most important, showing a stoping width of 14'. The veins strike N. 45° W., S. 70° W., and N. 70° W., with dip 20 to 70°, growing steeper with depth. The orebodies occur in shoots ranging in width from 3-25', with a maximum length of 450' for any single shoot.

Ore treated during year ending March 31, 1917, assayed 18.91 oz. silver and 0.18 oz. gold per ton, a decrease from previous year of 6.02 oz. silver and 0.06 oz. gold per ton.

Development: by 2 vertical main working shafts, viz., the Extension No. 2, 950', and the Victor, 1,759' deep. New work amounted to 12,017' in fiscal year ending March 31, 1917, compared with 13,967' in 1916. Total underground workings, Feb., 1917, 127,265'. Ore is extracted by overhead stoping and subsequent waste filling.

Work in 1916 proved a new 5' vein of \$20 ore, between the Merger and O. K. veins. During the past year at No. 2 shaft the Murray ore shoot was stoped out at 1,260', and at 1,350' is almost exhausted. The O. K. vein also supplied a good quantity and quality of ore. The Merger vein E. block will continue to yield ore for some time to come.

At the Victor shaft only part of the Murray has thus far been stoped at 1,440' while on 1,540' level it has produced a large amount of ore, though of low grade. Exploration work up to Sept., 1917, has developed nothing new of importance.

Ore reserves: The company has not given any estimate of blocked out ore to calculate reserves; conditions were, however, so favorable that the mill capacity was increased 25% in 1916, resulting in a saving of 85.5c. per ton in milling compared with costs for the previous year. Development in 1916-17 did not open as good ore as anticipated.

Equipment: at the mine includes a 150 h. p. Hendrie-Bolthoff hoist, 150 h. p. Nordberg hoist, Dean duplex and Aldrich quintuplex pumps, 2 Chicago Pneumatic Tool Co.'s compressors of 1,700' capacity, and tramway from mine to mill. All machinery is electrically driven. The 50-stamp mill, cyanide plant and concentrator have a daily capacity of 400 tons.

In Sept., 1917, an auxiliary 500 kw. power plant was tested. This is to generate electricity when the Nevada-California Power Co.'s supply fails.

Production: (year ending March 31)

	Tons Milled	Value Per Ton	Extr. %	Oper. Cost p. Ton			Metal Sold—Oz.	
				Mine	Mill	Total	Silver	Gold
1917	109,402	\$17.107	....	\$4.90	\$3.62	\$8.82	1,882,402	18,052
1916	91,981	18.038	92.39	4.61	4.48	9.59	2,106,519	20,576
1915	71,882	19.966	89.57	5.19	3.75	9.39	1,790,032	17,585

In July, 1917, the profit from 9,476 tons of ore was \$36,225. The July dividend was passed, owing to decrease in profits. It would appear that the mine is not in as good physical condition as 18 months ago, in spite of exploration at depth. Management is capable and careful. In October, 9,393 tons of ore yielded 82,725 oz. silver, 836 oz. gold, and \$13,228 profit.

TONOPAH MIDWAY MINING CO.

NEVADA

Office: Tonopah, Nev.

Officers: H. C. Brougher, pres.-mgr.; R. P. Stenson, v. p.; E. J. Erickson, sec.-treas.; J. M. Gregory, W. Brougher, R. B. Govan, W. J. Douglass, directors; W. J. Douglass, supt.

Inc. in Ariz.; reorganized, 1915, in Nevada. **Cap.,** 1,500,000 shares; \$1 par; assessable; outstanding, 1,132,096. On June 25, 1917, assessment No.

4, of 1c. per share, was levied. Annual meeting, in February. Listed on San Francisco and Salt Lake Stock Exchanges.

Property: 5 patented claims, 50.58 acres, in Tonopah district, said to show silver and gold ore. The quartz vein in trachyte dips 45° and pay ore occurs in shoots.

Development: by 2 shafts, 1,350' and 835' deep.

Operating expenses for year ending February, 1916, were \$25,788 and earnings \$11,088; all received as royalties. Developing.

TONOPAH MINING CO. OF NEVADA.

NEVADA

Office: 572 Bullitt Bldg., Philadelphia, Pa. **Mine office:** Tonopah, Nev.

Officers: J. S. Austin, pres.; J. Harvey Whiteman, v. p. and gen. counsel; C. A. Higbie, sec.-treas.; W. W. Charles, comptroller, with J. S. Austin, C. A. Daniel, C. R. Miller, C. A. Higbie, H. D. Moore, J. H. Whiteman, S. Bell, Jr., directors. W. H. Blackburn, mine supt.; F. F. Heydenfeldt, mill supt.

Inc. July 12, 1901, in Delaware. Cap., 1,000,000 shares; \$1 par; all outstanding. Annual meeting, May. **Transfer office:** 572 Bullitt Bldg., Philadelphia Pa. Listed on Philadelphia and San Francisco Stock Exchanges and on New York and Boston Curbs.

Comparative General Balance Sheet: year to March 1, and to Dec. 31, for 1916 and thereafter:

Assets—						
	Prop & Equip.	Invest's	Loans & Advances	Def'd Ch'g's	Other Current	Total
1916.....	\$127,234	\$3,085,876	\$1,480,667	\$226	\$661,222	\$5,355,224
1915-16....	113,530	3,147,832	911,532	1,603	512,364	4,686,861
1914-15....	162,970	3,104,511	566,265	1,370	929,178	4,764,294
Liabilities—						
	Capital Stock	Deprec. Reserve	Current	Net Surplus	Total	
1916.....	\$1,000,000	\$320,502	\$356,605	\$3,678,117	\$5,355,224	
1915-16.....	1,000,000	250,000	53,941	3,382,920	4,686,861	
1914-15.....	1,000,000	50,000	64,760	3,649,534	4,764,294	

Comparative Income Account: year to March 1 and Dec. 31, for 1916 and thereafter: Tonopah Mining Co. and Desert Power & Mill Co.:

	Metal Receipts	Oper. Expense	Net Income	D. P. & M. Co.	Divid's & Deprec'n	P. & L. Surplus
1916.....	\$1,141,181	\$823,093	\$918,065	.....	\$560,502	\$3,748,127
1915-16..	1,831,589	1,380,693	783,064	150,629	1,089,678	3,704,259
1914-15..	.....	1,628,648	925,557	124,567	1,165,234	3,860,244

Dividends: 1905, 75% of capital stock; 1906 and 1907, 120%; 1908, 50%; 1909, 130%; 1910, 150%; 1911 and 1912, 160%; 1913, 145%; 1914, 100%; 1915, 90%; 1916, 45%; total dividends paid to Oct., 1917, amounted to \$14,200,000. Present rate 60c. per share, payable quarterly.

Property: 160 acres at Tonopah, Nye Co., adjoins Tonopah Extension on the east and north and Jim Butler Tonopah Mining Co. on the north. Also owns the entire stock, \$400,000, of the Desert Power & Mill Co., and controlling interest in the Tonopah & Goldfield R. R. Co., 55% in the Eden Mining Co., and 83¼% in the Tonopah Placers Co. Acquired a 2-year option (extended to Jan., 1918) on the property of the Mizpah Extension Co., and began development work on Jan. 1, 1915. The Eden Mining Co., which see, is a Nicaragua company. Also owns \$30,000 capital stock of the Esmeralda Power Co. The company has acquired property in the

Schist and Flin Flon lake district in Ontario and is doing considerable diamond drill work there; also owns 92% of the Tonopah Canadian Mines of Manitoba, 92% of the Tonopah Nicaragua M. Co. and the Mandy Mining Co., of which Tonopah Canadian owns 85%. For descriptions see under respective titles.

For geology of the Tonopah district, see Tonopah-Belmont Mining Co. and Tonopah Extension.

Development: to a depth of 1,500', chiefly through the Mizpah, Desert Queen, Silver Top and Red Plume shafts. The Mizpah shaft is bottomed at 1,500', but lateral development has not been done at depth. Yearly development work during the past few years has been at the rate of about 17,000'. Total workings aggregate 40 miles, mainly above the 650' level.

In 1916 the Red Plume shaft was shut down and the hoist moved to the Sand Grass, which is 1,500' deep and is connected with the 1,170' level of the Merger shaft. Monthly advance about 200', Sept., 1917.

Production: for 10 months (financial year altered) ending Dec. 31, 1916, was 81,782 tons of ore averaging \$15.65 per ton. It contained 15,636 oz. gold and 1,387,557 oz. silver, of which 94.2% and 90.3% was extracted, respectively. Manganese silver compounds interfered with treatment to the extent of 0.2%.

Ore Reserves: estimated Dec. 31:

	Tonnage	Value		Tonnage	Value
1912	200,702	\$3,062,661	1915	53,493	\$ 798,789
1913	172,761	2,485,795	1916	72,100	1,206,821
1914	102,056	1,525,731			

Equipment: 100-stamp mill at Millers, Nev., 12 miles from the mine, operated under name of Desert Power & Mill Co., employs the concentrating leaching and sliming processes.

Production:

	Tons Treated	Value p. Ton	Costs Per Ton				Metal Loss	Profit p. Ton
			Mine	Mill	M'k't'g	Total		
1916(b)	81,782	\$15.65	\$4.61	\$3.16	\$0.94	\$8.71	\$1.34	\$5.60
1916(a)	136,246	13.66	3.87	2.94	.97	7.78	1.11	4.77
1915	143,432	16.25	4.40	2.96	1.15	8.51	1.23	6.51
1914	163,387	17.79	3.28	2.81	1.32	7.41	1.96	8.42
1913	173,336	18.16	3.27	2.67	1.25	7.19	1.85	9.12

(a) to March 31; (b) to Dec. 31.

In July, 1917, the profit from 7,452 tons of ore was \$40,300. In October, 11,400 tons yielded bullion worth \$100,450, and \$17,075 profit.

Mine costs include cost of handling dump ore. Marketing costs include freight.

The productive life of the Tonopah property is nearing an end; to counteract this and to make a permanent dividend-paying organization, new properties have been acquired. There is no doubt that the plan will succeed as the management is thoroughly experienced and capable.

On Sept. 1, 1917, J. E. Spurr, in charge of the Exploration Department, resigned, and the department was discontinued. From Jan., 1912, to Jan., 1917, the cost was \$261,108, and total value of results, \$7,858,601.

TONOPAH NORTH STAR TUNNEL & DEV. CO. NEVADA

Office: 265 Russ Bldg., San Francisco, Cal. Mine Office: Tonopah,

Nev.

Officers: H. Zadig, pres.; C. D. Olney, sec.; A. H. Lowe, supt.

Inc. 1912, in Nev. Cap., \$1,000,000; \$1 par; assessable. Company's

San Francisco office, transfer agent and registrar. Annual meeting in April. Listed on Salt Lake Stock Exchange.

Property: 5 claims, Ivanpah, Elaine, Pyramid Fraction, Crosscut and Crosscut Extension, 46 acres in Tonopah, said to show gold and silver ore.

Development: by shaft, 1,250' deep; lateral workings total about 5,000'.

Soon after reorganization the company struck a shoot which yielded some hundreds of tons of shipping ore in 1913 and 1914, but the shoot proved of limited extent and shipments declined. In 1916 the property shipped a moderate tonnage to the West End mill.

In April, 1917, shipments assayed \$30 per ton. Stope No. 2 from the 1,059' drift showed 30 inches of ore. Owners appear optimistic at last reports.

TONOPAH 76 CONSOLIDATED MINING CO. NEVADA

Address: R. J. Highland, Tonopah, Nev.

Officers: M. R. Averill, pres.; T. J. Lynch, v. p.; with W. S. Harris and L. L. Blumenthal, directors.

Inc. 1911, in Nev. **Cap.**, 1,500,000 shares; \$1 par; non-assessable; outstanding, 1,255,575. No annual meetings since July, 1913. Listed on San Francisco Stock Exchange.

Property: 5 patented claims and fractions, about 60 acres, ½ mile W. of Tonopah.

Development: by vertical shaft 300' deep.

Equipment: includes a 60-h. p. electric hoist. Is prospecting.

TONOPAH VICTOR MINING CO. NEVADA

Out of business. Property acquired by Tonopah Extension Mining Co., Tonopah, Nev., which see.

UMATILLA-TONOPAH MINING CO. NEVADA

Merged with the Montana Tonopah Mining Co. in May, 1916, as the After All Mines Co., which see.

UNION AMALGAMATED MINING CO. NEVADA

Address: Manhattan, Nev.

Officers: C. F. Wittenberg, pres.; J. H. Forman, v. p.; Percival Nash, sec.

Inc. in Nevada. **Cap.**, 2,000,000 shares; 10c. par. C. D. Olney, 265 Russ Bldg., San Francisco, Calif., transfer agent. Company is a merger of the Manhattan Amalgamated Mining Co., Litigation Hill Merger Co., and the Manhattan Earl Mining Co. The three properties have produced 9,615 tons ore returning \$183,848, ore running from \$15 to \$21 per ton.

Property: 6 claims, 74 acres, 3 claims patented, covering Litigation Hill at Manhattan, Nye Co., said to show gold-silver ore in fissure veins, from 4-8' in width.

Development: mainly by a 600' shaft, at which depth work has lately been concentrated. Reported in Oct., 1917, that many faces of milling ore are exposed. Water and bad air have interfered with work.

Equipment: includes electric hoists, transformers, surface track, ore cars and the Manhattan Milling and Ore Co.'s 10-stamp mill, cyanide plant and sampler.

Total production: of the properties merged, about 10,000 tons; value \$15 to \$21 per ton. A large amount of mill ore, running \$7 to \$10 per ton has been developed by lessees, which will be treated in the mill, recently overhauled and repaired.

In Sept., 1917, an option for control was given a syndicate headed by Whitman Symmes.

WEST END CONSOLIDATED MINING CO. NEVADA

Office: Syndicate Bldg., Oakland, Cal. **Mine office:** Tonopah, Nev.

Officers: F. M. Smith, pres.; B. F. Edwards, v. p.; G. C. Ellis, sec.; preceding with R. L. Oliver, W. J. Douglas, C. P. Murdock, directors. R. C. Bowen, asst. sec.; J. W. Sherwin, gen. supt.; J. H. Blair, aud. and purch. agt.; F. C. Ninnis, mill supt.

Inc. 1906, in Ariz. **Cap.**, 2,000,000 shares; \$5 par; nonassessable; outstanding, 1,788,486. No bonded indebtedness. Listed on San Francisco Stock Exchange and New York Curb. Registrar & Transfer Co., New York, transfer agt. and registrar.

Balance sheet for 1916 shows total assets of \$1,366,819, of which \$127,009 is for plant, \$506,897 for investments, \$277,018 in escrow, \$133,058 cash, \$75,000 for litigation cost and \$247,147 bullion, loans, etc. The surplus was \$916,857. Income in 1916 was \$1,249,932, of which \$89,424 was paid in dividends. The surplus was \$8,442. Of the profits, \$200,046 was deposited in escrow pending the apex suit.

Dividends: in 1913, 5c.; in 1914, 15c.; in 1915, 10c.; in 1916, 5c.; in 1917, to May, 5c. Total dividends to May, 1917, \$715,424.

Property: 10 patented and 4 unpatented claims, 184 acres in the Tonopah district. Whether there are two veins or one, the direction and angle of the dip, strike, etc., were the subject of litigation in the suits with the Jim Butler company during 1916, in regard to apex rights of the West End MacNamara vein. This suit was decided in the lower courts in favor of the West End but is still pending in the higher courts and will probably be decided late in 1917. As ore has been mined from the disputed area, about \$340,000 is deposited in escrow pending the decision.

For geology of the district see Tonopah Bonanza.

Development: by 3 shafts, deepest 1,000' with underground workings, aggregating more than 10 miles. Ore reserves are not officially reported. While some work is done in the disputed ground, recent work has been devoted to a new vein in the Ohio section of the property. On the 500' level a wide body of \$30 to \$50 ore is being opened. This has every evidence of persistency.

Equipment: includes hoists, buildings, compressors, etc., and a stamp mill and cyanide plant. The daily capacity of the mill was originally 100 tons, but has been increased to 225 tons. Total cost of plant is more than \$170,000. Considerable ore is treated from other mines.

Production—

	Ore Treated	Extraction %	Gross Value	Silver oz.	Gold oz.
1916.....	61,535	91.22	\$1,319,651	1,351,658	14,752
1915.....	56,976	90.92	958,657	1,210,038	13,219

Recent shipments have been about 100,000 oz. of silver-gold bullion monthly.

The company's position is greatly improved by late developments and the high price of silver, and if the disputed ore is given to it further profits should accrue.

WEST END EXTENSION MINING CO. NEVADA

Tonopah, Nev.

Officers: (in 1912) Franz Sigel, pres.; Frank S. Harris, v. p.; with Daniel O. Hulse, M. T. Rowland and Jas. M. Satterfield, directors.

Inc. in Del. **Cap.**, \$1,000,000; issued \$600,000; shares \$1 par. U. S. Corp. Co., New York, transfer agent and registrar. Listed on New York Curb as a prospect.

Property: 4 claims, the Bank group, 70 acres, at Tonopah; adjoining West End Cons. on the north and Tonopah 76 on the west. Letters returned in May, 1917.

WHITE CAPS EXTENSION MINES CO. NEVADA

Address: J. G. Kirchen, Reno, Nev. **Mine office:** Manhattan, Nev.

Officers: J. G. Kirchen, pres.; J. H. Miller, v. p.; A. G. Raycraft, sec-treas., with Hugh H. Brown and W. L. Mangum, directors.

Inc. 1917, in Nev. **Cap.**, \$200,000; shares 10c. par; assessable; 1,595,005 issued.

On June 30, 1917, assets amounted to \$191,074, of which \$130,384 was for property and plant and \$60,720 cash and accounts receivable. Current liabilities were \$462.

Property: 13 claims, in Manhattan district, said to show ore deposits occurring as chimneys in limestone, with 50° dip. Ore carries gold and a trace of silver.

Development: by 560' vertical shaft.

Equipment: includes 50 h. p. Hendrie-Bolthoff hoist, Chicago Pneumatic compressor, drills and pump, all motor driven.

Property: is in development stage, but is backed by strong interest and regarded as promising.

WHITE CAPS MINING CO. NEVADA

Offices: J. G. Kirchen, Reno; J. A. Cole, supt., Manhattan, Nev.

Officers: A. G. Raycraft, pres.; C. F. Wittenberg, v. p., with H. R. Cooke, J. G. Kirchen and C. J. Blumenthal, directors. P. S. Booth, sec-treas.

Inc. June 7, 1915, in Nevada. **Cap.**, \$200,000; issued \$160,000; shares 10c. par. U. S. Corporation Co., New York, transfer office and registrar. Listed on New York Curb, in San Francisco and on the Nevada Exchanges.

Balance sheet of April 30, 1916, the last available, shows **assets:** property and equipment, \$248,069; cash, \$10,336; accounts receivable, \$5,712. Liabilities show surplus April 30, 1916, end of fiscal year, \$118,659; current liabilities, \$13,549.

Property: 2 claims, near Manhattan, Nye Co., Nev. Apex litigation has been started by the Morning Glory company adjoining.

Geology: the ore is a replacement of limestone by quartz, pyrite, arsenopyrite and stibnite. Calcite is abundant, also realgar. Faulting is common. In the upper levels ore averaged 1.02 oz. gold and 0.02 oz. silver per ton. The sulphide ore is refractory, requiring special treatment.

Development: by a 550' vertical shaft with levels at 210', 310', 435' and 500', also an old 225' incline shaft. Two ore shoots, opened in 1916, showed 10' of \$40 ore and 3' of \$124 ore, respectively. Ore below 210' level carries primary sulphides. Work in 1916 was largely on the 310' level, searching for the downward extension of orebodies opened on levels above. Late in February, 1917, the east orebody was cut on the 435' level, assaying up to \$172 per ton. On this level the lens is 195' long, 34' wide, averaging \$36 per ton. This shoot was cut at 550', where it is 24' wide and 200' long, assaying \$24.80 to \$28.40 per ton. Much water has to be pumped.

Equipment: includes hoist, compressor, drills, with sharpener. Cameron pump, all motor driven, and 125-ton mill with rolls, trommels, Wedge roasting furnace, tube-mill and cyanide plant. Extraction is said to be 85%. Treatment problem at this mine was discussed by J. G. Kirchen in the E. and M. Journal of November 24, 1917. A 90% extraction is indicated at a milling cost of \$2 per ton.

Production is said to total 19,900 tons oxidized ore, average value \$19 per ton, all from above the 210' level.

Sulphide ore treatment commenced on August 22, 1917, but it was not until late in September that the plant was working well. By 1918 profits should be made, providing the ore yields to present treatment. From February to June the shares were dealt in at San Francisco in large numbers, the price rising over \$2. Company is backed by well-known Nevada men.

WOLFTONE EXTENSION MINING CO. NEVADA

Address: V. J. Bonaby, sec., 110 Sutter St., San Francisco, Cal.

Dividends paid in 1914 amounted to \$2,820.

Property in Manhattan district, Nye Co., Nev., is under lease. In the Sunrise and African claims are 12 parallel quartz veins, 2 to 12" wide, supposed to be feeders to the main orebody that should be found in the limestone. Ore from a shaft on the Sunrise yielded \$18 gold per ton.

ORMSBY COUNTY

UNITED MINING CO. NEVADA

Mine office: Carson City, Nev.

Officers: H. D. Cowden, pres. and gen. mgr., Bloomington, Ill.; R. H. Hington, treas. and gen. supt.; F. W. Boston, sec.; L. B. Perry, asst. sec.

Inc. 1905, in Nev. **Cap.**, \$3,000,000; shares \$1 par; non-assessable; 500,000 preferred and 2,500,000 common; issued \$1,876,150.

Property: 34 claims. 680 acres, in the Delaware district, 12 miles from Carson City.

Geology: country rock is granite, cutting sedimentary and intrusive rocks. Claims show 4 fissure veins in andesite and porphyry, capped by a strong iron gossan up to 200' in width. The limestone is highly crystallized and intruded by porphyry dikes. Ores developed are azurite and malachite with some copper oxides and silicates succeeded by sulphide ore at a shallow depth.

Development: by shafts of 100' and 450', numerous test pits and prospect tunnels. The veins vary greatly in width, the principal orebody said to be 7 to 12' wide, so far as developed.

Equipment: includes a 25-h. p. gasoline hoist, a 90-h. p. gas engine with air compressor of 5 drills capacity and a sinking pump, with about 8 buildings. Management reported, Jan., 1916, "property is not working now, as we are looking for some process that will enable us to handle our ores and have our own plant."

Reported in 1915 that the Nevada mine was abandoned and stockholders given shares in the Boston American Mining Co., an equally unpromising and doubtful proposition. It is evident from the misrepresenting literature sent out by these companies that the management prefers to mine the public instead of its mines.

Letters returned in May, 1917.

STOREY COUNTY

ALTA SILVER MINING CO. NEVADA

Address: 1026 Mills Bldg., San Francisco, Cal.

Directors: Geo. S. Sturges, Edw. B. Sturges, R. B. Worthington and Chas. H. Seoy. Geo. S. Sturges, Nevada agent.

Outstanding stock, Sept., 1917, 78,383 shares. A 3c. assessment called in 1916. Assessments levied have furnished necessary capital for repairs and development work.

Property: in Gold Hill section of the Comstock, Nevada.

Development: Old workings and 2,150' shaft said to show gold-silver-lead ore. Drainage connection is made with the Sutro tunnel at 1,100'

level. Idle owing to extensive interests of owners in other mining enterprises, which require all available capital.

ANDES SILVER MINING CO.**NEVADA**

Office: 381 Bush St., San Francisco, Cal., and Virginia City, Nev.

Officers: H. Zadig, pres.; Wm. Bannan, v. p.; J. W. Twiggs, sec.; Wells Fargo National Bank, treas.; W. W. Turney, Wm. Bannan and W. H. Moise, directors; Walter Techow, mgr.

Inc. Dec. 18, 1873, in Cal. Cap., authorized and outstanding, \$100,000; shares \$1 par. Registration Security Co., San Francisco, registrar. Annual meeting, December 20th, at San Francisco. Stock is listed on New York Curb and San Francisco Exchange.

Annual report for the year ending Dec. 31, 1916, showed: receipts, \$10,761, which included \$5,982 from assessments Nos. 84 (part), 85 and 86, and \$4,616 from ore sales. Disbursements amounted to \$10,529, including notes payable, \$1,000; salaries and wages, \$4,183; milling, \$1,340.

Property: 2 claims, patented, 22 acres, in the Virginia mining district, Virginia City, Nev.

BELCHER MINING CO.**NEVADA**

Merged with Jacket-Crown Point-Belcher Mines Co. (which see), March 10, 1915.

COMSTOCK-PHOENIX MINING CO.**NEVADA**

• Office: Provo, Utah. Mine at Six Mile Canyon, Virginia City, Nev.

Officers: Jesse Knight, pres.; W. L. Mangum, sec.-treas., with L. H. Parkhurst and F. M. Manson, directors.

Inc. 1909. Cap., 1,000,000 shares, at \$1 par, non-assessable; all outstanding. Cash on hand, 1917, is given as \$23,723, with debts outstanding of \$3,860.

Property: 3 patented claims in the Silver Star District, 2 miles from a railroad.

Development: 650' of shafts, 1,000' of tunnel, 500' of raises. Ore carries silver and gold.

Equipment: electric hoist, compressor, tram and buildings. Shipments from 1909 to 1914 amounted to \$400,000, with net returns of \$250,000, having paid dividends of \$102,516. Present company, which is a reorganization in January, 1917, of the old company, has not issued any reports.

COMSTOCK TUNNEL CO.**NEVADA**

Address: 25 Broad St., New York, N. Y. Franklin Leonard, pres.-gen. mgr.; Franklin Leonard, Jr., treas.

Cap., \$4,000,000; shares \$2 par; \$2,769,000 bond issue outstanding, on which no interest has been paid since 1892. Stock was traded on N. Y. Exchange in June, 1915, at 8 to 20c. per share. Company is controlled through stock ownership by the Leonard family.

Property: 7½ miles of tunnel, draining the Comstock mines to depth of 2,700'. Income of company was seriously curtailed in 1914 owing to inactivity of many mines on the Comstock lode, who pay 4% royalty on all ore extracted to the Comstock Tunnel Company for drainage and ventilation, but extensive resumption of operations in 1915-16 by the Comstock mines has restored revenues.

CONSOLIDATED VIRGINIA MINING CO.**NEVADA**

Offices: 339 Bush St., San Francisco, Cal., and Virginia City, Nev.

Officers: W. W. Turney, pres.; H. Zadig, v. p.; A. W. Havens, sec.; T. F. McCormick, supt.; with W. G. Morrow, H. L. Slosson, Jr., and Wm. Bannan, directors.

Inc. Nov., 1904, in Cal. Cap., 216,000 shares; \$10 par, assessable; all outstanding. Stock transferred at company's office in San Francisco.

Registration Trust Co., San Francisco, registrar. Listed on New York Curb and in San Francisco.

Property: the Con. Virginia claim, 1,310' along the Comstock Lode at Virginia City, is being operated in conjunction with the Mexican Gold and Silver Mining Co., which see. Reported to have 14' to 15' of ore on 2,700' level, averaging from \$17 to \$34 per ton.

CROWN POINT GOLD & SILVER MINING CO. NEVADA

Succeeded by Jacket-Crown Point-Belcher Mines Co., which see.

JACKET-CROWN POINT-BELCHER MINES CO. NEVADA

Office: Mills Bldg., San Francisco, Cal. Mine near Virginia City, Nev.

Directors: M. B. Forman, C. L. Moore, J. L. Brainard, H. W. Glensor and L. M. Bliss. Wm. P. Miller, supt. Virginia City, Nev. Company is a merger of 3 of the big Comstock mines.

Inc. Feb. 11, 1915, in Cal. California Corporation Commission authorized issue of 360,000 shares common and 12,000 shares preferred to the Yellow Jacket G. & S. Mng. Co.; 208,000 common and 10,400 preferred to Belcher Mng. Co., and 150,000 common and 10,000 preferred to the Crown Point G. & S. Mng. Co. Above stock is in payment for all properties of these 3 companies subject to debts of \$80,962; 217,600 shares to be sold at par, money to be used for development.

These are the bonanza properties which made the fortunes of Flood, Mackay, Lucky Baldwin and D. O. Mills. The mines are in the southern part of the Comstock lode, a great fissure vein 4 miles long, filling a fault plane in the andesite-diorite rocks of Mt. Davidson, near Virginia City. The ore is quartz carrying silver-gold. Geology described in Monograph 3, U. S. Geological Survey.

The merger made it possible to install modern pumps, to unwater the 1,700' and 1,800' levels of the mines where good ore was formerly worked until a great influx of hot water stopped mining. A fire in Dec., 1915, interrupted operations, but a centrifugal pump now installed on the 1,600' level has successfully handled the water and deep mining can now be resumed.

Production: for 1915 and first half of 1916 has come from old stopes and workings on the 1,600' level and above, the average production from both mines being about 1,000 tons per week. No 1917 returns.

KINKEAD MILL & MINING CO. NEVADA

Address: Virginia City, Nev. W. Techow, mgr., K. K. Techow, pres. Operates a 60-ton mill.

KLAMATH MINING & MILLING CO. NEVADA

O. W. Robertson, pres., Klamath Falls, Ore. Holdings in Jumbo district, near Virginia City, said to show 12'-20' ledge under development by crosscut tunnel.

MEXICAN GOLD AND SILVER MINING CO. NEVADA

Offices: 265 Russ Bldg., San Francisco, Cal., and Virginia City, Nev.

Officers: H. L. Slosson, Jr., pres.; Herman Zadig, v. p.; with Whitman Symmes, W. G. Morrow, and G. E. Arrowsmith, directors. Chas. D. Olney, sec.

Inc., 1874, in Cal. **Cap.**, \$201,600; shares \$1 par; assessable; all issued. In April, 1917, assessment No. 106, 10c. per share, was levied. Stock transferred at company's San Francisco office. Annual meeting, first Tuesday in December. Listed on New York Curb and San Francisco Exchange.

Property: 1 claim and 5 fractions, patented, on the Comstock lode, at Virginia City. During the height of the Bonanza excitement the stock sold for over \$100 per share in spite of the fact that not a ton of pay ore was found. Owing to its favorable location at the north end of the Comstock, it was always a favorite stock, and levied and collected upward of

\$4,000,000 in assessments. In 1911, the present management obtained control from the stock brokers who formerly mismanaged things so badly on the Comstock, and having resolved to prospect the hanging-wall for fractures, were rewarded by finding an orebody yielding over \$1,400,000 which enabled them to build a modern mill, equip the mine, contribute heavily toward the pumping of the Comstock lode, and pay two dividends aggregating nearly \$200,000.

The Comstock lode is a great fissure vein filling a fault plane. The main body of the lode is a belt of quartz and vein matter, 10,000' long and several hundred feet broad with a general strike N. 15° E. At each extremity of this main fissure the lode ramifies into diverging branches. The east or hanging-wall is diabase throughout the entire 10,000' of the main lode, and for some distance on the S.E. and N.E. branches. It is 1,500' or more in width, and includes numerous lenses of diorite. These are generally harder than the diabase, which, in most places, is in an extreme state of decomposition. The foot wall of the main fissure is diorite for more than $\frac{3}{4}$ of its length, but at the southern end is chiefly composed of metamorphic slates; it is much less altered than the hanging. Accompanying the vein for half its length is the narrow dike of younger diabase called the "black dike." Contents of the vein are simple, on the whole consisting of country rock in fragments varying from very small to several thousand feet in length, clay, quartz, and argentiferous minerals. With few exceptions all of the orebodies of any importance were found close to the contact of the diabase with the main fissure, or within the belt of diabase which forms the hanging wall.

The Gold Hill bonanzas rest upon metamorphic rocks. The geology is described in detail in U. S. G. S., Monograph No. 3, which, according to Whitman Symmes, requires some important corrections.

Development: the principal mining now being done is on the 5 north end mines; from north to south these mines are the Sierra Nevada, Union, Mexican, Ophir and the Cons. Virginia. At present ore is being extracted on the 2,700' level of Con. Virginia, and 2,700' level and above in Union and Sierra Nevada. The 2,900' level has been unwatered, and is being opened up. Union has recently yielded \$500,000 from stopes between the 2,300 and 2,500' levels. The lode from which this ore was mined has not yet been developed at 2,700'. After having no ore for years, Con. Virginia is opening a strong gold vein at 2,700'. Ophir is looking for an extension of the orebodies above 2,500', from which about \$4,000,000 was taken out in last 10 years, and is also exploring at 2,700'. The Mexican orebody, which yielded \$1,400,000, was worked out 3 years ago on the 2,500' level. Recently good ore has been found on the 2,700' level directly below the above-mentioned ore-shoot. In June, 1917, no ore was being shipped, all ore extracted from the North End mines being treated at the Mexican and other local plants. In 1916 the Mexican mill treated 18,920 tons of ore, yielding bullion worth \$431,569. Of this, \$417,739 was credited the Ophir, Sierra Nevada, and Union mines.

The flow of water below the 2,500' level is 1,000 gallons per minute.

In 1917, water was lowered to the 2,900' level which had been flooded for 30 years.

Equipment: includes 4 electric hoists of 25-h. p. and one of 200-h. p.; electric pumps; two compressors; 75-h. p. and 100-h. p. each; and an 80-ton all slime cyaniding plant effecting an extraction of 93.2%.

OPHIR SILVER MINING CO.

NEVADA

Offices: 265 Russ Bldg., San Francisco, and Virginia City, Nev.

Officers: H. L. Slosson, Jr., pres.; Chas. D. Olney, sec.

Inc: April 30, 1860, in Cal. **Cap.**, 201,600 shares; \$1 par; all outstanding. Listed on New York Curb and on San Francisco Exchange. Last dividend paid May 21, 1908.

Property: the Ophir claim, 675' along the Comstock lode, includes the Ophir mine, at Virginia City, being operated in conjunction with the Mexican Gold and Silver Mining Co., which see. Drifts on 2,000' and 2,700' levels reopened, 1917.

Production: to 1908, said to be \$15,514,000.

SIERRA NEVADA MINING CO.

NEVADA

Office: 339 Bush St., San Francisco.

Inc. Nov., 1904, in Cal. **Cap.**, 200,000 shares; all outstanding; shares \$1 par; assessable. Registration Trust Co., San Francisco, registrar. Listed on New York Curb and on San Francisco Exchange.

Property: 3,000' along the Comstock lode, in the Virginia mining district, at Virginia City, credited with a production of \$1,035,000 to 1908, is being operated in conjunction with the Mexican Gold and Silver Mining Co., which see. Work under way on 2,500' level.

TECHOW-WATERHOUSE LEASE

NEVADA

Address: W. Techow and F. G. Waterhouse, Virginia City, Nev. Has a lease on part of Sierra Nevada Mining Co.'s mine, Virginia City, Nev. Gold-silver ore is treated in a 30-ton mill.

THOUSAND MEMBER GOLD MNG. ASSOCIATION

NEVADA

A get-rich-quick scheme fostered, if not fathered, by the men who sell Eastern Star Mng. Co. stock.

UNION CONSOLIDATED MINING CO.

NEVADA

Offices: 265 Russ Bldg., San Francisco, Cal., and Virginia City, Nev.

Officers: H. L. Slosson, Jr., pres.; W. W. Turney, v. p.; A. P. Swain, sec., with Whitman Symmes, J. H. Goldman and H. G. Dodds, directors. Whitman Symmes, supt.

Inc. Nov., 1904, in Cal. **Cap.**, \$200,000; shares \$1 par; all outstanding; assessable.

Transfer office: 381 Bush St., San Francisco, Cal. Registration Surety Co., San Francisco, registrar. Annual meeting, third Thursday in Nov. Listed on New York Curb and San Francisco Exchange. Company is under same management as Mexican Gold & Silver Mining Co., which see.

Gross earnings for 1916 were \$378,818, less \$164,727 for operating charges.

Property: 2 claims and 6 fractions, patented, located on the Comstock lode at Virginia City, carries silver ore. See Mexican Gold & Silver Mining Co. for geology of Comstock lode. Present work is on the 2,700' level and above; ore being shipped from the 2,300' level assays \$18 to \$57 per ton; \$42 from 2,400', and \$30 from the 2,700' level. In Sept., 1917, 360 tons were milled averaging \$33.30 per ton. The old Union shaft has been retimbered and put in first-class condition to the 2,700' level; this gives better ventilation to the north end lower levels and makes a material reduction in operating costs. Greatest depth of workings, 2,700'.

Equipment: includes electric hoists, 2 air compressors of 75 and 100-h. p. each, and electric power.

Pumping is done by the United Comstock Pumping Ass'n. Ore is treated at the Mexican mill; tonnage treated in 1915 amounted to 3,117 tons, averaging \$15.60 per ton; a 92% extraction was obtained.

Production: to 1917, approximately \$3,400,000, including \$378,818 from 16,126 tons in 1916. Costs were \$10.21 per ton.

YELLOW JACKET G. & S. MNG. CO.

NEVADA

Property sold to and company merged with Jacket-Crown Point-Belcher

Mines Co., March 10, 1915, for 360,000 common and 12,000 preferred shares of the new corporation.

WASHOE COUNTY

GRANITE HILL COPPER MINE.

NEVADA

Property: 14 miles N. W. of Reno, Nev., now owned by Nixon-Nevada Mining Co., which see.

NIXON-NEVADA MINING CO.

NEVADA

Offices: 50 Congress St., Boston, Mass.; Gazette Bldg., Reno, Nev., and 27 Pine St., New York.

Officers: P. S. Jones, pres.; J. F. McDonald and R. J. Jefferson, v. p.'s; W. E. Brown, treas.; S. A. Cunningham, asst. treas.; with B. J. Dryer, W. L. Rianhard, and G. H. Allen, directors; J. A. Straussman, sec. and asst. treas.; W. H. Butler, managing director.

Inc. 1915, in Maine. Cap., \$1,000,000; shares \$1 par; fully paid and non-assessable; all issued. Stock is listed on Boston and New York Curbs. 250,000 shares underwritten at 40c. in Sept., 1917.

Since Feb., 1916, improvements and mine work cost \$78,000, \$27,000 being spent early in 1917. Cash assets amounted to \$10,173 in April, less \$7,333 bills payable.

Property: 840 acres in Hartlesville Township, known as the Granite Hill mine, 14 miles N. W. of Reno, and 50 acres at Big Mouth Canyon, 50 miles N. E. of Reno, Washoe Co., Nev. The Granite Hill group of 4 claims is traversed by 4 parallel veins within a distance of 900'.

Development: by shafts, crosscuts and drifts. A vertical shaft on vein No. 1 is down over 300', and an 121' crosscut from it cut No. 2 vein, 5' wide, carrying a 14" streak of copper glance. The shoot is 270' long, with better copper and gold contents in the last 100' depth. Over 1,000' of work has been done on No. 4 vein, showing similar characteristics to No. 1. It is considered that the 4 veins will junction at depth, so a crosscut is being driven to cut them. The drift started at 300' depth on No. 1 vein and will cut No. 4 at 700' on its dip. The total length will be 800'.

Equipment: at the Granite Hill includes 100-h. p. semi-Diesel engine and generator, 525 cu. ft. compressor, 25-h. p. hoist, with smaller compressor and hoist, also necessary buildings, numbering 18.

1916 shipments: 75 tons in June aggregating about \$7,500. First class ore about $\frac{1}{8}$ of the total, carried 40% copper, \$13.80 per ton gold and 26 oz. silver per ton. Second class ore carried 10% copper, \$8.80 per ton gold and 6.96 oz. silver per ton.

Developments at the Big Mouth Canyon property consist of numerous open cuts and several hundred feet of tunneling. No production to date, but showings of gold have been reported, and it was said January, 1916, that platinum had been discovered in doing assessment work. Mine is two miles from railroad. The veins are strong, of fair width, and carry shoots of exceptionally high-grade ore. Mr. Victor C. Alderson, E.M., Pres. Colo. Sch. of Mines, has endorsed the property.

By Dec., 1917, the Western Pacific R. R. had laid its line to within two miles of the mine.

RED METALS CO.

NEVADA

Last address: 16 Washoe Bank Bldg., Reno, Nev. A. W. Holmes, pres.; Geo. T. Milner, sec. and gen. mgr.; Jas. Howell, treas.

Inc. May 12, 1910, in Nevada. Cap., \$1,000,000; shares \$1 par; non-assessable; in \$50,000 preferred and \$950,000 common stock; issued, \$1,500 preferred and \$786,200 common stock. Annual meeting, first Monday in June.

Property: 16 claims, unpatented, 300 acres, on Peavine Mountain,

Washoe Co., Nev. Claims carry lenticular deposits, between diabase and diorite, that are 1 to 12' wide, show copper carbonate and bornite ore, said to average 9% copper, 15 oz. silver and \$4.80 gold per ton.

Development: by tunnel, 1,200' long. The mine was opened 1866, for silver, closed 1877, owing to the low price of that metal, and again reopened 1908. See Copper Handbook, Vol. XI.

Geology of this district is given in U. S. Geol. Survey Bull. 594, p. 194.

ELY DISTRICT WHITE PINE COUNTY

BOSTON-ELY MINING CO.

NEVADA

Dead. Impossible to locate officers; letters unanswered. Appears as if company's officers were afraid of service in some legal proceedings. Hosmer Robinson & Co., of Boston, were formerly interested, and gave company a standing.

Reported in March, 1917, that surface equipment at mine was being sold. Over \$150,000 was spent at the property sinking a 1,200' shaft, but heavy flow of water stopped operations. Over 1,000' of drifting at 1,100' failed to find the vein, so mine was closed down and stockholders will have to take their losses.

BUTTE & ELY COPPER CO.

NEVADA

General office: 1500 Alworth Bldg., Duluth, Minn. **Principal office:** Room 302, O'Rourke Estate Bldg., Butte, Mont. **Mine P. O.:** Kimberly, White Pine Co., Nev.

Officers: Jos. B. Cotton, pres.; John D. Pope, v. p.; John W. Neukom, sec. and asst. treas.; Thos. B. Adams, treas.; H. A. Holp, asst. sec.; preceding officers are directors.

Inc. July 27, 1905, in Montana. **Cap.,** \$500,000; shares \$1 par; stock was made assessable, 1907. Is a subsidiary of the Consolidated Coppermines Co., which owns 420,000 shares. Jan. 1, 1916 had \$266,576 in cash and cash assets in treasury. Net income for 1916 was \$7,453. Stock is listed on the Butte Mining Exchange. Annual meeting first Monday in June.

Property: 12 claims, patented, 210 acres, in the Robinson district, lying between the Nevada Consolidated and Giroux, includes a valuable water right, 20 miles distant, said to be capable of supplying 2,000,000 gal. daily; also 80 acres irrigable land near water rights.

Development: 3 shafts, 1 with steam hoist, 310' deep, showing disseminated ore. Mining was suspended late in 1907, but churn drilling was carried on in succeeding years intermittently, developing several bodies of low-grade disseminated ore, said to show an average of 1½% copper.

In 1916 the Nevada Consolidated Copper Co. mined for account of Butte & Ely 2,218 tons of ore from the Liberty Bell and Westphalia claims. This ore assayed 1.375% copper and yielded 39,777 pounds of electrolytic copper. As the Liberty Pit is extended westward, the above and several other Butte & Ely claims will be stripped and mined on the same terms as apply to mining of Coppermines ore under its contract with the Nevada company.

Sale of control of the Butte & Ely to the Giroux company in 1909, acquired later by the Consolidated Coppermines company, through stock ownership in the Giroux company, and purchase direct of additional Butte & Ely stock, created bitter dissatisfaction among certain Butte & Ely stockholders, who several years ago instituted injunction and receivership proceedings, which, however, were decided adversely to such stockholders

by the court. This dissatisfaction seems now to have disappeared as the operations of the Coppermines company are on a profitable basis, and it is believed that the terms under which the Butte & Ely company sold the control may prove to be, after all, in the interests of its stockholders. The minority stockholders claim, however, that they have vainly endeavored for several years to secure an accounting and the payment of interest on money loaned by the company.

CENTENNIAL DEVELOPMENT CO.

NEVADA

Ely, White Pine Co., Nev. No report for 1917. Probably dead. See Vol. XII.

CONSOLIDATED COPPERMINES CO.

NEVADA

Office: 120 Broadway, New York. Mine office: Kimberly, White Pine Co., Nev.

Officers: Albert E. Humphreys, pres.; Joseph B. Cotton, v. p.; Thomas B. Adams, sec.-treas.; Robert Linton, cons. eng. and gen. mgr.; Henry B. Paull, auditor; with Isidore Hershheim, C. Laurence Perkins, I. W. Bernheim, Ira B. Humphreys, Thomas A. Merritt, Arthur J. Selfridge, and Frederic R. Kennedy, directors.

Inc. May 20, 1913, in Delaware. Cap., \$8,000,000; shares \$5 par; non-assessable; \$4,060,360 outstanding June 30, 1917. Bonds authorized \$3,500,000, 1st mortgage 7% convertible, due 1928; \$1,437,000 outstanding, redeemable by lot at 110 plus accrued interest on any interest day. Guaranty Trust Company, New York, transfer agent; Bankers Trust Company, New York, registrar. Stock listed on New York Curb.

Statement of April 30, 1917, shows cash on hand, \$183,376.03; notes and accounts receivable, \$535,359.02; inventory of copper, silver and gold, \$314,090.36; other quick assets, \$120,770.95; quick assets over current liabilities, \$807,343.21.

Property: the Coppermines company owns in fee 1,151 acres of mining properties and claims, together with 2,565 acres of ranch lands having valuable water rights. It also controls, through its stock ownership in the Giroux Consolidated Mines Co., 2,000 acres of patented mining claims and 1,800 acres of ranch lands, which have valuable water rights; and through its stock ownership in the Butte & Ely Company 209 acres of patented mining claims. The total area of claims, exclusive of the Mexican properties, is 3,360 acres of patented mining claims and 4,365 acres of ranch lands.

The Sultana mine, the Mexican property of the Giroux company, 11 claims comprising about 459 acres of mineral lands, includes the San Jose mine, about 1 mile W. of Copete, in the Sierra de Oro, 25 miles E. of Carbo and about 35 miles from Hermosillo. Property shows a contact vein of 50 to 100' width, between limestone and porphyry, opened by 3 shafts, No. 2, the main working shaft, sunk on an incline, 1,200' deep. The San Jose mine shows, in the bottom level, a vein of about 40' width, carrying oxidized ores to shallow depth, succeeded by sulphides. The Mexican property as a whole shows low-grade copper ore with fair gold value. Total production to January, 1908, was \$542,000. Mines have not been in operation recently, owing to unsettled political conditions in Mexico.

Ore: there are two classes of ore deposits occurring on the Nevada properties, (1) disseminated porphyry concentrating ore, similar to that of the Nevada Consolidated Co., lying in large continuous masses that can be mined at low cost, some by open pit steam shovel methods, others by underground methods; and (2) direct smelting ore in fissure and replacement deposits in limestone at or near limestone-porphyry contacts.

The main supply of ore mined by underground methods comes from the 380' Morris shaft, now yielding over 1,000 tons per day of ore that averages about 2%. The Bunker Hill shaft and the Brooks incline shaft are used for manways, lowering timber and supplies and for ventilation. Open pit mining is done from properties at the west end of the Liberty-Eureka Pit of the Nevada Consolidated, where mining is being done by that company for account of Coppermines Co.

The porphyry ore is very friable and readily amenable to concentration. The Morris and Brooks orebody has a proven length of over 2,000', a width of 400' and depth of 100' to 175', but drilling has not yet been extended downward to the bottom of the orebody, along the South side. A second porphyry orebody extends along Old Glory Hill from the western end of the property and a third proven orebody is the one in Copper Flat at the west end of the Liberty-Eureka Pit, above referred to. Keystone churn drills, of which the company has ten, are used for testing the porphyry ground and proving up the ore occurrence. However, the lands are so extensive that only a small part of the property has up to the present time been thoroughly drilled.

Contact and limestone replacement orebodies have been developed only on the Alpha and adjacent properties, where development work has been too limited to give definite information as to the full extent of the ore. The results shown by work thus far done are extremely encouraging. Regular shipments of these ores were commenced in the spring of 1917, and are being made at the rate of about 1,500 tons per month, of ore averaging about 10% copper.

Development: porphyry ores have been developed by 115 drill holes, totaling 47,871'; also by extensive underground work on the Morris and Brooks, Minnesota, Old Glory, and other claims. The Morris and Brooks mine has been opened up ready for stoping to the 270' level, and it is estimated that considerably over two million tons of ore is available for mining above this point. Development work is also being prosecuted on the 360' level. Mining is by the branch raise caving system, which can be done at very low cost.

The contact and replacement deposits are reached and exploited through the Giroux shaft of the Alpha mine, 1,450' deep, with considerable lateral work done on the 770', 1,000', 1,200' and 1,400' levels. The Alpha shaft, 1,200' deep, connects with the same workings, and from this shaft lateral work has also been done on the 500' and 600' levels. Work thus far has been almost entirely confined to crosscutting the formation, but more active development work was started in the spring of 1917 on the 1,000' level, and it is from this level that shipments are being made as above noted.

On the 1,000' level of the Alpha there were said to be in Nov., 1917, 35 faces from 4 to 10' wide, one being over 40'. Stopping above this level has opened rich ore.

Mine equipment: at the Giroux shaft includes a 26 x 48" Allis-Chalmers duplicate-cylinder hoist capable of handling 5-ton skips in counterbalance to depth of 2,000', at a hoisting speed of 1,500' per minute; also a 20 x 48" Allis-Chalmers hoist for the cage.

Pumping equipment consists of two pumps of 600 gallons and one of 1,200 gallons capacity per minute. The main pumping station is on the 1,200' level. The 1,200 gallon Prescott cross-compound condensing pump is one of the largest underground engines ever built, and has a 7-ton flywheel with a 16" discharge pipe.

A three-mile private railway connecting the principal shafts with the Nevada Northern Railway, has grades averaging about 1.5%. Equipment

includes several Porter locomotives of 600 tons tractive power and sufficient ore cars for the present requirements of the property.

Concentrator: in 1916 careful concentration tests were made on the porphyry ores by J. M. Callow, of Salt Lake City. Results of these investigations were used in re-modeling the old mill at Kimberly. Concentration is now principally by flotation, and extraction of 85% and better is being made on the sulphide ores. The remodeled concentrator was put into operation about March 1, 1917, the first unit having a capacity of 500 tons per day. A second unit, bringing the capacity up to 1,000 tons per day, was started in July, 1917.

Ore reserves: the report of the general manager of April 30, 1917, estimates fully and partly developed ore at 27,164,426 tons, averaging 1.19% copper. These figures deal with the concentrating porphyry ores only, and no estimates are given covering tonnages and grade of direct smelting ores known to exist in the Old Glory, Taylor, Alpha, and other claims on or near the monzonite contact.

Direct smelting ores as well as the concentrates from the Kimberly concentrator are treated at the Steptoe plant of the Nevada Consolidated Copper Co. A contract was made between the two companies in the spring of 1917, covering treatment of both these concentrates and the direct smelting ores, for a term of five years from May 1, 1917. Under terms of contract the Nevada Consolidated agrees to mine and treat for account of the Cons. Coppermines, from properties at the west end of Liberty Pit, 425,000 tons of ore during the period ending August 15, 1918, and after that date at least 75,000 tons per year, for a period of five years. Coppermines company, however, has reserved the right to cancel the contract any time after August 15, 1918, upon giving three months' notice.

Coppermines company has no floating indebtedness other than current monthly accounts, and is now earning a substantial profit on its operations. Litigation which hampered the company's operations two or three years ago has all been satisfactorily adjusted.

Improved methods of concentrating low grade porphyry ores, developed during the past few years, contribute in an important way to the value of the property. Higher recoveries obtained by the use of these methods show a great increase in yield from the Coppermines ores and make it possible to mine at a profit ore of much lower grade than could have been anticipated when these ore bodies were first opened up.

Production: in Nov., 1917, was at the rate of 1,800 tons of ore daily, yielding 1,200,000 lbs. of copper per month. The Alpha shaft is shipping 150 to 250 tons of over 9% ore daily, direct to smelter.

Management of the company is now in strong and able hands and a progressive operating policy is practiced.

DEXTERETTA MINES CO.

NEVADA

Office: Room 1007, 20 Broad St., New York, N. Y.

Officers: J. W. Barbrick, pres.; Chas. S. Witwer, v. p.; G. D. Avery, 2nd v. p.; Wm. R. Ruhl, treas.; V. M. Schmitz, sec., with Wm. E. Austin, directors. Prof. J. H. Weber, cons. eng. J. W. Walker, supt.

Inc. in Nevada. Cap., \$1,000,000; shares \$1 par; U. S. Corporation Co., New York, registrars.

Property: 14 claims, 280 acres, at Cherry Creek, White Pine Co., said to show a vein from 5' to 50' wide and traceable for about 1 mile. Management estimates average silver contents of the ores at \$26.50 per ton.

Development by 1,200' tunnel, 100' shaft, several drifts and open-cuts.

Equipment: includes compressor, drills, engines and several buildings. Plan installing 100-ton mill with proceeds from sale of 300,000 shares of treasury stock.

DOYLE MINING CO.**NEVADA**

Controlled by Atkins Kroll Co. Mine produces scheelite (tungsten) ores and company also owns a mill which was treating scheelite ore at the Bonita property on Snake Creek, near Garrison, Utah, 1916.

ELY AMALGAMATED COPPER CO.**NEVADA**

Company controlled since 1911 by Jesse Knight, pres., Provo, Utah, who owns 51% interest.

Inc. 1907, in Utah. Cap., \$100,000; shares 10c. par.

Property: 6 claims, and a townsite, about 1 mile from the Steptoe smelter, of the Nevada Consolidated Copper Co., at McGill, White Pine Co., carries silver-lead ores. Several carloads of ore have been shipped and property under development.

ELY BELL MINING CO.**NEVADA**

Letters unclaimed at Ely, Nev., and Salt Lake City, Utah. Company probably dead. Stock worthless. Fully described Vol. XI, Copper Handbook.

ELY COPPER CO.**NEVADA**

Office: 815 Ernest & Cranmer Bldg., Denver, Colo. No representative at Ely, Nev. Idle since 1907. Fully described Vol. XI, Copper Handbook. Unfavorably regarded.

ELY GIROUX COPPER CO.**NEVADA**

Kimberly, White Pine Co., Nev. Windsor Trust Co., New York, trustee.

Inc. 1909, by B. W. Coleman, Graham F. Putnam, and Roswell S. Nichols. Cap., \$5,000,000; shares \$5 par. In Nov., 1912, majority holdings were pooled, and \$75,000 shares treasury stock offered public, proceeds to be handled by Windsor Trust Co. as trustee, exclusively for payment of contractors sinking shaft on company's property at Ely, Nev.

Property: in Robinson mining district. Stock listed on the New York Curb, as a prospect, 1915. No returns secured, and company advertised delinquent for \$91 taxes in Jan., 1916.

ELY-MIZPAH COPPER CO.**NEVADA**

Property: the Modoc group, near Ely, Nev. Assessment work neglected and property probably forfeited. See Vol. XI, Copper Handbook.

Principal booster or promoter was A. M. Kearns, 1st Natl. Bank Bldg., Denver, Colo.

ELY REVENUE COPPER CO.**NEVADA**

Idle.

Office: 830 Equitable Bldg., Denver, Colo.

Officers: F. C. Goudy, pres.; L. F. Twitchell, v. p.; J. P. M. Humphrey, sec.-treas.: above, with C. C. Eddy and A. E. Reynolds, directors.

Inc. 1907 in Colo. Cap., \$1,000,000; shares \$1 par. International Trust Co., Denver, registrar. Annual meeting 1st Tuesday in March.

Property: 132 acres, known as the Revenue group, at Ely, White Pine Co., near the Chainman and Altman mines. Operations to be resumed.

ELY VALLEY MINING & MILLING CO.**NEVADA**

Pioche, Lincoln Co., Nev.

Officers: George Weddell, pres.; W. E. Harrison, v. p.; Edward Thormarson, sec.-treas. and gen. mgr.; C. L. Warren, supt.; James W. Abbott, mg. engr.

Inc. Jan. 6, 1908, in Nevada. Cap., \$1,000,000; shares \$1 par, fully paid and non-assessable; 600,000 promotion stock and 400,000 treasury; 10,196 issued. Annual meeting, second Tuesday in May.

Property: 200 acres, 16 claims, part patented and balance held by location, in Ely mining district, shows ore in vertical contact veins between limestone and quartzite. Vein reported to be 7' wide, to strike N. W. and to be proven to a depth of 500'. A vein of 10% copper ore was cut in shaft at 480' depth. Average assays claimed to have been 20% lead, 20 oz. silver and \$2 gold per ton.

Development: by 4 shafts and 400' tunnel at last accounts.

Equipment: includes gasoline hoist, air compressor, pump and air-circulating plant. S. P. L. A. & S. L. R. R. 2½ miles from property. Letters neither answered nor returned.

ELY VERDI COPPER CO.

NEVADA

Geo. Wingfield, pres., Goldfield, Nev. Mine near Ruth, via Ely, Nev.

Directors: S. R. Roberts, John Berry, of Ely; A. P. Sawyer and Leslie L. Savage, of Goldfield; M. R. Brown and H. S. Anderson, of Pierre, S. D.

Inc. May, 1912, in South Dakota. Cap., \$5,000,000; shares \$5 par. Is a reorganization of company of same name that was listed on New York Curb in 1909.

Property: a large group of claims south of the Copper Flat steam-shovel pit of the Nevada Consolidated. Only assessment work being done.

ELY WITCH COPPER CO.

NEVADA

Idle. Mine near Ely, Nev.

Officers: J. E. Bamberger, pres., 163 So. Main St., Salt Lake City, Utah; D. M. Hyman, v. p.;-treas.; H. Cohen, sec.; Ernest Bamberger, gen. mgr.; preceding with H. G. McMillan and W. W. Armstrong, directors.

Inc. Nov. 22, 1906, in Maine. Cap., \$5,000,000; shares \$5 par.

Property: 7 claims, 1 fractional, 54 acres, patented, bought for \$275,000, lying in the porphyry zone between the Ruth and Cumberland-Ely mines of the Nevada Consolidated, shows large blowouts of iron-stained porphyry.

Development: by 300' shaft, with levels at 100' intervals, and by tunnels of 1,200', 600' and 1,050', with 3,500' of workings. Development was disappointing, for, while claims cover the main monzonite belt of the district, the underground work on 300' level showed values too low to work. Drilling by Nevada Consolidated Co. is the logical thing to do and that company can probably work this property since it is now handling 1.6% ore at a profit. Company was a speculative promotion at time Nevada Consolidated was floated, and proving lean on development, has been idle since.

FEDERAL ELY COPPER CO.

NEVADA

Office: 26 Mining Exchange Bldg., Salt Lake City, Utah. **Mine Office:** Ely, Nev.

Officers: J. A. Cunningham, pres., at last accounts.

Inc. 1914 in Utah. Cap., \$5,000,000; shares \$5 par; assessable; 12 assessments levied to March, 1915. Stockholders plan reducing company's capitalization to \$150,000 in 1916.

Property: 21 claims, 3 fractional, 400 acres, also the Huesser ranch of 600 acres, 15 miles north of Ely, in the Steptoe valley, bought 1906, and a mill-site. Mining lands are the Panama claim, bought 1909, for \$10,000, lying about one-half mile north of the Star Pointer shaft of the Nevada Consolidated; 8 claims north of the Nevada Consolidated; 3 claims between the Cumberland-Ely and Turner-Ely, and the Queen of the West group, in Robinson cañon. Company is said to have paid \$225,000 for its lands.

Geology: property north of the Nevada Consolidated shows limestone beds dipping to the east, said to be underlain by cupriferous monzonite, and to carry 3 parallel shear zones, each about 400' in width, 600' apart, showing a little copper and lead ore. The limestone capping on the Savage claim is

said to carry lead ore. Churn-drill borings are said to have given a satisfactory showing of ore, and there also was some test-pitting and surface trenching.

Development: by tunnels aggregating about 1,600' and 4 shallow shafts, 3 said to show copper sulphides at depth of 100', the main shaft said to be near the contact of 3 ore zones, which seems peculiar, if the ore zones are parallel, as claimed.

The Queen of the West shaft shows, at depth of 110', a sulphide orebody of considerable size, averaging 3% copper, 1 to 2 oz. silver and 40 to 50 cts. gold per ton. The Kessler shaft, about 100' deep, near the tunnel, shows lead carbonates of fair tenor. Mine has a small steam plant.

Company has done little save levy assessments for several years, doing barely enough work on the claims to meet annual assessment requirements. Their claims were surveyed for patent in 1912 and reported partly patented in 1914. No recent returns.

FORT SCHELLBOURNE MINING & MILLING CO. NEVADA

Office: 521 Felt Bldg., Salt Lake City, Utah. **Mine Address:** Dan Doyle, Supt., Schellbourne, Nev.

Officers: F. W. Snyder, pres.; Hugh H. Tarbet, v. p.; E. H. Snyder, sec.-treas.; with Howard Phelps and J. E. Hepworth, directors.

Inc. Sept. 27, 1916, in Nev. Cap., \$100,000; shares 10c. par. \$650,000 issued; assessable. Operating expenses, 1916, \$2,000. No income, save stock sales.

Property: McMahon mines, 7 claims, 140 acres, unpatented, in Schellbourne mining district, White Pine Co., Nev., 8 miles from Nevada Northern R. R. (Cherry Creek Station). Lands show a fissure vein on a limestone shale contact, with 15-20' orebody. Ore in streaks carries \$1 gold and 12 oz. silver per ton, in quartz calcite gangue.

Development: by 500' tunnel with 280' back and 1,000' of work. Company plans tunnel to cut ore at greater depth. No production since 1875.

GIROUX CONSOLIDATED MINES CO. NEVADA & MEXICO

Office: 1400 Alworth Bldg., Duluth, Minn. **Mine Offices:** Kimberly, Nevada, and Carbo, Sonora, Mexico.

Officers: Robert Frothingham, pres.; Henry B. Paull, 1st v. p.; Ernest R. Grochau, 2nd v. p.; Joseph B. Cotton, general counsel; Frederic R. Kennedy, sec.; Thomas B. Adams, treas.; foregoing with Samuel Brenner, Chas. H. Maddien, Albert E. Humphreys, Jr., Chas. d'Autremont, Jr., directors. Edwin F. Gray, gen. mgr.; Samuel L. Heslet, supt., Mexican mine.

Inc. April 14, 1903, in Delaware. Cap., \$7,500,000; shares \$5 par; issued \$7,207,100, with \$292,900 in treasury for conversion of bonds. Bonds outstanding \$292,900. American Trust Co., Boston, transfer agents. Boston Safe Deposit & Trust Co., registrar.

The Giroux is now controlled absolutely by the Consolidated Coppermines Co., through exchange of Giroux stock for that of the Coppermines company. The latter company now owns about 97% of the total Giroux stock outstanding. For description of properties and operations see Consolidated Coppermines Co.

GLENDALE MINING, MILLING & POWER CO. NEVADA

Glendale, Calif. **Mine:** near Cherry Creek, Nev.

A jitney auto man, named Hart, of Glendale, Calif., is running property, and in our opinion, result of inexperience will be the usual one. J. H. Leishman, Templeton, Calif., was formerly president, acting merely in an advisory capacity in the early days of the corporation.

Very unfavorably regarded.

HAMILTON POWER, MINING & TRANSP. CO. NEVADA

Mine in Rocco canyon, near Hamilton, White Pine district, Nev. J. D.

Teasdale, v. p. and sec.; Wm. Harwood, mgr.; preceding, with R. G. Henke and John Blair, directors at last accounts.

Property: the Grand Prize group, 5 claims and power rights on Illipah creek. Ore is a carbonate carrying copper, lead and silver.

Development: by 235' tunnel cutting ledge at 165' with 36' winze in ore and a 125' shaft sunk on the vein, showing a 12" paystreak of shipping ore. Shipments in 1913, of 20 tons sacked, averaged \$84 a ton, assaying 6.40% copper, 20.5% lead and 107 oz. silver. Shipments averaged 60 tons a month during 1914.

Probably dead.

HUNTER MINE

NEVADA

Owned by Vulcan M., S. & R. Co., which see.

INDEPENDENT SCHEELITE CO.

NEVADA

Address: Scheelite, via Ely, Nev.

Property: tungsten producer in the Snake Range district, 26 miles from Ely. A 30-ton mill was erected in 1916.

JERSEY VALLEY MINES CO.

NEVADA

Worcester, Mass. W. Prince Catlin, mgr., Battle Mountain, Lander Co., Nev.

Property: in Kimberly or Hill Top district, 23 miles from Battle Mountain, comprises the Jersey Valley group, and the Gray Eagle claims, acquired Sept., 1913, from the Gray Eagle Mining Co. Four sets of lessees were taking out ore from the last named claims at last reports.

LEAD KING MINING & MILLING CO.

NEVADA

Office: Continental Natl. Bank Bldg., Salt Lake City, Utah.

Officers: A. P. Spitko, pres.-mgr.; Geo. F. Goodwin, sec.-treas.; A. Cigneaux, supt.

Inc. 1899. **Cap.**, 300,000 shares; 10c. par; assessable; 254,000 shares issued. Stock listed on Salt Lake Exchange.

Property: 15 claims, 8 patented, 250 acres, in Duck Creek mining district, White Pine Co., Nevada, is said to carry high-grade galena ore with small silver values, occurring in gray and blue limestone formation.

Shipments: to date total 10 carloads, netting \$20,000. Development work resumed 1917. Tunnel is 700' long.

LUCKY DEPOSIT MINING CO.

NEVADA

Officers: L. G. Hardy, pres.-gen. mgr.; J. P. Cahoon, v. p.; C. W. Knudsen, sec.-treas.; above with A. N. Olsen, directors.

Inc. March 1, 1914, in Utah.

Property: 9 unpatented claims at Aurum, White Pine Co., Nev., said to show copper ore with some silver-gold values, running \$45-\$50 per ton.

Development: by 175' crosscut tunnel cut along a porphyry dike said to measure 200' across. The tunnel is being driven to reach depth of 300'.

Production: in 1916, 65 tons were shipped. About 200 tons of ore ready for shipment May, 1917.

MCDONALD-ELY COPPER CO.

NEVADA

Idle.

Office: 918 Kearns Bldg., Salt Lake City, Utah. **Mine Address:** J. P. Turner, supt., Ely, White Pine Co., Nev.

Officers: D. C. McDonald, pres. and gen. mgr.; Col. Enos A. Wall, v. p.; Geo. W. Parks, sec.; Frank Knox, treas.; preceding, with Frank J. Westcott, Geo. W. Lamb and Hon. Thos. Kearns, directors; E. P. Jennings, cons. engr. and mgr.

Inc. Nov., 1906, in Utah. **Cap.**, \$1,000,000; shares \$5 par; non-assessable; issued, \$790,000. Debentures, \$100,000, at 6%, maturing Nov. 15, 1915. Shares are listed on the Salt Lake Stock Exchange.

Property: 28 claims, patented, 325 acres, 19 claims held under bond and lease. Property, on the lime belt, in the N. E. part of the Ely district, carries 4 contact deposits, between porphyry and limestone, showing prominent iron outcrops. Management estimates veins as 20' wide carrying oxidized ores, assaying 1 to 40% copper, and about 80 cts. gold per ton.

Development: is by the 415' Wall tunnel, showing 21' of heavy iron. The mine as a whole has about 3,000' of workings.

Equipment: includes a 25-h. p. gasoline hoist, 40-h. p. steam hoist, and a 6-drill Ingersoll-Sergeant air compressor. There are 6 buildings, including necessary shops. A pumping plant and pipe line supply water from a spring at nearby ranch.

An old 50-ton mill, with rolls and cyanide plant, remains from a former ownership. The 100-ton concentrator has a gyratory crusher and 3 trains of rolls. In May, 1914, drifting was in progress. Ten men employed. Property considered promising. No recent information obtained.

NEVADA CONSOLIDATED COPPER CO.

NEVADA

Controlled by Utah-Copper Co.

Office: 120 Broadway, New York. **Operating Office:** McGill, White Pine Co., Nev. Mine near Ruth, White Pine Co., Nev.

Officers: Silas W. Eccles, pres.; Daniel C. Jackling, v. p.; W. E. Bennett, v. p. and sec.; preceding with E. A. Guggenheim, H. F. Guggenheim, Chas. Hayden, Wm. B. Thompson, Chas. M. MacNeill, W. Hinckle Smith, W. C. Potter and C. B. Lakenan, directors; C. K. Lipman, treas.; C. B. Lakenan, gen. mgr.; C. V. Jenkins, business mgr.; Robt. Marsh, Jr., mine supt.; W. S. Larsh, underground supt.; E. E. Vanderhoff, pit supt.; Geo. C. Riser, mill supt.; R. E. H. Pomeroy, smelter supt.

Inc. Nov. 7, 1904, in Maine, as a merger of the Boston & Nevada Copper Co. and White Pine Copper Co. **Cap.** \$10,000,000; shares \$5 par; non-assessable, original cap., \$5,000,000, increased Feb. 5, 1908, to \$8,000,000, and again increased Nov., 1909, to present figure. A former issue of \$3,000,000 first-mortgage 6% convertible gold bonds, due April, 1918, has been retired. Old Colony Trust Co., Boston, and Guaranty Trust Co., New York, registrars; Boston Safe Deposit & Trust Co., Boston, and D. A. Crockett, 120 Broadway, New York transfer agents. Shares listed on the New York and Boston stock exchanges. Annual meeting, third Friday in April.

Comparative General Balance Sheet: Nevada Cons. Copper Co. and Nevada Northern Ry. Co.—

Assets:

	Property & Equip.	Def'd Chgs. to Oper's	Metals on Hand	Other Current	Total
1916.....	\$11,634,365(d)	\$4,935,838	\$9,265,014	\$6,473,648	\$32,308,865
1915.....	12,198,977(a)	4,136,970	4,998,829	2,512,439	23,847,215
1914.....	13,361,672(b)	3,739,988	3,114,863	1,229,737	21,446,260

Liabilities:

	Capital	Current	—Surplus—		Total
			(c)	Earned	
1916	\$9,997,285	\$2,300,219	\$7,071,850	\$12,939,511	\$32,308,865
1915	9,997,285	1,576,544	7,071,850	5,201,536	23,847,215
1914	9,997,285	1,756,982	7,071,850	2,620,143	21,446,260

(a) After deducting \$7,140,441 for depreciation and ore extinguishment.

(b) After deducting \$5,289,208 for depreciation and ore extinguishment.

(c) Amount realized from Capital Stock and Securities sold in excess of par value or cost less extra dividends paid. (d) \$8,336,219 deducted for ore and depreciation.

Comparative Income Account: Nevada Cons. Copper Co.:

	Operating Revenue	Operating Expenses	Net Op'tg Profit	Total Income	Total Deduct's	Balance Dec. 31
1916..	\$24,366,292	\$9,996,023	\$14,370,269	\$15,435,359	\$7,931,272	\$12,353,643*
1915..	11,685,276	6,544,593	5,140,683	5,905,602	3,346,672	4,849,556
1914..	7,052,499	6,335,522	716,977	1,763,021	2,542,037	2,290,626

* Includes \$4,849,556 balance from 1915.

Dividends: Begun Oct., 1909, rate 37½c per share quarterly; paid \$1.50 in 1910 and 1911; \$2 in 1912; \$1.50 in 1913; \$1.12½ in 1914; \$1.50 in 1915; \$6.75 in 1916; \$4.15 in 1917.

Company absorbed the Cumberland-Ely Copper Co., paying \$7,554,084 cash therefor, Aug. 30, 1910. Shareholders of the Cumberland-Ely were given the opportunity of exchanging stock on the basis of ¾ shares for 1 share Nevada Consolidated. The Nevada Consolidated is controlled through stock ownership, amounting to 1,000,500 shares by the Utah Copper Co. The Nevada Cons. Copper Co. controls through stock ownership the Nevada Northern Railway Co.; also owns, through purchase and absorption, the physical assets of the Steptoe Valley S. & M. Co., which was dissolved Oct., 1914.

Property: 106 claims patented, 27 unpatented. Distributed as follows: Copper Flat Group—33 patented claims, covering about 355 acres; 23 unpatented. Ruth Group—57 patented, 705 acres; and 4 unpatented. Veteran Group—14 patented; and 2 outlying patents.

Geology: The geologic features of the property are somewhat similar to those of Morenci, Ariz., and Bingham, Utah. An area of Paleozoic limestones and shales is intruded by a great mass of monzonite porphyry, tilting and breaking the sedimentaries and forcing its way into them in dykes and sills. Alteration of both sedimentaries and monzonite is extensive, and inclusions of great masses of country rock in the intrusive are common.

The main orebodies are found in monzonite porphyry; all of the porphyry area however is not ore bearing. Small bodies of high-grade copper ore are encountered in the sedimentaries near the contact, and occasional occurrences of silver-lead ore are met at some distance from it. These latter are of small importance. Commercial ore occurs at depths varying from 20 to 700' below the surface, and up to 450' thick. Copper occurs as chalcocite, chalcocite coating pyrite, and some chalcopyrite, in seams and disseminated through the mass of porphyry. As the copper-content fades out gradually in depth, the bottom limits of pay ore are determined largely by commercial factors. The capping, which is leached porphyry, is for the most part barren, though there are occasional occurrences of copper carbonates, silicates, oxides, etc., in it. Sufficient carbonate ore is found in the capping of the Copper Flat orebody to supply the smelter with flux. A considerable part of the property is covered with rhyolite capping, the remains of an extensive lava flow occurring long after the

NEVADA CONSOLIDATED COPPER CO.

Our Statistical Department will furnish complete information on application.

HAYDEN, STONE & CO.

Members New York, Boston and Philadelphia Stock Exchanges.

25 Broad Street, NEW YORK

87 Milk Street, BOSTON

monzonite intrusions. To date no orebodies have been found in the rhyolite.

Development: has so far proved the existence of three main orebodies, namely: the Copper Flat, Ruth, and Veteran, and several of lesser importance;—the Kimberley, Ingersoll, Wedge and Jupiter.

The Copper Flat orebody, which is the largest and most important, is mined by steam-shovels, and was disclosed in three places known as the Eureka, Liberty, and Hecla pits. These three pits have been consolidated into one. The big pit has roughly the shape of a dumbbell, with the former Eureka and Liberty pits on the east and west end respectively, and the Hecla in the middle. Its longest dimension E.-W. is 4,100' and N.-S., 2,500'. It covers an area of 124 acres and is at its deepest point 250' below the surrounding country. Entrance for trains is had in the northerly part of the Eureka and Liberty ends. These entrances are made from an assembly yard, where ore trains are made up for the Nevada Northern R. R., which handles them from this point to the smelter, 26 miles distant.

In mining, benches are maintained at about 50' intervals. To loosen up the material ahead of the shovels, 6" holes, placed at proper intervals in the benches, are put down by churn-drills. Nine drills of the No. 5 Keystone type are kept on this work; 1½ in ore, 3½ in waste, and 4 as extras are kept in the pit to minimize the amount of moving. Holes are spaced about 35' apart, .10 or 12' back from the edge of the bank and average 50 to 55' in depth. They are sprung or chambered by light charges before they receive the blasting charge.

After blasting, the material, ore or waste as the case may be, is loaded into railroad cars by steam-shovels. In this work eight 95-ton Bucyrus shovels, having Vanderhoef 4-cu. yd. dippers, are used. A good general average is 1,200 cu. yds. per steam-shovel shift of 10 hours.

Transportation of ore from the pits to the assembly yard, and of waste to the various dumps, is taken care of by 15 saddle-back locomotives, 2 being of 85 tons, 5 of 65 tons, 7 of 45 tons, and one of 35 tons weight. In addition one 56 ton, 6 wheel yard or switch engine is employed in general service. Cars for the transportation of ore from the mines to the mill are furnished by the Nevada Northern R. R. and are of 55 ton, all steel Ingolsby type. There are about 200 of these in service. Overburden is handled with 70 wood and steel dump cars of 18 and 20 yard capacity.

About 10,000 tons of ore and 10,000 yards of overburden are handled daily.

Other pit equipment consists of one 30 ton locomotive type Industrial crane, one employes' car used to transport men to and from work; a repair car equipped with tools, compressor, and boiler; ten coaling cars of special design for the shovels; 4 flat cars for transporting drills, casing, etc.; and two powder cars, one a refrigerator used to preserve explosives at the right temperature. Adequate machine, blacksmith, carpenter, engine and car shops with full equipment are maintained.

The Ruth orebody lies about 1¼ miles east of the Copper Flat orebody. Here the capping is too thick to economically mine it by steam shovels; hence it is mined by underground methods.

The Ruth mine is served by two shafts, the Star Pointer—the main working shaft, a 4 compartment vertical, 25'-6"x5'-6" inside dimensions; and the Ingersoll, an incline, 5'x8'-6", inside dimensions. The two shafts are about 2,600' apart, 600' and 550' deep, respectively, and connected on the 500 and 600' levels. At present the 500 and 600' levels are active; the

300 and 400' levels have been finished and abandoned, and the 700 and 800' are yet to be driven. Station and pockets, 700' level, Star Pointer shaft, are completed. To date about 14½ miles of underground workings have been driven.

Ore is mined by the branch-raise caving system, which consists in driving raise series at 25' intervals at right angles to motor haulage ways. From the branch-raises, finger-raises are put up to open the orebody at 12½' intervals, both parallel and normal to the direction of the haulage ways. The orebody is undercut at the tops of the finger-raises, caved, and ore drawn off through the fingers and branches to the haulage ways.

Material is handled underground by eight 10-ton mine locomotives; 4 of Baldwin-Westinghouse and 4 of General Electric make. The former are 60 h. p. and the latter 90 h. p., of 250 volt d. c. trolley type. Fifty 88 cu. ft. saddle back steel cars, holding about 4 tons each, are used.

In the Star Pointer shaft, ore is hoisted by a 400 h. p., 550 volt a. c. Nordberg hoist in 6 ton self dumping skips running in balance. The shaft is also equipped with a 200 h. p. geared hoist handling a double deck cage capable of holding 30 men. From the tippie ore is distributed in a 3,000 ton capacity bin by means of properly arranged chutes, and loaded from the bin into Nevada Northern R. R. 55 ton cars, which pass beneath it.

The Ruth mine is producing up to 2,700 tons daily, the total in 1916 being 591,545 tons of 2.195% ore. Mining cost \$1.202 per ton. In 1918 this mine will be capable of producing 5,000 tons per day. Development in the Ruth last year amounted to 33,321', making 54,188' to 1917. Of this, 32,868' has been caved.

The Veteran mine, taken over from the Cumberland-Ely, west of and adjoining the Consolidated Coppermines Giroux holdings, is not producing, operations at this property having been discontinued indefinitely. Mine contains 155,800 tons of ore.

Nearly all of the waste, and some of the material for mining, is handled through the Ingersoll shaft in a 2 ton capacity skip. Equipment here consists of a 112 h. p., 550 volt a. c. Wellman-Seaver-Morgan electric hoist.

The Ruth is further equipped with 2 Ingersoll-Rand, P. R. E.-2, 3,000 cu. ft. air compressors direct connected to 550 h. p. synchronous motors, 3 phase, 600 cycle, 600 volts. About 80 air drills are in use. Direct current at 250 volts for the underground trolley system is furnished by three 150 h. p. Allis-Chalmers motor generator sets of the Bullock type. A saw-mill, equipped with timber framing machinery, and handling about a half-million foot, board measure, of timber per month; a blacksmith shop and a small machine shop are maintained.

The Kimberley orebody has been developed only by churn drills. No underground workings and no mining. Drilling has proved the existence of about 600,000 tons of commercial ore.

The Wedge and Jupiter orebodies are small. They were developed by underground workings. No mining is being done in either place at present.

Ore reserves: extensive churn-drill borings on the Copper Flat, Liberty, Veteran, Ruth and other properties, have proven a tonnage estimated Jan. 1, 1917, as 67,993,117 tons of ore, averaging 1.59% copper and representing an ore supply of about 17 years. A revision of reserves was made in 1916, the new estimate being an increase of over 17,000,000 tons. Of this, 22% is in the Ruth mine, remainder at Copper Flat.

Comparative Table of Recoverable Developed Ore:

	Tons	Copper		Tons	Copper
Sept. 30, 1907....	14,432,962	1.97%	Dec. 31, 1912....	38,853,551	1.67%
Sept. 30, 1908....	20,000,000	1.94%	Dec. 31, 1913....	39,108,590	1.65%
Sept. 30, 1909....	29,000,000	1.94%	Dec. 31, 1914....	41,020,296	1.68%
Sept. 30, 1910....	40,360,823	1.70%	Dec. 31, 1915....	50,525,289	1.65%
Dec. 31, 1911....	40,853,371	1.66%	Dec. 31, 1916....	67,993,117	1.59%

Churn-drilling in 1916 totaled 45,222'; 103' holes were drilled, 19,704' being in the Ruth. Average depth in the mine was 469', and at Copper Flat 418'.

Electric power is used throughout, current being brought from the Steptoe smelter, at 40,000 volts, and stepped down to 600 volts by seven 200-k. w. transformers in a concrete station at the Ruth mine.

Ore is shipped to the Steptoe smelter, at McGill, separately described below, over a 27-mile standard-gauge railway, equipment including 400 self-dumping ore cars. This line is a part of the Nevada Northern railway, having a standard-gauge line of 165 miles in length, running from the mines and Ely to a junction with the Southern Pacific railway at Cobre station. The Nevada Northern Railway Co., controlled through stock ownership by the Nevada Consolidated, is capitalized at \$2,000,000, with a \$1,000,000 bond issue, at 5%, the line doing a general business in addition to handling the traffic of the Nevada Consolidated Copper Co.

Tonnage carried in 1916 totaled 13,240 daily, of which nearly 12,000 was ore. ●

Costs: the cost of stripping overburden was given at 30.09c. per cu. yd. for the fiscal year ending Dec. 31, 1916, with actual mining costs for ore of 12.42c. per dry ton, with an additional charge of 30c. per ton made to cover stripping redemption at the various pits. There was 3,988,655 cu. yd. of capping moved in 1916. Ore mined and treated during the fiscal year 1916 averaged 1.632% copper, by assay, with an average extraction of 73.87%. The cost of production for the fiscal year 1916 was given as 8.13c. per lb. of copper and 8.86 cts., covering all charges, including depreciation charges on Steptoe plant. It is not probable, however, although the Nevada Consolidated is one of the largest and best mines in the world, that the mine can continue to produce copper, for any great length of time, at much less than 8 cts. per lb., and, when all factors are taken into consideration and due allowance is made for the cost of improvements, that ultimately must be charged against costs, a net cost of 9 cts. per lb. for finished copper laid down at the seaboard, would be a fair estimate. Production is marketed through the American Smelting & Refining Co., on a 1% commission basis.

Steptoe Smelter

The ore reduction works, concentrating mill and smelter owned by the company are at McGill, White Pine Co., Nev. Lands cover 8 square miles, with water rights. The property is on the eastern side of Steptoe valley, on the slope at the foot of the Schell Creek range, 14 miles N. E. of Ely and 22 miles from the mines, on the line of the Nevada Northern railway. The smelter site proper comprises 320 acres, 1 mile long and one-half mile wide, on a hillside with 10% grade, permitting the works to be terraced, and handling material by gravity throughout. Lands carry water rights to Duck Creek, and to the McGill ranch, estimated as capable, jointly, of furnishing water for a 15,000-ton plant.

The reduction plant is one of the largest and best in existence. The present average capacity is 12,000 tons daily, but the plant is so designed that it can be increased easily to a much greater capacity, and late in 1917

changes were under way to increase the quantity to 15,000 tons. All main buildings are of steel frame and the plant is built on the unit system, with allowance for expansion.

The mill, nearly a mile from the smelter, is 378x756' in size. There are 8 sections, treating a total of over 12,000 tons of ore daily. Each section can be operated independently, but the plant is run in 4 units of 2 sections each.

The mill handles a moderately hard silicified altered porphyry ore containing tiny specks of chalcocite, pyrite and some chalcopyrite and averaging 1.5% copper. This is concentrated 8 into 1, with a recovery of about 74% of the assay value, the product containing 9% copper.

The coarse ore bins are of timber, 15' deep, 20' wide and 288' long with a capacity of 5,000 tons. They are built about the center line of the mill and 400' behind the center line of the fine ore bins. The ore is dumped on grizzlies of railroad iron with openings of 13.5".

From the coarse ore bins the ore goes through chutes at the bottom to twenty-four 60" steel apron feeders driven at a speed of 2.2' per minute. The full capacity of each feeder is 75 tons per hour. The two feeders in each unit adjoining the center line of the plant can be run at 9' per minute, delivering 700 tons per hour. The feeders, with the exception of these two, deliver to two 60" steel pan conveyors, each 118' long, traveling at a speed of 28' per minute, and with a total capacity for the two of 1,700 tons per hour. The high speed feeders and pan conveyors deliver to two 60" traveling grizzlies of 3.5" openings and having a speed of 40' per minute. The oversize from the grizzlies is delivered to two No. 8 McCully crushers. The discharge from the McCully crushers and the undersize from the grizzlies is elevated by two 42" belt conveyors to two screens 6'x14' of $\frac{3}{8}$ " wire, 1"x $\frac{1}{2}$ " mesh, inclined at an angle of 36 to 48°. The oversize of these screens is reground by two Garfield rolls, 72"x20", set for a $\frac{3}{8}$ " opening. Discharge from the rolls and undersize from the screens is elevated to two horizontal conveyors which distribute to the fine ore bins by means of two trippers.

In order to avoid sliming the flow sheet is arranged for step grinding. From the fine bins the ore passes by belt feeders over automatic scales to a set of 36"x15" rolls set for an opening of $\frac{5}{8}$ " and run at 85 r. p. m. with water introduced beneath washing to a pair of bucket elevators. The buckets on these elevators are 8"x8"x18" and the elevators deliver to two trommels, 42" diam. by 8' long, having one section of 3/16" and one of 5/16" perforations. The oversize goes to another set of rolls 36"x14" set for a 5/16" opening and driven at 105 r. p. m. The undersize of 5/16" goes to a set of rolls 30"x14", set for a $\frac{1}{8}$ " opening and run at 122 r. p. m. The undersize of 3/16" goes to eight 2 m. m. trommels 36" diam. by 8' long. The oversize of the 2 m.m. screens goes to a fourth set of rolls 36"x15" with an opening of 1/16" and driven at 160 r. p. m. All of the above rolls deliver to the same elevators so that everything must finally pass 2 m.m.

The undersize of 2 m.m. passes to 10 double deck Wilfleys making final concentrates, and middlings to five Wilfleys. The five Wilfleys make final concentrates and send tailings to the regrinding system. The tailings from the ten double deck tables pass to four Steptoe classifiers, having four spigots and an overflow. The overflow is sent to a 50' Dorr thickener, delivering underflow to the slime department and overflow to the reclaimed water system. The first spigot product goes to the regrinding system after being dewatered. The second spigot delivers to four Wilfleys which make final concentrates and send tailings to the regrinding system. The third spigot delivers to eight Wilfleys, making final concentrates, middlings to

the regrinding system and tails to waste after being dewatered in Steptoe tanks. The fourth spigot delivers to Callow tanks, delivering underflow to four Wilfleys and overflow to slime department. These four Wilfleys produce final concentrates and send tailings to Callow tanks delivering underflow to Johnson vanners.

Each unit is equipped with two Hardinge mills 8'x30" direct driven through herringbone gears. The feed to these is delivered at 65 to 75% solids by means of a shovel wheel. The product is delivered by two bucket elevators to four Steptoe classifiers making four spigot products and an overflow. The overflow goes to two 17' Dorr's delivering underflow to the slime department and overflow to 75' Dorr thickeners. The first spigot delivers to two Wilfleys, making final concentrates, and sending tailings to the regrinding system. The second spigot delivers to seven Wilfleys making tailings to waste and sending middlings to six more Wilfleys, making tailings to waste. The third spigot delivers to seven Wilfleys, making tailings to waste and sending middlings to the above mentioned six Wilfleys. The fourth spigot delivers to Callow tanks whose overflow goes to the slime department and underflow to ten Wilfleys, delivering tailings to Callow tanks which in turn deliver underflow to 26 Johnson vanners and overflow to the slime department.

All concentrates except those of the real slime department are delivered to 16 steel tanks of 225 ton capacity, and having filter bottoms for suction drying. These tanks are unloaded by a Blaisdell disc excavator into cars running on a track beneath.

All overflows of Callow tanks, Steptoe tanks, and Blaisdell concentrates tanks are delivered to a series of settling ponds from which the underflow is delivered to the slime department and the overflow is pumped to the mill to be re-used.

Water is secured from Duck creek, which has an average flow of 8,000 gals. per minute, water being collected in the hills in reservoirs and brought by gravity for 9 miles through a 32" iron-banded wooden pipe line and delivered at the highest point of the works under a pressure of 10 to 20 lbs. per sq. in. An electrically-driven pumping plant in Steptoe valley, immediately below the works, has a capacity of about 5,000 gals. per minute. By means of a system of settling tanks, ponds and pumps, approximately 8,000 gal. of water per minute is recovered from mill tailings for re-use. Approximately 4½ tons of fresh water to 1 of ore are used in the process.

The smelter is about one mile from the concentrator, and is connected therewith by a standard-gauge railway line. The works have about 12 miles of railway track, equipped with 9 small locomotives, a switch engine and 100 cars, and 2 loco cranes.

The smelter includes separate buildings for calcining, reverberatory smelting, blast-furnace smelting and conversion, all of steel frame, with corrugated iron sheathing. Each department has independent flues and chimneys.

The roaster building, 328' in length, has 4 floors, with twenty-four modified McDougal roasters, set in 2 rows. Concentrates are delivered to the calcining building in 10-ton standard-gauge cars, entering over a trestle built of timbers, the feed floor being on a level with the railway trestle. All the roasters have air-cooled rabbling arms, and center columns supplied with air under a pressure of about 3" of water by a National Blower Co.'s fan of about 120,000 cu. ft. capacity. The roasters are driven by 10 h. p. electric motors. Hot calcines, carrying 6.5 to 9% sulphur, are discharged into hoppers beneath the roasters and trammed directly to the reverberatories, or to nine 150-ton calcine storage bins, built of brick and steel, which serve as a balance-wheel between the roasting and smelting

departments. Each roaster discharges gases through a 54" elbow into a brick flue running between the 2 rows. This flue discharges fumes into the main flue, which is in 2 parts, each of 312' square cross-section, permitting either to be cut out for cleaning. The flue is 1,070' long, including the dust chamber, which is 150x50x30', and leads to a brick stack 250' high and of 18' internal diameter at the top. Dust from the flue in the roaster building is piped to the ground floor, for loading into cars, and for about 500' the flue has tracks underneath, permitting the collection of dust from steel hoppers in cars, which are hauled by small locomotives.

The reverberatory building has five 600-ton furnaces, each 19' wide x 111' to 130' long, fired with California crude oil, atomized by air at 40-oz. pressure from a Connersville blower and fed through 5 burners per furnace. From 250 to 350 bbls. of oil per day are used by each furnace, varying with the nature of the charge smelted. Each furnace is connected with two 400-h. p. boilers arranged in parallel, instead of tandem, in the flue between the furnace and the dust chamber. These boilers develop about 85% of their normal rated capacity under oil firing. Each furnace has bypasses with dampers giving a direct passage for the gases from furnace to dust chamber, when boilers have to be cut out. The equivalent of about 35% of the fuel value of the oil used in the furnaces, is recovered as steam by these boilers. As the gross oil used per ton of charge is about 0.543 bbl., the net, after deducting these waste heat credits, is about 0.35 bbls. per ton of charge.

Powdered coal is to be used for the reverberatories instead of oil, on account of the high price of the latter.

The reverberatory furnaces are charged with calcines mixed with limestone, dumped through slide gates, from hoppers suspended from the charge floor. Each furnace has 2 tap holes on one side, from one of which matte is drawn off into matte cars of about 30-ton capacity. These cars are tilted and contents poured into the converters by an electrically-driven mechanism mounted on the car frame. Slag is skimmed twice every shift, the skimmings going to a cast-iron box leading to a lined launder, in which a jet of water granulates the slag and washes it to the dump. Slags carry 50 to 45% silica, 6 to 12% calcium oxide, 25 to 35% iron oxide and 8 to 14% alumina. The reverberatory building has a dust chamber of 1,000' square section, 155' long, leading to a 300' brick chimney, 15' in diameter at top.

The blast-furnace building, located between the reverberatory and converter departments, has a single blast furnace, 42x240" at the tuyeres, and 84x240" at the shaft, with a capacity of 300 to 500 tons of charge per day, the furnace being so planned that it can be enlarged if desired to 80' in length. The furnace is 13' above the ground level, with a height of 16' from the tuyeres to the charging floor, operating with a 10' column charge and 40-oz. blast pressure. There are 4 steel water jackets on each side, and 1 at each end, and each side has 24 four-inch tuyeres, 10" apart, receiving blast from a 30" bustle pipe. The water jackets each have separate blast boxes and independent air and water connections, so that any jacket may be removed by breaking 3 simple connections. Charging is done by cars dumped pneumatically, matte is tapped into ladles on cars and slags granulated and sluiced, as in the reverberatory building. Fumes discharge through a 108" downtake to a 12x15x250' brick flue, terminating in the main roaster flue. The blast furnace is not in operation.

The converter building is about 600' from the reverberatory furnaces, and receives molten matte from cars, behind and above the converters, the contents being poured into a launder, while the shells remain in position for blast. The building has two 5-motor Shaw electric cranes, each with a hoist capacity of 60 tons besides 2 auxiliaries of 25 tons each. There are 2 of the

old stalls with 96x150" shells of the barrel type built for acid linings, but now used with magnesite brick linings. There are also 2 Peirce-Smith barrel-type converters, both originally 25' 10" long by 10' diameter shell. One of these was lengthened at the smelter to 33' 11". They originally had 30 tuyeres each but these have been increased to 35 and 46, respectively. The blast pressure used is nominally 10-lb. gauge at an altitude of 6,327'. The Peirce-Smith converters produce about 60 and 50 tons of copper per day on 40% matte.

Blister copper is poured into ladles and transferred into a brick-lined steel cylindrical receiver. This is mounted on rollers and rotated on its own axis by an electrical motor, so that the molten blister copper is poured through a tilting pouring spoon into moulds on a horizontal straight-line chain and sprocket conveyor. These moulds discharge on a submerged apron conveyor which after traveling in the water horizontally for a few feet turns on an incline and raises the copper ingots out of the water and lands them on the loading platform. They contain 99.5% copper, weigh about 400 lbs., and after trimming and being weighed on accurate scales, they are shipped in box cars.

The converter's slag is taken back to the reverberatory furnaces in 10-ton side-tilting pots operated by compressed air. Flux for the converters consists of concentrator slimes and silicious carbonate ore from the Copper Flat pit, mixed and dried in 2 oil-fired rotary driers at the converter building and handled and charged by boats. The hoods from the converters lead to a balloon flue running along over the charge floor for the extent of the converter building covered by stalls. It is then connected by a circular flue 10' diam. to a brick dust chamber which in turn connects to a brick stack 100' from the ground, 10' diam. at top.

The power plant has 4 batteries of two 400-h. p. Babcock & Wilcox water-tube boilers each and one battery of two 600-h. p. Stirling water-tube boilers. Two batteries have Foster and 3 others have Babcock & Wilcox internal superheaters, and there is a separate Foster superheater for the steam supplied by the reverberatory waste heat boiler plant of ten 400-h. p. boilers. Steam is generated at 160-lbs. pressure and can be superheated 100° F. All boilers are fired by Green chain grate stokers, coal being fed from overhead bins by chutes direct to the stoker hoppers. Each double battery of boilers has a 9x40' steel stack with induced draught, furnished by 5 Sturtevant fans, each connected with a 30-h. p. Sturtevant slide-valve engine, running at 150 to 175 r. p. m.

Each battery of boilers is equipped with fuel economizers of about 3,360 sq. ft. heating surface, set between the boilers and the induced draught fan; they are dampered so that they can be cut out for cleaning while the boilers are in service. A 3,000-gal. capacity Kennicott water purifier supplies make-up water for all boilers.

The engine-room, main floor, contains the generating engines, blowers, 3 exciters and a switchboard, and the basement contains condensers, air pumps and oil filters. The electrical equipment consists of two 1,100-h. p. 22x48x48" Allis-Chalmers Corliss cross-compound engines, with 800 k. w. Bullock a. c. generators mounted on the shafts; two 2,000-h. p. 31x66x48" Nordberg Corliss cross-compound engines with 1,500-k. w. Bullock a. c. generator mounted on the shafts, and one 2,500-k. w. steam-driven Westinghouse turbo generator. Current is generated at 600 volts and carried to a concrete transformer station, equipped with 7 200-k. w. Bullock water-cooled transformers, stepping the current up to 40,000 volts, for transmission to the mines; four 750-k. w. Westinghouse water-cooled transformers, and four 1,000-k. w. General Electric water-cooled transformers, stepping

current up to 13,200 volts for transmission to the mills; 13,000 and 40,000-volt choke coils and lightning arresters.

A 3,000-k. w. turbo-generator is being added to take care of increased power consumption at the mill.

The smelter blast plant, in the engine house, includes a 350-h. p. 14x28 x36" Nordberg tandem-compound engine direct-connected to a No. 10 Connersville blower with capacity of 300 cu. ft. of air per revolution, making 120 r. p. m. This is for the blast furnace. For the converters air is supplied at 10-lbs. gauge pressure by 1 Allis-Chalmers blowing engine, 16" and 24" diam. steam, 34" and 34" diam. air by 48" stroke of 6,000 cu. ft. capacity. 1 Nordberg 25" and 54" diam. steam, 52" and 52" diam. air by 48" stroke of 12,000 cu. ft. capacity, and 1 Nordberg 26" and 56" diam. steam, 54" and 54" diam. air by 48" stroke of 18,000 cu. ft. capacity. These are all of the cross compound steam, tandem, air and steam type.

A 20,000 cu. ft. steam-driven turbo-blower was added in 1916 to supplement the blowing engine in supplying air for converters, etc.

A Laidlaw-Dunn-Gordon cross-compound air compressor with steam cylinders 11" and 21" diam. and air 21" and 12" diam. and 18" stroke of 1,080 cu. ft. displacement, compresses air to 100-lbs. gauge. This was originally for tamping converter linings but is now used for pneumatic tools of various kinds at the shops and the mill.

A 2,000 cu. ft. 2-stage, steam-driven compressor was added in 1916.

In connection with the works are a number of thoroughly appointed shops, including a boiler, machine and carpenter shop, foundry, warehouse and roundhouse.

The Steptoe works were started in April and the finished copper shipped in Aug., 1908. Nearly 1,500 men are employed at the plant.

Production: was 33,283,348 lbs. fine copper in the fiscal year ending Sept. 30, 1909; 62,772,340 lbs. in the fiscal year 1910; 78,541,270 lbs. for the 15 months ending Dec. 31, 1911; 63,063,261 lbs. for the year ended Dec. 31, 1912; 64,972,829 lbs. in 1913.

Recent Production:

	Tons Treated	Cu. %	% Rec.	Ratio Conc.	% Cu. in Cncts.	Cost per Ton Mng.	Net Prod. Lbs. Cu.	Cost per Lb. Cts.	Sell. Price Cts.
1916.....	3,922,634	1.68	78.87	.....	8.98	12.42c	90,785,287	8.86	25.83
1915.....	3,081,820	1.54	70.18	7.18:1	7.77	15.24c	62,726,651	8.23	17.65
1914.....	2,640,294	1.48	68.48	6.05:1	6.14	15.17c	49,244,056	9.82	13.39

Production of gold and silver amounted to \$801,818 in 1916, compared with \$615,605 in 1915. Copper production for first six months in 1917 amounted to 39,669,677 lbs.

The property has been splendidly developed and is being managed with ability and success.

NEVADA UNITED MINES CO.

NEVADA

Address: 441 Equitable Bldg., Denver, Colo.

Officers: W. J. Chamberlain, pres.; H. F. Crocker, v. p.; R. J. Pitkin, sec.; E. S. Kassler, treas., with H. B. Northrop, F. N. Bancroft, J. B. Grant and A. G. Burton, directors.

Inc. Feb. 6, 1906, in Arizona. Cap., \$3,500,000; shares \$1 par; non-assessable; 2,962,952 issued.

Property: 50 claims, 38 patented, about 600 acres, 18 miles from Ely. White Pine Co., Nev., said to show "chamber" deposits of lead ore in limestone. Ore contains lead, silver and iron.

Development: by tunnels totaling 2,400' to 350' depth. Mining is by caving system.

Property worked by Berger & Platt, of Denver, the present lessees. Output in May, 1917, was 90 tons of ore daily.

NEW ELY CENTRAL COPPER CO.**NEVADA**

Main office: 907 Market St., Wilmington, Del. Business office: 16 State St., Boston, Mass.

Officers: John G. Gray, v. p.; Jonathan H. Brown, sec.; H. E. Lodge, treas., with J. Pearce Cann, directors.

Inc., Feb. 19, 1912, in Delaware. Cap., \$8,000,000; reduced to \$2,500,000; shares \$5 par; fully paid, non-assessable; issued, 500,000 shares. Bonds authorized \$500,000, 6%; \$175,000 issued. American Trust Co., registrar; Federal Trust Co., transfer agent. Annual meeting, second Monday in February.

This corporation was reorganized from the wreck of the Ely Central Copper Co., by about 1,600 of its stockholders. All the stock and bonds that have been issued are to the stockholders of the corporation which participated in the reorganization plan, except stock of the par value of \$5,550,000 which was issued in trust for treasury purposes.

At a special meeting of the stockholders held Dec. 20, 1913, it was voted to deed to the Consolidated Coppermines Co. the entire property of the New Ely Co., and in pursuance of this vote a deed was executed and delivered, the Cons. Coppermines Co. thereupon taking possession of all the property of the former company. The stock and bondholders deposited for exchange 475,464 shares of the 500,000 outstanding shares and \$167,550 of the \$175,000 outstanding bonds up to Dec. 31, 1915. The New Ely Central Copper Co. will be dissolved when all stock and bonds have been exchanged.

NORTH MOUNTAIN MINING CO.**NEVADA**

Controlled by John Dern, Box 1,418, Salt Lake City, Utah.

Property: 11 patented claims in Gold Canyon district, near Cherry Creek, White Pine Co., Nev. Idle many years.

OLD IMPERIAL MINING & MILLING CO.**NEVADA**

Cherry Creek, White Pine Co., Nev. Advertised sold for \$125 delinquent tax, Jan., 1916.

PILOT KNOB GROUP**NEVADA**

Property: 5 claims in Snake Creek range, 2½ miles S. of Osceola, White Pine Co., Nev., developed by 400' tunnel and 200' shaft.

Ore: tungsten, occurs in quartz veins in limestone formation. Equipment includes a 20-stamp mill.

Reported, June, 1916, that Uvada Tungsten Co. was to be organized by A. V. Taylor, L. Jeffs and C. H. Thompson, of Salt Lake City, to take over the property.

PITTSBURGH-ELY COPPER CO.**NEVADA**

Idle. Ely, White Pine Co., Nev.

Officers: H. P. Harder, pres.; Louis H. Bock, v. p.; J. A. Varney, sec.; Frank Straub, treas., trustee and gen. mgr.

Inc. Dec., 1916, in Arizona. Cap., \$5,000,000; shares \$5 par; non-assessable; 695,285 shares outstanding at last reports.

Property: 11 claims, unpatented, 220 acres, including the Keyboard group of 6 claims, 120 acres, near the Keystone mine of the Nevada Consolidated, and a small group near the Cumberland-Ely mine of the same company. Lands show porphyry and limestone, and company reports having copper oxides and sulphides, assaying 3 to 12% copper.

Development: by 2 shallow shafts and tunnels of 160' and 40'

Equipment: includes a 40-h. p. steam hoist. Inactive, except for annual assessment work, since 1907.

PRINCESS COPPER CO.**NEVADA**

Address: C. W. Freed, pres., 1007 First Ave., Salt Lake City, Utah.

Mine office: Ely, White Pine Co., Nev. F. J. Austin, sec.; H. P. Clark, treas.

Inc. 1911. Cap., \$1,000,000; shares \$1 par.

Property: 30 claims, about 550 acres, acquired of the Ely Resurrection Copper Co., in the Robinson district, lying a little north and east of Ely.

Mine has 2 short tunnels and a 140' shaft, said to show 18' of ore assaying up to 5% copper, with gold and silver values, and some high-grade ore assaying up to 46% lead and 110 oz. silver per ton, with gold values. Management plans resumption of development work.

SALT LAKE TUNGSTONIA MINES CO.

NEVADA

Office: 212 Kearns Bldg., Salt Lake City, Utah. **Mine office:** Tungstonia, White Pine Co., Nev.

Officers: L. W. Robbins, pres. and gen. mgr.; Gustav Wissler, v. p., sec. and treas.; with G. H. Blood, S. T. Merrill and J. A. Rasmussen, directors.

Property: 15 claims adjoining the Shepherd mine, in north end of Snake range, shows a number of veins 1"-48" wide, carrying hubnerite ores said to average 2% tungstic acid. The veins occur in granite, near a limestone contact.

Company has erected a 25-ton mill, using Marcy ball mill and Wilfley tables. Concentrate is said to contain 71% tungstic oxide.

A lower tunnel was 190' long in Sept., 1917, and had cut 3 shoots of 2% ore, and within a total of 500' nine are expected to be cut.

SILVER TUNGSTEN MINING CO.

NEVADA

Office: 222 Judge Bldg., Salt Lake City. Raymond Ray, pres.; Ernest Kimball, sec.-treas.

Inc. 1916, in Utah. Cap., \$50,000; shares 10c. par; assessable; outstanding 38,000 shares. Listed in Salt Lake City. Cash on hand, April, 1916, \$458; no debts except a bond of \$1,750 due May, 1917.

Property: 3 claims, unpatented, in the Cherry Creek mining district, 8 miles from a railroad, said to show an 8' vein, containing tungsten ore. Development work to May, 1916, consisted only of 24' of trenching and 20' of tunneling. Evidently one of the mushroom tungsten companies brought out when tungsten was selling high.

SMOKEY DEVELOPMENT CO.

NEVADA

Property near Ely, Nev., sold at delinquent tax sale, February, 1915. Described Vol. XI, Copper Handbook.

STEPTOE VALLEY SMELTING & MINING CO.

NEVADA

Company dissolved 1914. Property owned and operated by Nevada Cons. Copper Co., which see.

UNITED STATES TUNGSTEN CORPORATION

NEVADA

Operated a mill for concentration of tungsten ore at Tungsten, S. of Osceola, White Pine Co., Nev. The statement that this company is a subsidiary of the Tonopah Mining Co., or has any connection with it, is officially denied. The plant was advertised for sale, October, 1917. Fully described, Vol. XII.

UVADA TUNGSTEN CO.

NEVADA

Care A. V. Taylor, Dooly Block, Salt Lake City, Utah. Is reported to have taken over the Pilot Knob group near Osceola, Nevada. (See Pilot Knob.)

Property: 5 claims, Pilot Knob group, 2½ miles south of Osceola, Nevada, shows quartz veins in limestone, overlying quartzite, underlain by granite. Ore carries tungsten.

Reported in June, 1917, that owing to low price of tungsten the property had been allowed to revert to original owners.

VULCAN MINING, SMELTING & REFINING CO. NEVADA

Address: Cherry Creek, White Pine Co., Nev.

Officers: H. Ornauer, pres., 708 First National Bank Bldg., Denver, Colo.

Inc. in Wyoming. Cap., 2,500,000 shares.

Property: 15 patented claims, 300 acres, in the Hunter district, about 30 miles from Ely, the nearest rail point, shows copper, iron and silver-lead ores occurring in fissure veins in monzonite and limestone. Developed by 300' and 500' shafts and 2,600' tunnel, with a total of 2,000' underground workings.

Equipment: includes hoist, compressor and steam power. Lessees produced 65 tons of ore in 1915, averaging \$38 per ton.

In 1916, lessees had 400' of ground to work and shipped fair quantities of ore to Murray, Utah.

NEW JERSEY

Companies are arranged in alphabetical order.

BALBACH SMELTING & REFINING CO. NEW JERSEY

Office: 580 Market St. **Works:** 111 Passaic Ave., Newark, and on Newark Bay, N. J.

Officers: Edward Randolph, pres.-treas.; C. M. Loeb, v. p.; E. E. Diefenbach, supt.; preceding officers and Dr. Otto Sussmann, directors. F. Schmutzer, sec.

Inc., 1891 in New Jersey. **Cap.,** \$1,000,000, shares \$100 par, nonassessable, in \$500,000 preferred and \$500,000 common stock; 3,900 preferred and 3,900 common shares issued and outstanding. American Metal Co. is the purchasing and selling agent, but does not control the company.

Plant at Newark comprises an electrolytic refinery, a lead desilverizing plant, and a small copper smelting plant. The refinery has 444 tanks, in parallel, with two 360 k. w. generators. Plant has a capacity of 1,800 to 2,000 tons electrolytic copper per month, employing 150 men. The metallurgical practice of the works ranks deservedly high. The lead refinery, with a capacity of 4,000 tons per month, erected at Newark Bay, went into operation July, 1913. Company does a custom business in ores, bullion, residues, blister copper, etc., containing gold, silver, platinum, copper and lead.

IRVINGTON SMELTING & REFINING CO. NEW JERSEY

Address: Charles Engelhard, treas., 30 Church St., New York. **Works** at Irvington, N. J.

Officers: W. L. Glorieux, pres.; C. O. Baker, v. p.; C. W. Baker, v. p.; Robert A. Knorre, sec.

Property is an electrolytic smelter and refinery for gold, silver, platinum and copper ores.

NATIONAL LEAD CO. NEW JERSEY

Main office: 1 Exchange Place, Jersey City, N. J. **Executive and transfer office:** 111 Broadway, New York.

Officers: E. J. Cornish, pres.; Geo. O. Carpenter, R. P. Rowe and E. J. Cornish, v. ps.; M. D. Cole, asst. to the pres.; Chas. Davison, sec.; Fred R. Fortmeyer, treas.; Chas. Simon, asst. treas. **Executive committee:** E. J. Cornish, chairman; E. F. Beale, R. P. Rowe, J. R. Wellstein and G. D. Dorsey.

Directors: Edward F. Beale, Geo. O. Carpenter, Fred M. Carter, R. R. Colgate, E. J. Cornish, G. D. Dorsey, Chas. E. Field, Geo. W. Fortmeyer, E. C. Goshorn, Morris B. Gregg, R. P. Rowe, W. N. Taylor, Walter Tufts, J. R. Wettstein and G. W. Thompson, chief chemist; A. H. Sabin, cons. chemist; and A. B. Hall, mgr. metal dept.

Inc. Dec. 7, 1891, in New Jersey. Cap., \$25,000,000 common and \$25,000,000 preferred stock; shares \$100 par; \$20,655,400 common stock and \$24,367,600 preferred stock is outstanding. Listed on New York Stock Exchange. Bankers Trust Co., New York, registrar. Annual meeting, third Thursday in April. Company has 6,640 stockholders.

Comparative General Balance Sheet:

Assets—

	Plant Invest.	Other Invest's.	Stock on Hand	Other Current	Total
1916.....	\$23,805,234	\$17,982,307	\$7,320,170	\$6,058,190(f)	\$55,163,901
1915.....	23,785,822	17,520,916	6,267,772	5,884,460(a)	53,458,970
1914.....	23,768,789	16,963,718	7,164,475	4,467,083(b)	52,364,065

Liabilities—

	Capital Stock	Insurance Fund	Reserve	Current	Surplus	Total
1916..	\$45,023,000	\$1,200,000	\$700,000	\$2,057,788(e)	\$6,183,113	\$55,163,901
1915..	45,023,000	1,100,000	300,000	1,298,608(c)	5,737,362	53,458,970
1914..	45,023,000	1,000,000	.....	988,835(d)	5,352,230	52,364,065

(a) Includes: subsidiary Co.'s, \$545,000. (b) Includes: subsidiary Co.'s, \$845,000 (c) Includes: subsidiary Co.'s, \$1,048,285. (d) Includes: subsidiary Co.'s, \$669,029. (e) Subsidiaries, \$1,622,731. (f) Subsidiaries, \$836,045.

Comparative Income Account:

	Net Income	—Dividends—		Surplus Year	P. & L. Surplus
		Pfd.	Com.		
1916.....	\$2,977,699	\$1,705,732	\$826,216	\$445,751	\$6,183,113
1915.....	2,710,526	1,705,732	619,662	385,132	5,737,362
1914.....	2,476,293	1,705,732	619,662	150,899	5,352,230
1913.....	2,458,306	1,705,732	619,662	132,912	5,201,331

Dividends:

	1911-15	1910	1908-9	1907	1906	1901-5	1898-00	1896-7	1895	1894	1893
	%	%	%	%	%	%	%	%	%	%	%
Preferred...	7	7	7	7	7	7	7	7	7	7	7
Common...	3	4	5	4½	2	..	1	..	1	3	2

Present rate: preferred 7%, payable quarterly, March 15, etc.; common, 3%, increased to 4% March, 1916, payable quarterly, March 30, etc.

The National Lead Co. owns all the capital stock of the following companies:

Carter White Lead Co., Heath & Milligan Mfg. Co., Magnus Co., Inc., Matheson Lead Co., St. Louis S. & R. Co., United Lead Co., and Bass-Hueter Point Co. It is a stockholder in the following companies: U. S. Cartridge Co., Baker Castor Oil Co., River S. & Ref. Co., Williams Harvey Corporation, and Cinch Expansion Bolt & Engineering Co. Company manufactures lead in various forms for commercial uses.

On Dec. 5, 1916, company completed its 25th year, and on the 15th paid its 100th dividend on preferred stock.

NEW JERSEY METAL REFINING WORKS, LTD. NEW JERSEY
Elizabeth, N. J. See Mountain Copper Co., Ltd.

NEW JERSEY ZINC CO. NEW JERSEY
See full description in first part of United States section.

Company not only owns the Franklin Furnace, N. J., mines, but has holdings in various states and is therefore grouped with the Am. Smelting & Refining, U. S. Smelting and other large companies with widely scattered holdings.

ORFORD NICKEL-COPPER REFINERY **NEW JERSEY**

Property of International Nickel Co., 43 Exchange Place, New York. Plant at Bayonne, N. J.; treats nickel-copper matte from Sudbury smelter Robt. C. Stanley, supt. of plant; A. J. Wadham, asst. supt.

PERTH AMBOY SMELTER. **NEW JERSEY**

Owned by American Smelting & Refining Co., at Perth Amboy, which see. Has 600-ton copper-lead smelter, 200-ton lead refinery and a 300-ton electrolytic copper refinery, employing about 2,000 men.

RARITAN COPPER WORKS. **NEW JERSEY**

Owned by International Smelting & Refining Co., at Perth Amboy, N. J. A. C. Clark, supt.

UNITED STATES METALS REFINING CO. **NEW JERSEY**

Office: 120 Broadway, New York. Works office: Chrome, Middlesex Co., N. J., and East Chicago, Ind.

Officers: F. Y. Robertson, v. p. and gen. mgr.; R. W. Deacon, supt. copper smelter and refinery, Chrome, N. J. Wm. Thum, supt. lead refinery, East Chicago, Ind.

Inc. Nov., 1903, in New Jersey. Reorganized Oct. 15, 1906. Cap., \$4,000,000, shares \$100 par, half in 7% cumulative preferred and half in common shares; issued \$3,100,000, half preferred and half common stock. Is controlled through stock ownership by the United States Smelting, Refining & Mining Co. Annual meeting, second Tuesday in May.

The Chrome works, which have had to be enlarged nearly every year since they were first built, include a complete smelting and converting plant for the treatment of ores, concentrates and mattes, with smelting capacity of 15,000 to 18,000 tons a month, converting capacity of 3,500,000 to 4,000,000 lbs. of blister a month, and an electrolytic refinery with a capacity of 250,000,000 lbs. annually.

The smelter has two 42x186" blast furnaces, two converter stand using 84x120" basic-lined converters, one 60x6' rotary kiln for sintering fine material, and one Dwight-Lloyd sintering machine. The smelter is further equipped with a 500' steamship dock, with berth for 2 steamers, the most modern type of Fairbanks scales, having a sensitiveness of 10 lbs. on a load of 200,000 lbs., and a very complete automatic sampling mill equipped with Brunton samplers.

The refinery has two 225-ton and two 175-ton anode furnaces and three 225-ton wire-bar furnaces, equipped with charging cranes, casting wheels, waste heat boilers and the most modern devices for mechanical handling. The tank house has 1,228 tanks arranged on the Walker system. The weighing is done on tandem Fairbanks scales, sensitive to 1 lb. in 15,000 lbs.

The power house is steam-driven and arranged for highest economy with economizer and superheater equipment, 3 compound condensing units and 2 triple expansion units, using exhaust steam turbines for the third expansion. Current is generated at the rate of 11,000 amperes. Three circuits are carried in the tank house with a voltage of 115 volts each, 1 power unit being carried in reserve.

A new laboratory with the most modern equipment was completed in 1917.

The anode slimes are refined by the usual processes, the doré bullion produced being parted electrolytically. Some of the rarer elements are recovered as by-products.

The Grasselli plant, consisting of a 100-ton electrolytic lead refinery, was the first electrolytic lead refinery in the United States. Has annual capacity of 72,000,000 lbs. lead.

The plants of the United States Metals Refining Co. are strictly modern

in design and equipment and are noted for the technical excellence of their practice and the purity of their commercial products. The Betts process is used which permits the recovery of bismuth and other by-products.

NEW MEXICO

The active mining companies of this state are grouped by counties, which brings the Silver City, Santa Rita, Burro Mountain and Lordsburg properties all under Grant County, and the Kelly, Cooney or Mogollon and San Andreas districts under Socorro County.

COLFAX COUNTY

BLACK COPPER CO.

NEW MEXICO

Mine office: Elizabethtown, Colfax Co., N. M. Work resumed on this property May, 1914. Developed by shafts and credited with past gold production of \$200,000.

GOLD & COPPER DEEP TUNNEL M. & M. CO., NEW MEXICO

Office: Beaver Falls, Beaver Co., Pa. Mine office: Elizabethtown, Colfax Co., N. M.

Officers: A. T. McIntyre, pres.; Jas. E. Glasson, v. p.; W. H. Martin, sec.-treas.; W. P. McIntyre, gen. mgr. and supt.; preceding officers and Geo. E. Dachtler, directors.

Inc. Oct. 10, 1900, in New Mexico. Cap., \$200,000; increased 1912 to \$500,000; shares \$1 par, nonassessable; issued, \$250,000. Annual meeting third Tuesday in July.

Property: in the heart of Cimarron range, on the west slope of Baldy mountain, 12,500' high, comprises 12 claims, 260 acres, in the Moreno district, 18 miles from the St. L. R. M. & P. R. R. at Ute Park. Orebody, a contact between slate and monzonite, is developed by 2 shallow shafts and a 2,300' crosscut tunnel, planned to penetrate the mountain with a final length of 3,500', cutting 2 bodies of low-grade copper ore. Also said to carry a deposit of molybdenite. Property operated part of 1916. Total underground work, 4,400'. Proposed to let contract for 300' tunnel.

Equipment: includes a 12-h. p. gasoline air compressor and 10 buildings; 20-ton stamp mill. See U. S. Geol. Survey Prof. Paper, 68, p. 95, for geology of this district.

DONA ANA COUNTY

Including Black Mountain or Kent, Modoc, Organ and Texas creek districts.

AZTEC COPPER CO.

NEW MEXICO

Office: 707 Colorado Bldg., Washington, D. C. Mine office: Organ. Dona Ana Co. N. M.

Officers: Gen. H. H. C. Dunwoody, pres. and mgr.; C. C. Clements, v. p.; Gen. B. K. Roberts, sec.-treas.; preceding officers, Col. M. C. Wyeth, C. F. Humphrey and Admiral C. H. Davis, directors.

Inc. in Arizona. Cap., \$1,000,000; shares \$1 par; nonassessable; 600,000 shares issued.

Lands: 4 claims, 6 acres, in the Organ Mountain mining district, about 12 miles by good road southeast from Las Cruces. Claims cover the mineralized limestone porphyry contact worked by the Modoc mine. Developments are on the Orejon claim opened by a 140' 45° inclined shaft, sunk on a 12 to 18" vein, reported to carry copper, silver, lead and zinc ore, averaging \$40 per ton.

BENNETT-STEPHENSON M. & M. CO. NEW MEXICO

Officers: O. Jolliffe, pres.; Jas. C. White, v. p.; C. B. Gill, treas.; J. L. McCullough, sec. Annual meeting April 7th at Las Cruces. Controls through stock ownership the Organ Mountain Mining Co., which see. Fully described Vol. X.

Mines under 10-year lease to the American S. & R. Co.

BIG THREE MINES. NEW MEXICO

Situated 3 miles north of Organ, Dona Ana Co., N. M. Owned and operated by Capt. C. B. Gill, Geo. Luchen and Dr. J. H. Johnson.

Property: 7 claims shows copper, silver and lead deposits. Workings 116' deep, and equipped with 14-h. p. gasoline hoist. Plan sinking shaft on Rubyin mine to 200' depth and drifting. No recent information.

DONNA DORA MINING CO. NEW MEXICO

Organ, Dona Ana Co., N. Mex. Reorganized as Mineral Hill Mining Co., which see.

MEMPHIS MINING CO. NEW MEXICO

Office: 204 Mills Bldg., El Paso, Texas. **Mine office:** Organ, Dona Ana Co., N. M.

Officers: J. I. McCullough, pres.; W. N. Small, v. p.; Jas. C. White, sec.-treas., with T. S. Semple and Chas. E. Head, directors.

Inc. 1911, in Arizona. **Cap.,** \$1,000,000; shares \$1 par; 650,000 shares outstanding. Gross earnings in 1917 amounted to about \$7,500, all from ore sales.

Property: 5 claims, 100 acres, consisting of the Old Memphis mine, Contention and Copper Bow group.

Development: by 4 shafts with 2,000' of workings. Two years shipments said to have averaged 10% copper, 6 oz. silver, and \$3 gold per ton.

Property under lease to Phelps, Dodge & Co. for 5 years, from April 1, 1916. The Copper Bow shaft has been sunk to 300' and exploration work is underway.

MINERAL HILL MINING CO. NEW MEXICO

Office: 13 Arch St., Philadelphia, Pa. Samuel P. Hanson, pres. Is the successor of the Donna Dora Mining Co.

Property: on the eastern slope of the Organ Mts., near Organ, Dona Ana Co., N. M., is developed by 400' tunnel and shallow shaft sunk on a 5' vein containing copper, lead, silver and gold values. No recent returns received.

ORGAN MOUNTAIN MINING CO. NEW MEXICO

Office: 204 Mills Bldg., El Paso, Tex. **Mine Office:** Organ, N. M.

Officers: J. I. McCullough, pres.; J. H. May, v. p.; F. W. Campbell, sec.-treas.; with J. C. White and T. S. Semple, directors.

Inc. 1913, in New Mexico. **Cap.,** \$2,000,000; shares \$1 par; fully paid and nonassessable; issued, about 1,225,000.

Property: 17 claims, 2 patented, 340 acres, 12 miles N. E. of Las Cruces and the A. T. & S. F. R. R. was formerly owned by the Bennett-Stephenson M. & M. Co. It includes the Stephenson, Henderson, Page and Bennett mines, showing 6 veins in carboniferous limestone, lying near or in contact with porphyry dikes. Veins are said to be from 5'-30' wide, with ore-shoots opened up from 50'-600' in length. Ores are mainly lead, silver, copper, wulfenite, and zinc.

Development: consists of a 3-compartment shaft, 400' deep, 2,000' drainage tunnel and several thousand feet of drifting. Mine was discovered 1849, and closed 1911; is credited with a production to 1915 of about \$1,000,000.

Equipment: includes 200-h. p. plant at mine and 250-h. p. plant at mill;

together with 3 hoists, pumps and 2 air compressors of 9-drill capacity combined. Mill includes 2 Joplin jigs, 3 Wilfley tables, 1 vanner and 2 slimers.

Phelps, Dodge & Co. have a 5 years' lease on these properties, from April 1, 1916, and have spent \$100,000 in preliminary prospecting. They are now sinking shafts at the Stephenson and Bennett mines. Main development is from 3-compartment shaft 550' deep. At 500', a crosscut passed through the Bennett vein, which carried 15' of high-grade lead-zinc ore.

TEXAS CANYON MINING & MILLING CO. NEW MEXICO

Office: C. S. Cleaver, 5427 University Ave., Chicago, Ill. Mine Office:

J. S. Dodd, supt., Organ, N. M.

Officers: E. H. Bickford, pres.; C. S. Cleaver, sec.; H. R. Gottman, treas.; also directors.

Inc. Jan. 19, 1917, in New Mexico. Cap., \$100,000; shares \$100 par; non-assessable.

Property: 8 claims in Texas canyon, Organ mountains, 7 miles E. of Organ, Don Ana Co., N. M. Examined by C. M. Becker.

Development: by short tunnels. Ore averages 0.43 oz. gold, 14.05 oz. silver, and 2.3% copper. Faulting is evident through the property. Not enough work done to place any value on mine.

TORPEDO MINE NEW MEXICO

Address: N. C. Foster and E. J. Foster, Fairchilds, Wis., owners.

Property: in Organ Mountain district, N. M. Under lease to Phelps, Dodge & Co., as are the Memphis and Organ properties, which see.

Development: several thousand feet to depth of 400' in search of lead-zinc-ore.

VICTORIA MINING AND SMELTING CO. NEW MEXICO

Bankrupt. Holdings bought by C. J. Boyd of Los Angeles at sheriff's sale, Dec., 1915.

Property: 2 groups, 1,000 acres, 20 miles apart, the Southern group between Organ and San Andres Mts.; the other in Plomo district, San Andres range, 35 miles N. E. of Las Cruces. Claims which show large bodies of silver-lead ores of milling grade were to be opened and developed in 1916.

GRANT COUNTY

Includes Apache, Black Hawk, Burro Mountain, Central, Duncan, Fierro, Granite Gap, Georgetown, Hachita, Lordsburg (Pyramid), Pinos Altos, Santa Rita, San Simon, Steins Pass, Steeple Rock and Virginia districts.

Mining Companies around Tyrone

The mineral area in the Burro Mountain mining district is being developed by numerous other strong mining companies. Some of these, notably the Austin-Amazon and the Giant Copper companies, are operating on a considerable scale and are steady shippers of copper ore.

Among the other companies besides the Burro Mountain Copper company that are operating or planning to operate may be mentioned the Big Burro Copper Co., Mangus Development Co., Burros Development Co., Fidelity Copper Co., Burro Grande Copper Co., Ocala Copper Co., National Copper Co., Tyrone-El Paso Copper Co., the Tyrone-New Mexico Copperfields Co., and the Tyrone-Copperfields.

AMERICAN EXPLORATION & MG. CO. MEXICO & NEW MEXICO

Presumbaly idle. Letters remain unanswered.

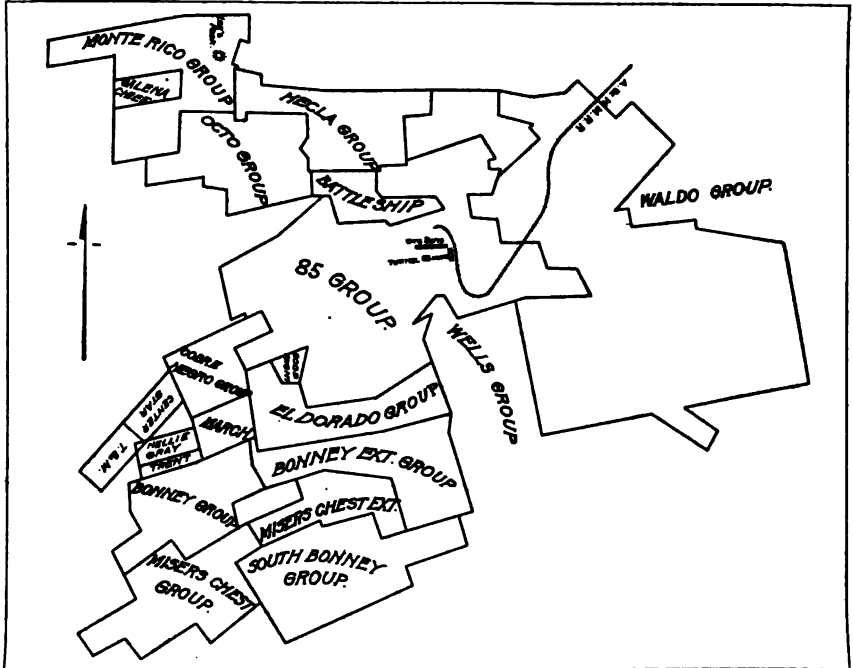
Office: 60 State St., Boston, Mass. Mine offices: Steeple Rock, Grant

Co., N. M.; Ahumada, Bravos, Chihuahua, Mex., and Terrazas, Iturbide, Chihuahua, Mex.

Officers: W. Franklin Burnham, pres. and gen. mgr.; Henry A. Haile, treas.; preceding officers, Jas. Duckworth, Geo. Empsall, Hinsdale Smith, Arthur Smith, Jesse W. Morton and Harry Hinckley, directors; Wm. A. Farish, cons. engr.; John A. Rice, engr.; John Searls, supt. Ahumada mines; Frank Hickman, supt. Steeple Rock mines.

Inc. Sept. 28, 1907, in Maine. Cap., \$500,000; shares \$1 par, non-assessable; issued, 275,748.

Lands: 600 acres, including 16 claims in New Mexico and 12 different properties in Mexico, also 3 mill sites at the different properties.



PROPERTY MAP NEAR LORDSBURG, NEW MEXICO

Property includes mines known as the Burnham at Terrazas, San Ignacio at Ahumada, and Hinckley at Steeple Rock. The New Mexican property has tunnels of 100' and 313' and shafts of 100', 100' and 150', with 1,223' of workings, carrying mainly silver ore. The property at Ahumada has shafts of 25', 100', 160' and 474', giving ore assaying about 30% lead, 6% zinc and 12 to 20 oz. silver per ton. The property at Terrazas shows contact deposits between limestone and porphyry, giving assays of about 3% copper, 24% lead, 8 to 20 oz. silver and \$2.50 to \$12 gold per ton. Development is by shafts of 187' and 200'. Equipment includes a 55-h. p. gasoline plant and necessary mine buildings.

Company planned milling about 30 tons daily at Ahumada, concentrating 6 into 1, and continuing development work at the various properties.

ANDERSON-APACHE COPPER CO.**NEW MEXICO**

Robt. Anderson, El Paso, Tex., chief owner. **Mine address:** Hachita, Grant Co., N. M.

Officers: Hon. Geo. H. Neale, pres.; Harry Duey, v. p.; Chas. H. Howe, sec.-treas.; Arthur Houle, cons. engr.

Inc. June 1, 1907, in Arizona. **Cap.**, \$500,000; shares \$5 par. Held lands under a \$100,000 bond and lease, with \$20,000 paid.

Property: the Apache mine, 5 claims, 100 acres, 5 miles southeast of Hachita. Mine, opened 1883, was worked continuously until 1907, by leasers, producing approximately \$200,000. Property shows contact deposit 50'-150' wide between quartz-feldspar-hornblende-porphry and carboniferous limestone, with ore, oxidized to present depth, and running 4 to 30% copper with one ounce silver to each unit of copper. Bornite ore occurs at the bottom of the shaft.

Development: by a 360' shaft, for a length of 400' and along the surface for 600', said to show 200,000 tons of ore, with about 40,000 tons blocked out for stoping.

Equipment: includes a 25-h. p. Fairbanks & Morse gasoline hoist. Shipments of low grade copper and silver ore with lime gangue are made intermittently to the El Paso smelter.

ATWOOD COPPER CO.**NEW MEXICO**

Morningstar & Augustine, owners, Lordsburg, N. M.

Property: the Atwood mine, near Lordsburg, Grant Co., N. M., was under option to 85 Extension Copper Co., which defaulted in payment.

Operated by leasors, 1917, who paid 10% royalty, amounting to \$2,600.

AUSTIN-AMAZON COPPER CO.**NEW MEXICO**

Offices: 116 Texas Bldg., El Paso, Texas; Room 4, Porterfield Bldg., Silver City, N. Mex. **Mine address:** Tyrone, N. Mex.

Officers: Chas. E. Davis, Mayor of El Paso, pres.; M. W. Porterfield, v. p.; C. H. Leavell, sec.-treas., with John M. Wiley and D. M. Jackson directors. J. H. Shockley, mgr.

Inc. Dec. 1, 1916, in New Mexico. **Cap.**, \$1,500,000; shares \$1 par; 1,060,000 outstanding. El Paso Bank & Trust Co., registrar and transfer agents. Annual meeting 2nd Tuesday in March.

Property: 15 claims, 500 acres, in Burro Mtns., Grant Co., N. M., 6 miles W. of Tyrone.

Ore: chalcopyrite occurs in contact and quartz veins, running N.E.-S.W. through monzonite (quartz-diorite), and said to average 6% copper. A N.-S. mineralized shear zone, in places 150' wide, is said to traverse several claims.

Development: 3,000' of shafts, drifting, etc. Over 30 shallow openings show ore.

Equipment: includes 18-h. p. gasoline hoist and compressor. Shipments to Oct. 1st, 1917, 137 cars of 6.26% copper ore. Management plans sinking to 700' level in 1917-18, opening levels every 100', and doing development work on the 83' level. J. H. Shockley reports that property can be made one of the important copper mines of the West.

AZURE MINING CO.**NEW MEXICO**

Mine office: Tyrone, Grant Co., N. M. Employs 30 men, when in full operation. Louis Kahn, pres.; M. D. Rothschild, sec.-treas., 14 Church St., New York. Wm. Rogers Wade, supt.

Inc. 1890, in New York. Is operated as a close corporation.

Lands: 110 claims, 1,800 acres, near the Burro Chief group of the Chemung Copper Co. Company sold 73½ acres, 1909, to Mangas Devel-

opment Co. Claims under option to Phelps, Dodge Corp'n, 1917. Company owns zinc-lead claims at Tres Hermanos, N. M.

Geology: the Burro Mountain property shows monzonite, quartz-porphry and granite, with fissure veins in granite and disseminated ore in porphyry, there being 7 orebodies with 2 under development. The Santa Fé vein is from 15 to 75' wide, averaging 40' and is traceable for 6,000'. This vein is developed by a 417' shaft, having 5 levels with 15,500' of workings showing gem turquoise as well as copper ore. The old turquoise mine has 2 tunnels and large open-ast workings.

Besides the Santa Fé vein, the property has disseminated ores, one orebody on the contact between granite-porphry and monzonite-porphry being 152' thick, developed for 500' in length and carrying 2½% copper present as disseminated particles of chalcocite. Property has been explored by churn drills and diamond drilling.

The mine was at one time the largest turquoise property in the world, systematic mining having begun in 1891. Gem production has practically ceased and the property is considered valuable for its copper ore alone.

Company is also developing the Tres Hermanos zinc mine in the Tres Hermanos district, 23 miles S. of Deming, Luna Co., N. Mex., said to show oxidized ores carrying zinc-lead-silver values.

Ore: occurs as blanket and chamber deposits in limestone, 2-5' wide, reported to assay from 30-35% zinc, 30-40% lead, and 6-8 oz. silver. Developed by several vertical shafts, from 30-100' deep.

Equipment: includes compressor and 20-h. p. gasoline hoist.

Production: in 1915, mainly from development work, was 720,000 lbs. zinc, 300,000 lbs. lead and 2,000 oz. silver. Further development planned.

BATTLESHIP MINING & MILLING CO. NEW MEXICO

Probably dead, as mail is returned. See Vol. XII. Former office: 412 Mack Bldg., Denver, Colo. Mine near Lordsburg, Grant Co., N. M.

Dr. O. L. Blachly, pres.; O. B. Crum, sec.-treas.

Cap., \$100,000; shares \$1 par.

Lands: 2 groups of 2 claims each, area 79 acres, in the Virginia district, 3 to 4 miles from Lordsburg, connected therewith by a good wagon road. Property has no surface improvements, but is opened by 478' of shafts, crosscuts and open cuts, showing ores that are said to have given average returns, from smelter shipments to El Paso, of 8 to 14% copper, 1 to 20% lead, 22 oz. silver, and \$10 to \$20 gold per ton. Property reported under lease to Andrew Bain of El Paso in 1915.

BETHLEHEM COPPER CO. (INC.) NEW MEXICO

Address: Steins, N. M.

Officers: J. A. Sund, pres.-mgr.; Wm. Charles, v. p.; F. P. Davy, sec.-treas.

Inc. June 1, 1917, in N. M. Cap., \$1,000,000; shares \$1 par; 537,500 issued.

Property: 12 patented claims, 240 acres, in San Simon mining district, Grant County, N. M., said to show a contact deposit between diorite and porphyry. Ore vein reported to be 100' wide, 3,500' long. Values of ore given as \$2.40 gold, 3 oz. silver and 1.4% copper per ton. Only development work to date is by open cuts.

Is a prospect.

BLACK HAWK MINING & MILLING CO. NEW MEXICO

Office: care of C. A. O'Leary, 802 Pioneer Bldg., St. Paul, Minn.

Officers: E. D. Lidstone, pres.-mgr., P. O. Box 456, Silver City, New Mexico; John P. Fetsch, v. p.-treas.; Jas. E. Liebe, sec., with Judge S. W. McCall and N. L. Watson, directors.

Inc. Oct. 27, 1915, in Arizona. **Cap.**, \$1,000,000; shares \$1 par; 550,500 issued. Transfer office: Old South Trust Co., Boston. Registrar: Equitable Trust, Boston.

Property: 12 claims, 140 acres, 8 patented, about 6 miles N. W. of Tyrone, Grant Co., N. M. Claims show several strong fissure veins in gneiss, near monzonite stock. Veins run N.E. exposed for a distance of 2 miles carrying high grade ore with native silver and argentite with arsenides of cobalt and nickel. Geologic and mineralogic conditions said to resemble those of Cobalt, Ontario. Ore assays 66 oz. silver, 0.24% lead, 0.75% copper, 0.75% nickel, 0.19% zinc.

Management reports 50,000 tons of milling ore blocked out and 10,000 on the dumps.

Development: by incline shaft 720' deep, with about 5,462' of workings. Mine closed down in 1893 when silver was demonetized, after producing over \$750,000.

Equipment: Lidgerwood hoist. 2 Chicago pneumatic oil driven compressors, etc.

Operating expenses 1916 for pumping and development work were \$29,449. This work opened a new oreshoot, 85' long on 8th, 160' long on 9th and 220' long on the 10th levels, as the fault which cuts it off eastward has a flat eastward dip. The ore is said to average 30" wide and \$94.30 per ton.

Property good, promotion firm reputable; and with good management operations will be profitable.

BONNEY MINING CO.

NEW MEXICO

Office: Lordsburg, Grant Co., N. M.

Officers: J. B. Foster, pres.-treas.; Ed. F. Laffin, v. p.-sec.; Jas. R. Portens, supt.

Inc. 1904 in Dist. of Columbia. **Cap.**, \$500,000; shares \$1 par, non-assessable, 498,000 issued.

In January, 1917, the San Toy Mng. Co. acquired a controlling interest in a lease and option on the Bonney Mng. Co. property through purchase of thirty-five sixtieths of the stock of the Lawrence Mng. Co., to which lease and option had been assigned.

San Toy Mng. Co. paid \$50,000 for this interest and must pay \$32,000 on Oct. 1, 1917, and \$25,000 each six months thereafter, until purchase price of \$200,000 is paid, the Lawrence Mng. Co. reserving the right to abandon at any time without further liability.

Property: 7 claims, 125 acres, includes the Bonnie mine in the Virginia district, 5½ miles south of Lordsburg.

Ore: occurs as black and red oxides and chalcopryrite, carrying gold and silver values found in 5 fissure veins in andesite forming the hills at the northern end of the Pyramid mountains, at an elevation of 4,500 to 5,500'.

Development: by shafts, deepest 500', each showing commercial ore carrying copper, silver and gold values.

Geology: veins of district, according to U. S. Geological Survey, are narrow and characterized by quartz with plentiful barite, rhodochrosite and other carbonates and carry ore in bands and bunches in central part of quartz. Wide silicious zones occur but are barren. Values considered superficial by authorities.

Equipment: includes air-compressor, drills, steam hoists, pumps, dwellings, offices and mine buildings. Shipments to date amount to about 10,000 tons. Management estimates ore reserves, October, 1917, at 25,000 tons. Total costs given at \$9.50 per ton.

Leasers shipped ore during last three months of 1916 averaging \$10 per ton.

BURRO MOUNTAIN COPPER CO. NEW MEXICO

Branch of the Phelps, Dodge Corporation, which see.

BURROS DEVELOPMENT CO. NEW MEXICO

Address: J. M. Kiner, pres., Silver City, N. M. R. W. Jackson, v. p.; C. C. Royall, sec.-treas.

Inc. 1917 in N. M. Cap., \$600,000; shares \$1 par; 100,000 shares offered the public Oct., 1917, at 10c. to provide funds for patenting and development.

Property: 21 claims, 420 acres, a short distance south of Leopold, said to show a vein of 7.2% copper ore in a 75' shaft.

B. V. N. MINING CO. NEW MEXICO

Probably defunct.

Pinos Altos, Grant Co., N. M.

Officers: at last accounts, Dr. A. M. Torello, pres.; J. W. Bettes, T. B. Fischer, Robt. Noble. Jos. Vinot, H. Bettes and S. D. Bettes, directors. Wm. Donovan, supt.

Inc. Nov., 1914, in N. M. Cap., \$250,000.

Property: Silver Hill mine, in Pinos Altos district, shows gold-silver-zinc ore in vein, 1' wide, believed to be continuation of rich orebody on adjoining Lankston and Pacific No. 2 claims.

Development: 3 tunnels, 280', 300' and 400' deep and 260' stope. Little work was done in 1915.

CALUMET NEW MEXICO MINING CO.

Owens 3 claims in Pinos Altos district. See under same title, Socorro Co.

CARLISLE MINING CO. NEW MEXICO

Mine at Steeplerock, N. M.

Officers: August Heckscher, of New Jersey Zinc Co.; G. M. Heckscher, Sumner Girard, H. K. Welch and S. Makeever, directors. M. K. Welch, mgr.

Company has applied for articles of incorporation.

Property: formerly owned by Marshall Field, L. Z. Leiter and N. K. Fairbanks. Has produced \$6,000,000 in gold ores. Ores with depth turned into complex sulphides which were not amenable to metallurgical processes of the early '80s. Property has been idle for nearly 39 years.

Development: mine has been completely unwatered to 627' in shaft. On 500' level development work is progressing and it is reported that ore has been cut for 40' and no indication of walls in sight. Reported to be 500,000 tons of ore blocked out.

Equipment: a 125-ton unit of a 500-ton mill, being built by Messrs. David Cole and Hardinge, using oil flotation, electrostatic and wet concentration. The mill feed from development work has averaged \$120 gold, 3 oz. silver, 4% lead, 8% zinc, 1% copper. A 35-ton car of lead-silver-gold concentrates and a 50-ton car of zinc-copper have been shipped to the smelters. Other equipment includes electric generators, motors, pumps, air compressors, etc.

An assessment of \$100,000 called Oct., 1917, to provide for further development.

CHEMUNG COPPER CO. NEW MEXICO

Bought out, Aug. 18, 1912, by Phelps, Dodge & Co., and dissolved after paying shareholders \$1,881,072, or \$6.16 per share.

CHINO COPPER CO. NEW MEXICO

Office: 25 Broad St., New York. Mine office: Hurley, Grant Co., N. M.

Officers: Charles M. MacNeill, pres.; Daniel C. Jackling, v. p. and managing dir.; Charles Hayden, v. p.; preceding and A. Chester Beatty, Sherwood Aldrich, K. R. Babbitt, gen. counsel, W. Hinckle Smith, Mark L. Sperry, John M. Sully, gen. mgr., directors; A. J. Ronaghan, asst. sec.; C. W. Peters, treas.; Horace Moses, mine supt.; W. H. Janney, mill supt.; R. C. Gemmell, cons. mng. engr. Guaranty Trust Co. of New York and Old Colony Trust Co., Boston, registrars; Bankers Trust Co., New York, and American Trust Co., Boston, transfer agents.

Inc. Aug., 1909, in Maine. Cap., \$3,500,000; shares \$5 par; increased to \$4,000,000, June 30, 1911; and again increased to \$4,500,000, April 2, 1912, of which 100,000 shares are reserved for conversion of bonds and 30,000 shares remain unissued; 869,980 issued. Bond issue has been retired. Annual meeting, third Friday in April. Paid initial dividend of 75c per quarter, June, 1913, and has paid a total of \$18.50 per share to April 1, 1917. Earnings for 1st quarter 1917 were \$3.44 per share, and dividends declared were \$2.50. Dividend for 2d and 3d quarters similar, but December declaration \$2, which with 40c. Red Cross make total for 1917 of \$9.90. Listed on New York and Boston Stock Exchanges.

Statement for 1916 gave total current assets as \$11,188,343, including \$6,882,340 for copper and ore on hand; accounts receivable, \$54,764; materials and supplies, \$980,398; marketable securities, \$248,750; cash on hand and due for copper deliveries, \$3,022,091; total current liabilities were \$1,491,763. and surplus quick assets, \$9,696,579.

Income account showed: \$19,219,767 operating revenue; \$325,285 misc. income; \$6,701,891 operating expenses; \$7,177,335 dividends; \$315,213 reserve for depreciation, etc.; net undivided profit of \$5,350,613. Earned surplus of \$8,613,260 for 1915; \$13,963,873 for 1916. Net income for 1st quarter, 1917, was \$2,992,071, and dividends declared, were \$2,174,950.

Property: 131 claims, 2,412 acres, patented, at Santa Rita, title to which was derived from the Santa Rita Mining Co., since dissolved; also 23 claims, 339 acres, held by location and 160 acres, patented, agricultural land, making a total at Santa Rita of 2,921 acres. Also owns 185,701 acres at Hurley for mill site and water rights, 17,170 acres patented, and the remainder in process of patent.

The property is the old Santa Rita del Cobre mine, which is the oldest copper mine in New Mexico, and the second oldest in the United States, having been opened, 1804, by Spaniards. The property was worked by an American named Pattie, in 1822 and to 1827. It was in possession of a Frenchman from 1828 to 1834, when an American called McKnight, began operations which ceased in 1836. From 1840 to the late fifties, it was in possession of a Spaniard. In 1851 Santa Rita was the headquarters of the American Commissioners, of the Boundary Survey. Some time before 1860 four Americans attempted to operate the property. In 1862 Gen. Sibley, of the Texas Confederate force, held the mine. In 1873 M. B. Hayes, acting on behalf of Denver people, succeeded in purchasing the

CHINO COPPER COMPANY

Our Statistical Department will furnish complete information
on application

HAYDEN, STONE & CO.

Members New York, Boston and Philadelphia Stock Exchanges

25 Broad Street, NEW YORK

87 Milk Street, BOSTON

claims, attempting to perfect the title by obtaining U. S. patents, although patents had been refused by the Commissioner of the Land Office in 1870. Hayes' application was turned down in April, 1873. Between that date and the final decision of the Secretary of the Interior in November, 1873, title was obtained by Hayes from the surviving heirs of the original Spanish estate and final U. S. patent was obtained to the claims covering the Santa Rita del Cobre Grant. Title was acquired by the Chino Copper Co. from the Santa Rita Mining Co., since dissolved.

Geology: Santa Rita is situated in the Central mining district, Grant Co., New Mexico, on a branch of the Santa Fe system which connects at Whitewater with the Deming-Rincon division of the same railroad. The orebody and town of Santa Rita are located in a distinct basin and the rocks exposed in the district may be roughly divided as follows: 1, sedimentary; 2, intrusive; 3, extrusive. The sedimentary formation, of which there is a large area in comparison with the intrusive exposures, consists of limestones of more or less purity, and belonging to the sub-carboniferous and carboniferous series, there also being some isolated exposures of Devonian rocks. These beds vary from nearly pure limestones, through cherty limes and shaly limes, to shales. Through faulting there is also exposed a considerable area of Cretaceous sandstones and shales, the former in the immediate neighborhood of the intrusives appearing as quartzites. The principal intrusive rocks in the Santa Rita basin are granodiorite, a quartz-monzonite porphyry, and another of distinct porphyritic texture which may be classed as andesite. This latter rock intrudes the two general types as also the sedimentaries, in sills, lacoliths and dikes. The boundary forming the S. E. side of the Santa Rita basin is composed of two flows, the principal one being rhyolite and rhyolite tufa overlaying an older flow which is of an andesite nature.

The granodiorite is intrusive into and across the edges of the sedimentary series, which form a syncline dipping to the south from the northerly bordering ridges toward the lowest point of the basin. The area within the basin has been strongly faulted in wide zones and in two general directions. The intersections of the numerous faults have resulted in a roughly circular shear zone that has a diameter of $\frac{3}{4}$ of a mile. This shear zone on the southeastern side of the property has a width of some $\frac{3}{4}$ of a mile. The narrowest part is in the N. W. portion where it is some 400' wide. Generally speaking, the center, or core, is of granodiorite. As a result of the conditions mentioned, there is the center of the basin of granodiorite, surrounded by shear zones which affect it at times as well as the surrounding sedimentaries, the rhyolite tufa and quartz monzonite porphyry, the two latter rocks being on the S. E., E. and S. W. This shear zone has been the depository of the valuable copper minerals, chalcocite, cuprite and native copper. Bornite, chalcopyrite and cupriferos pyrites are also found, but to a much lesser extent than the previously named. There also occurs in small restricted areas, malachite and azurite with a very limited amount of chrysocola.

The old workings, which are very extensive, have been practically eliminated by the steam shovel operations. During the year drills were moved from Northwest orebody to Sierra section in order to secure definition of that area. Churn drilling amounted to 13,161' for the year, making a total of 227,303' drilled to January, 1917, and mine was estimated to have 95,555,843 tons of ore developed, averaging 1.656% copper. Of the above footage, some is from scout holes which indicate a considerable extension of the orebodies as now outlined.

Equipment: consists of 10 steam shovels, 21 locomotives, 140 dump

cars, of 6-20 cu. yd. capacity. Company operates about 24 miles of track, giving access to the pits. There is also a primary crushing plant, equipped with 48"x60" jay crusher, together with bins for handling and breaking up coarse material loaded by shovels.

Concentration Plant—The concentrating mill at Hurley, 9 miles from the mine, on the Santa Rita branch of the Santa Fe railway, with original capacity of 5,000 tons per day, treated on an average of 8,455 tons per day in 1916, and 9,461 tons daily for 1st quarter, 1917, due to the improved metallurgical methods. Two new sections are being added and will be completed by the end of 1917. Mill will then have a capacity of 12,500 tons. A 1,000-ton tailings retreatment plant, later to be increased to 5,000 tons, will begin operations when the new turbo-generator is completely installed. The first unit went into operation in Oct., 1911, and ore was running through the 5th and last section on Nov. 28, 1912.

Ore is delivered to bin of 18,000 tons capacity. In conjunction with this coarse ore bin is a coarse crushing plant, consisting of 2 sets gyratory crushers, 2 sets 72"x20" Garfield rolls, and to which a second unit is being added. From here material is delivered into the fine ore bins at maximum size of ¾". Mill is equipped with 6 sets 16"x42" rolls for preliminary grinding, 9 Garfield Chilean mills for final grinding. Roughing treatment consists of Garfield tables, followed by Wilfleys and full equipment of Richards-Janney classifiers and Isbell vanners. Concentration is 15 to 1 with recovery of 66.6%, or 28.697 lbs. copper per ton of ore.

Power plant includes twelve 445 h. p. Heine boilers, three 1,250 k. w. generators, direct-driven by Nordberg Corliss engines, and one 2,000 k. w. Allis-Chalmers turbo-generator set. Primary water is secured from the Apache Tejo Spring, 3½ miles south of Hurley, from underflow of White-water draw, Cameron Creek draw and Whiskey Creek draw. There is also in use a storage reservoir below the mill, the dam forming this reservoir having been built out of mill tailings and having storage area of nearly 3,000 acre feet.

Settlement at Hurley includes in addition to mill and accessory buildings, office building, store, school, shops and dwellings, town having population of about 3,500 people. Town of Santa Rita, on company ground, has population of over 4,000.

Production:

Year.	Tons Treated.	Cost per Ton Ore.	Cents Waste.	Cents Mill.	% Cu.	% Rec.	Ratio Conc. in Cnts.	Lbs. Cu. Rec.		Net Cost per Lb.	Rec'd per Lb.	
								Ore.	Lbs. Cu.			
1912	1,120,375	.....	.....	.....	2.077	61.63	16.6:1	21.20	24.79	27,776,088	7.69	.....
1913	1,942,700	23.13	16.	61.08	2.033	67.31	10.6:1	14.52	27.37	50,511,661	8.787	15,489
1914	1,907,300	22.13	16.12	55.01	2.115	67.86	12.9:1	18.50	28.70	53,999,928	7.60	13,325
1915	2,379,800	19.47	16.51	54.19	2.155	66.69	15.0:1	21.55	28.70	64,887,788	7.12	17,42
1916	3,094,400	19.88	18.09	64.	1.833	66.59	12.0:1	14.82	24.42	72,319,508	9.15	26,465

Note: net cost per pound copper includes all charges except bond interest and depreciation, but does not credit miscellaneous income, equal to 0.45c per lb. copper in 1916. Gold and silver produced in 1916 amounted to \$80,498, a credit of 11c per lb. copper.

Both property and management are regarded as exceptionally good, and the stock as a very high-grade investment.

CHINO DEL NORTE COPPER CO. NEW MEXICO

Address: C. W. Hoyt & Co., 79 Milk St., Boston, Mass. **Mine address:** Geo. E. Coxe, mgr., Hanover, N. M.

Officers: Wm. A. Ulman, pres., 233 Broadway, N. Y. City; John H. Leddy, sec.-treas.; foregoing, and Elmer E. Fox, Meshech Frost, H. O. Bursum, Geo. E. Cox, F. J. Griffiths, S. Morgan Barber, Clarence W. Hoyt, D. C. Sutton, cons. engr., directors.

Inc. in Delaware. **Cap.**, \$3,000,000; shares \$1 par.

Owens its properties through ownership of entire capital stock of El Norte Copper Co., of New Mexico, the operating company. Properties were paid for partly in cash and partly by 110,000 shares, \$1 par, of preferred stock of the El Norte Copper Co. 1,000,000 shares Chino Del Norte stock offered at 50c in October, 1917, by Boston agents.

El Norte Copper Co.

All the common stock and all but 11,000 shares of preferred stock of this company, held by Chino Del Norte Copper. The El Norte owns the New Mexican holdings.

Property: 29 claims, 600 acres, and 17 more claims under option.

C. & O. MINING & MILLING CO.

NEW MEXICO

Pinos Altos, Grant Co., N. M.

Officers: J. L. Caddel, pres.; A. Caddel, v. p.; Jackson Agee, sec.-treas.; above, with John James and A. L. McCarty, directors; A. L. McCarty, supt.

Inc. April, 1914, in New Mexico. **Cap.**, \$100,000; shares \$1 par; outstanding, 90,000 shares. Annual meeting, Jan. 12th. Gross earnings from ore sales in 1914-1915 amounted to \$50,000 with operating expenses of \$40,000.

Property: 2 claims, patented, in the Pinos Altos mining district, 7 miles N. W. of Silver City.

Ore: lead-zinc-copper in fissure vein in diorite. Vein has a N. S. course, dips 65° and is said to have an orebody 6" to 4' wide. Ore minerals are galena, sphalerite, chalcopyrite and pyrite and average assay is said to be 2% lead, 2% copper, 8% zinc, \$4 to \$10 gold, and 10 oz. silver per ton.

Development: by 200' incline, shaft with 4,000' of underground workings said to block out 70,000 tons of ore on the 100' and 200' levels.

Equipment: includes 20 h. p. gasoline hoist, a 50-ton concentrator which is run jointly with P. A. M. & M. Co. Management states that company will shortly resume operations. In April, 1917, unwatering of shaft was only work being done.

C. O. D. LEASING CO.

NEW MEXICO

Idle. **Office and mine:** Lordsburg, Grant Co., N. M. Described in Vol. XII, 1916.

COPPER QUEEN & COPPER KING GROUP

NEW MEXICO

Mine near Steins, Grant Co., N. M. Dr. J. O. Hamilton, of El Paso, Texas, owner.

Property: 17 claims is reported to show a monzonite porphyry dike, 100' wide impregnated with copper sulphides and averaging about 3% copper.

Development: by shallow shafts. Mine east of the San Simon valley and 5 miles from the S. P. R. R.

DUNDEE MINE

NEW MEXICO

Messrs. Fink, Guildes and H. H. Sholly, lessees, Lordsburg, N. M.

Mine near Lordsburg, said to show high-grade ore, shipments in 1917 carrying about 14% copper, 1 oz. gold and 14 oz. silver per ton.

ECLIPSE MINING & MILLING CO.

NEW MEXICO

Address: Duncan, Ariz., and Steeplerock, New Mexico.

Officers: Geo. W. Trimble, pres.; Ben. F. Barbour, sec.-treas. and mgr., with W. C. Downey, Wm. O. Olsen, Chas. H. Lee, Morgan M. Wilson and C. R. Meyer, directors.

Inc. in Arizona. **Cap.**, \$1,000,000; shares \$5 par; 106,000 shares issued.

Annual meeting, first Wednesday in January. Is the successor to the Shamrock Mining & Milling Co., described in Vol. XII.

Property: 24 claims, 480 acres in Steeplerock mining district, Grant Co., N. M., said to show a fissure vein in andesite, from 6-8' wide with S. E.-N. W. course. Ore is silicious and reported to assay 1.16 oz. gold, 15.1 oz. silver and 6.84% copper.

Development: by several tunnels and shafts. Mine was operated 2 months during 1916, receipts from ore sales amounting to \$4,800.

Management plans extensive development and installation of necessary machinery, in 1918.

(85) EIGHTY-FIVE EXTENSION COPPER CO. NEW MEXICO

Office: Miami, Ariz. Mines at Lordsburg, N. M.

Officers: Lester B. Doane, pres.; L. D. McClure, v. p. and gen. mgr.; De Witt Murray, sec.; C. C. Faires, treas.; above, with E. K. Davis, directors.

Inc. in Arizona. **Cap.**, \$5,000,000; shares \$1 par; 2,000,000 shares paid for property are being held in escrow; 400,000 shares offered the public at 50c each, April, 1917.

Property: 400 acres adjoining the 85 Mining Co.'s ground at Lordsburg, N. M., including the Southern group. Also has a bond on the Atwood mine, formerly under option to the 85 Mining Co. Claims show several veins along a dike reported to be 75' wide and traceable for 600'. Ore is silicious and carries gold, silver and copper values.

Development: by 310' vertical shaft with many open cuts and shallow workings. The management (or perhaps we should say the promoters, the E. F. Hiatt Investment Co., Globe, Ariz.) claim to have 463,460 tons of ore in sight averaging \$13.50 per ton, giving the property a valuation of \$6,284,517. This estimate is based on a report by J. L. Wells.

Production: to date 149 cars of ore shipped in former years from the Atwood mine netted leasers \$40,965. Leasers shipping some surface ore, 1917, said to run \$25 a ton.

Property may have merit, but the statements above are in our opinion not warranted by facts.

85 (EIGHTY-FIVE) MINING CO. NEW MEXICO

Office: Lordsburg, Grant Co., N. M.

Officers: A. P. Warner, pres.; C. H. Warner, sec.; P. B. Yates, treas.; A. J. Interridan, mgr.

Inc. Sept. 23, 1909, in New Mexico. **Cap.**, \$1,000,000; shares \$1 par. Annual meeting, second Wednesday in December.

Company purchased the Superior mine of the Superior Mining Co., in 1912.

Property: 6 claims, in Shakespeare camp, about 4 miles from Lordsburg, in the Virginia district, includes a mine, in rhyolite, developed by 600' tunnel and a 700' blind shaft, with a 300' air shaft to surface, and 3,500' of drifting on each level. Vein is estimated by company to average 10' in width and to carry 3.5% copper, 6 oz. silver and 0.1 oz. gold per ton.

Equipment: includes 100 h. p. electric motor, hoist, an 85 h. p. Fairbanks-Morse crude-oil engine, as an auxiliary, two 500 h. p. Lyons-Atlas-Diesel engines and an Aldrich electric pump. Company employs about 500 men and ships 400 tons per day to the smelter at Douglas or El Paso.

Company proposes (Sept., 1917) erection of 300-ton mill with fine grinding, Wilfley table, vanners and flotation treatment.

Reserves, 463,460 tons of \$13.56 ore, with normal metal prices, besides ore between 210 and 310 levels.

A new strike on 148' level, has yielded ore averaging 7.92% copper, 6 oz. silver, \$5.20 gold.

Production: for 1916 amounted to \$1,456,587 gross as compared with \$762,921 in 1915. Shipments, 1917, average \$25.

Property considered good, and management competent.

EL CENTRO MINING & MILLING CO. NEW MEXICO

Lordsburg, Grant Co., N. M.

Officers: E. S. Eno, pres.; Geo. M. Peck, v. p.; R. F. Fitz, sec.-treas., P. O. Box 275, Los Angeles, Cal., with Henry Muntz, Alfred Cole, D. D. Culver and J. A. Rowelstad, directors.

Inc. in Ariz. Cap., \$200,000; shares \$1 par; outstanding, \$100,000. Company, in 1915, bought the Last Chance mine, owned by the Sutton Consolidated Mining Co., and claimed to have produced \$135,000 in the past.

Property: 4 claims, patented, 68 acres, in the Pyramid mining district, near Lordsburg, said to show shoots 9-30' wide of silver-copper ore in a fissure vein in andesite.

Ore reserves: claimed to be 10,000 tons of ore, assaying \$4 to \$12 per ton.

Development: 275' vertical shaft with 2,000' of underground workings. Mine idle in 1915-1916, but present management resumed operations, March, 1917.

EL NORTE COPPER CO. NEW MEXICO

G. E. Coxe, mgr., Hanover, N. M.

Has taken an option on 29 claims near Hanover. Is operating company for Chino del Norte Copper Co., which see.

EL PASO MINING & MILLING CO. NEW MEXICO

Dr. J. E. Spencer, mgr.; J. W. Crowdus, cons. engr. and sec.; A. F. Kerr, pres., El Paso, Tex.; Louis Addoo and Mrs. J. W. Crowdus, directors.

Operating the Savannah Copper Co. group of 19 claims, including Pacific No. 2, at Pinos Altos, N. M., under lease. Shows gold bearing quartz in Skilacorn vein.

Has 75-ton concentration mill and flotation process, idle in summer, but operated, Sept., 1917.

EMMA MINE NEW MEXICO

S. L. Landon, supt. Mine at Fierro, Grant Co., N. M., is owned by the Copper Queen Consolidated Mining Co. and is being operated on a small scale by lessees, 1916.

ERNESTINE MINING CO. NEW MEXICO

Absorbed, June, 1915, by Mogollon Mines Co. Latter company wound up and holdings bought by Socorro Mining & Milling Co., which see.

GIANT COPPER CO. NEW MEXICO

Address: J. L. Burnside, Silver City, N. M.

Officers: F. R. Jones, pres., El Paso; J. L. Burnside, v. p.; D. C. Crowell, sec.-treas.; F. P. Jones, T. L. Lowe, J. Agee, T. W. Carter, D. C. Crowell and D. T. White, directors.

Inc. 1917, in N. M. Cap., \$3,500,000; shares \$1 par; 620,000 issued.

Property: 61 claims in the Burro Mountain district, N. M., including those of National Copper Co. Considerable development done to date.

GOLDEN LINK CO. NEW MEXICO

Probably dead. See Vol. XII.

Jackson, Grant Co., N. M.

Property: 8 claims, along the Big Dry canyon, 6 miles from Jackson. in the Cooney, or Mogollon district, Socorro Co., N. M. J. G. Barnesdale, treas., Superior, Wis.

Development: by 3 tunnels, lowest 120' long, and a vertical shaft, all in ore, vein said to be 8' wide. Equipped with 100 h. p. water-power plant, 3-stamp mill and 500' tram. No returns secured. Probably idle.

GREAT EASTERN GROUP

Santa Rita, Grant Co., N. M. Al. Owen, owner.

Property: 8 claims, 160 acres, adjoining Chino Copper Co.'s lands on the east side of the Santa Rita basin. The S. W. side of the group shows a quartzite capping and iron gossan, with limestone covering porphyry over other parts of the claim. Veins with a N. E. course outcrop and show small percentages of copper. Developed by shallow shafts. Owner was preparing to drill property in 200' blocks; at last accounts.

HANOVER BESSEMER COPPER & IRON CO. NEW MEXICO

Address: Hanover, Grant Co., N. Mex. Is a close corporation owned by Hon. Boise Penrose and associates of Philadelphia, Pa.

HANOVER COPPER CO. NEW MEXICO

Hanover, Grant Co., N. M. Geo. A. St. Clair, pres., Duluth, Minn.; F. T. Walker, mgr.

Inc. 1909. Cap., \$50,000; shares \$10 par.

Property: 18 claims, north of the Chino Copper property and near the holdings of the Philadelphia Copper Co. Mine has shafts of 70', 100' and 150', and tunnels of 40' and 60', showing copper and zinc ores. Equipped with hoist and compressor.

Shipping 20-30% zinc carbonate and sulphide ore, 1917.

HARDSCRABBLE MINING CO. NEW MEXICO

At last accounts officers were: J. E. Lundstrom, pres.; E. S. Bruning, sec.-treas., with S. H. Beach and J. T. Janes, directors; J. T. Janes, supt.

Inc. 1911, in Colo. Cap., \$150,000; outstanding, \$75,000; shares \$1 par. Has a 5-year lease, dating from 1913, on the Hardscrabble mine, 1½ miles W. of Pinos Altos.

Had a lease on the Hardscrabble mine near Pinos Altos, Grant Co., New Mex., now being operated by the United States Copper Co., which see.

HECLA MINING CO., THE NEW MEXICO

Office: 652 South Spring St., Los Angeles, Calif. **Mine address:** Lordsburg, N. M.

Officers: R. E. Vandruff, pres.; John W. Wilson, v. p.; W. G. Wilbern, sec.-treas.; O. H. Reinhold, cons. engr.; Franklin Smith, geologist; E. K. Davis, gen. mgr.

Inc. Oct. 17, 1916, in Nevada. Cap., \$850,000; shares \$1 par; treasury reserve, \$200,000; balance partly used in completely paying for 9 claims and new equipment and partly offered for sale (150,000), proceeds to be used for development. No indebtedness.

Property: 9 claims fully paid for, and another, the Bonnie Jean, under option, about 140 acres lying between the 85 and the Octo mines, 3 miles S. W. of Lordsburg, in Grant Co., and 2 miles from the Southern Pacific Railway.

Geology: similar to that of the 85 and Octo mines. Country rock is diorite-porphyry. General geology fully described by Lindgren in Prof. Paper 68, U. S. Geological Survey. Outcrops conspicuous and form landmarks, such as Lee's Peak 500' from the Hecla, frequently mentioned by Lindgren. Gangue very silicious and ore is therefore in demand for fluxing the basic ores from Bisbee. Sulphides found near the surface. Many mineral varieties occur, but main values lie in copper, gold and silver contents, said to average over \$30 a ton before the rise in metal prices.

Development: includes two 300' and several shallow shafts. One of the deeper shafts will be enlarged, retimbered and deepened. The topography does not lend itself to successful tunnelling.

Equipment: includes 250 h. p. boiler plant, 40 h. p. hoist, 700 cu. ft. air compressor, pumps, etc. Has produced some ore, amount not stated.

HERMOSA COPPER CO.**NEW MEXICO**

Office: 30 Church St., New York. **Mine office:** Hanover, Grant Co., N. M.

Officers: D. M. Riordan, pres.; L. B. Judson, v. p.; M. F. Westover, sec.; Henry W. Darling, treas.; preceding, with A. W. Burchard, John B. Keating, directors.

Inc. July 20, 1905, in New Jersey. **Cap.**, \$100,000; shares \$100 par. Corporation Trust Co., New York, registrar. Annual meeting, first Monday in June.

The mines, discovered 1800, and opened 1880, were worked intermittently, owing to various Indian troubles and lack of funds, until taken over, 1904, by the present owner, which practically is the General Electric Co.

Property: 114 claims, patented, about 2,200 acres, in the Central or Hanover district, adjoining the Chino Copper Co., includes the Ivanhoe and Humboldt mines; also the Copper Queen, Treasure Vault, Ninety, Tourmaline and other mines and attempts at mines. Country rocks are porphyry, granite, quartzite and limestone, showing various contact deposits between granite and limestone, with porphyry intrusions, ores occurring as lenticular bodies, in veins with a generally N. E.-S. W. strike and an average dip of 45°. Four different orebodies are developed, ranging from 15 to 20' in width, with a known depth of 410' and known length of 2,000'.

Development: by several shafts, 300 to 400' deep and all showing ore; the various mines have about 3 miles of workings, estimated to show 100,000 tons of ore, with 25,000 tons blocked out for stoping. The property has large bodies of low-grade concentrating ore carrying average value of 3% copper, 3 oz. silver, and slightly under \$1 gold per ton, with small quantities of lead near the surface and occasional traces of zinc, but not in sufficient quantities to materially hamper reduction.

Equipment: includes a 700 h. p. steam plant, with 7 hoists, good for 500 to 1,000' each, and 4 Sullivan air compressors of 26 drills aggregate capacity. Buildings include machine shop, smithy, carpenter shop, framing mill, warehouse and sawmill, with a total of 20 buildings.

The 100-ton concentrator has a No. 14 Blake crusher, 2 sets of rolls, 1 Hartz jig, 5 Overstrom tables, 2 Wilfley tables, 7 screw sizers, 1 hydraulic sizer and 1 Huntington mill.

Considerable systematic development was done, 1904-1907, based upon estimates of tonnage by eminent engineers, but results did not come up to expectations, for although some fairly large bodies of low-grade ore were found, they were not large enough to render the property profitable. Property closed down and in hands of a caretaker at last reports.

JACK MINING & MILLING CO.

Address: J. F. Thomas, pres. and mgr., Bayard station, via Santa Rita, N. M. J. E. Thomas, supt. and sec.; S. D. Clifford, mill foreman.

Property: the Roosevelt group, a former gold mine in Gold gulch, Santa Rita Mountains, near Bayard, a few miles S. W. of Santa Rita. The ore deposit contains both silver-lead and molybdenum, the former containing 8% zinc and lead.

The concentrating mill handles 30 to 40 tons a day and makes both silver-lead and molybdenite concentrates.

JOHNNY BULL MINE**NEW MEXICO**

W. H. Henry, owner, Boston Road, New York, N. Y.; David L. Creswell, purch. agt., Steins, Grant Co., N. M.

Property: 3 patented claims, south of Steins Pass, between S. P. and E. P. & S. W. R. R., on western slope of Peloncillo range, shows a contact deposit between limestone and a N.-S. monzonite dike. The ore is said to average 5% copper and to run high in lime and iron.

Development: includes 2 old shafts, 100' and 150' deep, with 1,000' of work, exposing 2 parallel veins, each 125' wide. Property was formerly owned by the Johnny Bull Copper Mining Co., whose charter was forfeited in 1902.

Owner reports that the smelter at El Paso, Texas, has settled for 3 lots of ore averaging 7.8%, 6.5% and 4.2% copper, total net returns being \$1,810. About 225 tons of 5% ore has been mined to date, yielding gold and silver also.

JUMBO MINING CO.**NEW MEXICO**

Office: Deming, N. M. M. Lininger, supt.

Officers: J. J. Hyatt, pres.; C. J. Kelly, v. p.; E. L. Foulks, sec.-treas. Inc. 1917. **Cap.**, 250,000; shares \$1 par; 50,000 treasury shares offered, Oct., 1917.

Property: in Cook mining district, 25 miles north of Deming and near the Graphic and the Cook Peak mines. Claims show four strong parallel fissure veins in andesite porphyry.

Development: by 250' shaft with new level at 200' and 250'. On latter level vein No. 1 is 2'-6" wide and carries high-grade silver lead ore.

Equipment: 50 h. p. boiler, compressor and 50 h. p. oil engine.

KING & QUEEN COPPER CO.**NEW MEXICO**

Idle. Dr. J. Odd Hamilton, pres. and chief owner. Mine near Steins, Grant Co., N. M., 8 miles S. W. of Steins Pass, near the King Kendall and Johnny Bull mines, shows limestone cut by a large N.-S. dike of monzonite porphyry with ore occurring in contact metamorphic deposit of altered garnetiferous limestone. Ore carries a little bornite, chalcopyrite, pyrite, calcite and on the Queen claim, some chrysocolla. The ore is low-grade, carries zinc and lead and is hard to concentrate.

Development: numerous shallow workings showing ore said to average 1½-2% copper. Property being developed under lease and bond in 1915-1916.

LAWRENCE MINING CO.**NEW MEXICO**

Office: Oliver Bldg., Pittsburgh, Pa.

Officers: G. A. Deitch, pres.; D. J. Evans, v. p.; Edw. Hopes, sec.-treas.; above, with C. A. Blanchard, J. C. Slack and R. J. Kerr, directors.

Owns lease and option on the Bonney mine of the Bonney Mng. Co., 5 claims, in the Virginia mining district, 5 miles S. W. of Lordsburg, N. M.

In 1917, company sold controlling interest in their lease to the San Toy Mng. Co., namely, 35/60 of the stock, for \$200,000. \$50,000 was paid in cash, \$32,000 is due, Oct. 1, 1917, with payments of \$25,000 every 6 months thereafter.

See San Toy Mng. Co., under Mexico.

MANGAS DEVELOPMENT CO.**NEW MEXICO**

Office: Silver City, N. M. **Mine office:** Tyrone, Grant Co., N. M.

Officers: J. E. Saint, pres.; G. A. Kaseman, v. p.; M. W. Porterfield, sec.-treas., with W. C. Porterfield and R. P. Barnes, directors.

Inc. Oct. 2, 1909, in New Mexico. **Cap.**, \$500,000; shares \$5 par; 87,315 issued and paid up.

Property: 37 claims (being patented), the Porterfield-Robinson and Midway Groups, near the Chemung and Savanna mines, on the N. E. slope of the Burro mountains, 12 miles S. W. of Silver City. Property adjoins that of Burro Mountain Copper Co.

The Porterfield-Robinson group of 22 claims, 353 acres, lies near the extreme S. W. edge of the favorable area of the district, the northern part

being the more promising, showing iron stains, with some copper stains, and slip zones.

The Midway group of 15 claims, 10 fractional, 254 acres, carries the N. W. continuation of the ore zone of the Chemung Copper Co., and also lies near the Burro Mountain mine, with conditions markedly similar to those existing on these adjoining properties, on which large quantities of ore have been developed, and are being treated.

The orebodies are a combination of stockwork and impregnation deposits, carrying values mainly along a series of small intersecting veinlets, with occasional masses of solid chalcopyrite up to several inches in size, but ore occurring mainly as minute particles of chalcocite, in veinlets, and as films on gangue rock. See Geology of the Burro Mts. Copper district by R. E. Somers, Bull. Am. Inst. Min. Eng., May, 1915, p. 957.

Nothing has been done since 1910, being short of money. The ground requires drilling.

MANHATTAN MINE

NEW MEXICO

Operated by R. J. Doyle and associates.

Property: 10 patented claims, 200 acres, near Pinos Altos, Grant Co., N. Mex.

Ore: containing gold, silver and copper, occurs in a fissure vein in diorite-porphry, 18" to 5' wide, strike N. 15° E.; dip almost vertical. Average assay said to be \$20 per ton.

Development: 900' tunnel and 300' shaft below tunnel level. Claims to have shipped 1,200 tons of \$20 ore in 1915 and to have received \$26,000 from ore sales.

Preliminary development was undertaken by churn drills, with holes put down at 200' intervals. Drilling was suspended, 1910, but in 1911 an exploratory shaft was started on the eastern side of the Tulloch group, in high-grade carbonate ore, and reached sulphides at comparatively shallow depth. The Midway group when taken over, had 2 shallow shafts and a few pits, showing a little carbonate and silicate ore on the dumps.

Insufficient funds limited company's development plans, but management is good and property has a fair chance of developing into a large mine.

Over 30 men employed, Aug., 1917, including lessees. Ore being shipped to Douglas, Ariz.

MONTE RICO MINING & MILLING CO.

NEW MEXICO

Office: 428 Washington Trust Bldg., Washington, Pa. **Mine office:** Lordsburg, Grant Co., N. M.

Officers: Lawrence R. Boyd, pres.; F. B. Theakson, v. p.; Jas. V. Boyd, sec.-treas.

Inc. in Arizona. Cap., \$500,000; shares \$1 par; non-assessable.

Lands: 9 claims, 120 acres, on Lee's peak, in the Pyramid mountains, Virginia district, 4 miles S. W. of Lordsburg.

Geology: property shows diorite cut by andesite, and there is said to be a dike 100 to 200' wide mineralized throughout and forming the center of a network of veins. Ores at and near surface carry azurite and malachite, succeeded at depth by chalcopyrite, and there are also silver, lead and copper ores with small gold values.

Development: mine is reported to have upwards of 2,000' of workings, with ore in sight estimated by the company at 500,000 to 1,000,000 tons, which is probably as true as the statement that its ores can be mined and milled at an expense of \$1.50 to \$2 per ton. In 1916 a tunnel was being driven.

The prospectus of the company is replete with misinformation, and

among other things states that "this formation, as well as the character of the ore, is identical with that found in the great copper mines at Bisbee, Globe, Jerome and Cananea," but as is well known, the orebodies of those localities differ greatly in occurrence. In view of the many questionable statements made, and the unreasonably large profits promised in the prospectus, the company must be regarded with much suspicion.

NATIONAL COPPER CO. NEW MEXICO

Idle. Chas. P. Laughlin, sec., Tyrone, Grant Co., N. M.

Inc. Feb., 1902. Cap., \$1,200,000; shares \$100 par.

Property: 22 claims, 10 patented, 4 miles from the Chemung Copper Co., in Whitewater Canyon, Burro Mountain district, has a fissure vein, in granite, of 60' estimated average width, carrying mainly chalcocite, opened by a 200' shaft and a 360' tunnel having a 214' blind shaft. The mine shows considerable bodies of copper ore, mainly in disseminated sulphides of 2 to 3% copper tenor, with some ore carrying up to 15 and 20% copper.

Equipment: Includes steam power and a Norwalk air compressor. Described in Copper Handbook, Vol. XI.

NATIONAL GOLD & SILVER MINING CO. NEW MEXICO

M. R. Sherman, pres.

Property: the Beck mine, near Steins, Grant Co., N. M., developed by 2 miles of workings with a 300' shaft, showing a 12-18" vein of gold-silver ore. Has steam power and 5-drill compressor, hoist, and a 50-ton concentrator. Worked steadily in 1915, 1916 and 1917. Shipments made to the El Paso smelter are intermittent.

NEW MEXICO ZINC & COPPER CO. NEW MEXICO

Address: J. L. Ferry, mgr., Hanover, N. M.

Officers: Judge W. H. Winter, pres.; H. O. Bursum, v. p.; J. A. MacDonald, sec.-treas.

Property: the Mountain Home zinc mines, 11 patented claims, 211 acres, and the Copper Flat group, 52 unpatented claims, covering the extension of the first named group. Holdings adjoin Phelps, Dodge, Empire Zinc, and are near Hanover Bessemer C. & I., El Norte Copper and other producers.

Geology: contact deposits, shear zones and fissure veins in contact metamorphic areas of altered limestone near monzonite dikes and granitic intrusive masses.

NOVEMBER MINING CO. NEW MEXICO

W. H. Kinnon, mgr., Steins Pass, N. Mex.

Inc. 1913, in New Mexico, to take over a group of claims, including the World's Fair and Louise, at Granite Gap, 12 miles S. of Steins Pass. Mine shows silver-lead-copper-zinc ore in veins in a contact between limestone and granite.

Development: by shafts, tunnels and diamond drilling.

Equipment: includes compressor and tramway. Has been an intermittent shipper for several years.

OCTO MINING CO. NEW MEXICO

Office: 112 East State St., Redlands, Calif. Mine at Lordsburg, Grant Co., N. Mex.

Officers: E. W. Smith, pres.; G. S. Turrill, v. p.; F. E. Sanford, sec.; J. M. Wilson, treas.; O. H. Reinholt, cons. engr., directors; E. K. Davis, gen. mgr.

Inc. Nov. 15, 1912, in Calif. Cap., \$500,000; shares \$1 par; issued, 300,000. Annual meeting, third Thursday in December. In treasury, Sept., 1917, \$11,700.

Property: 8 claims, 125 acres, 3½ miles S. W. of Lordsburg, N. M., and 2 miles from the S. P. Ry. Geology is similar to that of the Eighty-Five and Hecla mines adjoining and is fully described in U. S. Geol. Survey, Prof. Paper, p. 68.

Ore: contains copper, silver and lead values.

Development: by several old and a 145' 3-compartment shaft to be sunk to 600'.

Equipment: includes 40 h. p. hoist, 6-drill compressor, 200 h. p. boiler plant, etc.

Several carloads of surface ore shipped are reported to have netted \$28 per ton.

PINOS ALTOS M. & M. CO

NEW MEXICO

Dead. Company had a bond and lease on 14 claims belonging to the Savannah C. Co., in the Pinos Altos district, N. Mex.

Claims show fissure veins 2' wide in diorite, carrying complex sulphide ores said to carry .25 oz. gold, 8 oz. silver, 2.5% copper, 10% zinc and 2% lead.

Fully described in Vol. XII.

PROGRESS MNG. CO.

NEW MEXICO

Address: Chas. F. Hanson, mgr., or John Evans, supt., Steeple Rock, via Duncan, N. Mex.

Property: 14 miles N. E. of Duncan, shows quartz monzonite with chalcopyrite stringers and veins.

Development: by shaft, 105' deep, Jan., 1917, being actively sunk.

Equipment: includes 45 h. p. Stover gas engine.

REPUBLIC MINING & MILLING CO.

NEW MEXICO

Office: Harrison Blk., Philadelphia, Pa.

Inc. 1916.

Property: the Welch mine, east of the Empire Zinc concentrator at Hanover, developed by 150' double-compartment shaft and carrying a complex low-grade zinc ore. A new mill is to be erected, 1917.

RIVAL MINING CO.

NEW MEXICO

Office: Bisbee, Ariz. **Mine office:** H. M. Ziesemer, supt., Duncan, Ariz.

Officers: J. M. Ross, pres.; Arthur Notman, v. p.; R. A. Ziesemer, sec-treas., with W. H. Brophy, L. R. Budrow, M. J. Cunningham and Robert Rae, directors.

Inc. March 13, 1917, in Arizona. **Cap.**, \$500,000; shares \$1 par; non-assessable; 275,000 issued. Annual meeting first Monday in March.

Property: 8 claims, 160 acres, in Steeplerock district, Grant Co., N. M. Examined by F. W. Smith, Arthur Notman and I. B. Joraleman.

Geology: quartz vein in andesite, with 70° dip and N. W.-S. E. course. **Ore:** carries gold and silver.

Development: new shaft being sunk 300'; old shaft, 150' to be deepened to 500'. These shafts, 1,800' apart, are to be connected at 500'.

Equipment: 18 and 25 h. p. hoists, 520 cu. ft. compressor and 100 h. p. gas engine.

Production: former owners shipped \$14,000 of ore, averaging \$40 per ton.

ROBERT LEE MINE

NEW MEXICO

Address: Pyramid Camp, via Lordsburg, Grant Co., N. M. Owned by Dan. Breil and Harry Small, of Lordsburg, N. M. Mine was operated in 1885 and was later purchased by Dr. Bartlett, inventor of the Bartlett concentrating table, who erected a mill and milled \$97,000 worth of ore. The

claims show a well-defined quartz-calcite vein running N. E.-S. W. and dipping S. E., lying in a zone of altered and chloritized diorite porphyry.

Development: includes the old shaft, 250' deep, which has been reopened and shows in the lower level a streak of ore 2' thick, carrying 30% copper and 500 oz. silver.

SAVANNA COPPER CO.

NEW MEXICO

Address: Henry Hovland, Lonsdale Bldg., Duluth, Minn. Mine near Tyrone, N. M. I. J. Stauber and I. L. Wright, lessces.

Inc. Sept. 16, 1908, in Arizona. **Cap.**, \$2,000,000; shares \$10 par, half in full-paid and half in part paid stock, latter \$5 paid. The company was a merger of the Copper Gulf Mining Co. and Comanche Mining & Smelting Co., and also absorbed the Casa Grande Development Co., owning in fee simple all property formerly owned by the Comanche Mining & Smelting Co. and holding all but 320 shares, or 99.30% of the stock issue of the Copper Gulf Mining Co. In Jan., 1913, the company had 133,116 shares of full-paid stock outstanding. Cash balance, Feb. 1, 1913, was \$12,628.

The Copper Gulf Mining Co. owns its property in fee and owes the Savanna Co. \$124,464 for money borrowed to develop its claims. The combined properties consisted of 199 claims, about 4,000 acres, all in Grant County, N. M., but in 5 districts. The company has 28 claims, 16 patented, in the Pinos Altos district, 4 patented claims in the Anderson district, 17 unpatented claims in Chloride Flat district and 1 patented claim in the White Signal district.

The claims in the Burro Mountain group sold, Jan., 1916, to Phelps, Dodge & Co., for \$700,000, constituted the principal and most valuable holdings. The Comanche group comprised 43 claims. The Copper Gulf group consisted of 1,440 acres. The Jennie group of 4 claims, patented 1910, on the Gila river, 35 miles N. W. of Silver City, is not worked owing to its inaccessibility, and development on the Chloride Flat property has been confined to assessment work.

SUNSET COPPER CO.

NEW MEXICO

L. M. Stiles, pres. and mgr., Box 393, El Paso, Tex.; W. P. Stiles, v. p.; S. F. Johnson, sec.; L. B. Wilcox, treas.

Property: includes the old King mine, 7 miles N. W. of Hachita, developed by 400' shaft with workings on a vein said to show gold-silver-copper ores. Is a prospect.

SUSQUEHANNA MINING CO.

NEW MEXICO

Address: C. J. Plankenhorn, sec., Williamsport, Pa. Company succeeded North American Copper Co., described in Copper Handbook, Vol. XI. In 1915, part of the property was worked by lessces. In 1916, B. W. Randall operated the Nellie Bly mine under lease and bond.

Property: near Lordsburg, 9 claims, patented, in the Pyramid and Virginia districts, including the Nellie Bly and Cobre Negra groups. Claims show andesite, diorite and trachite, having 8 orebodies, reported as fissures running parallel with porphyry dikes.

Development: the Nellie Bly mine, in the Pyramid district, 8 miles S. W. of Lordsburg, has shafts of 450', 125', 65', 33' and 40', with about 6,000' of workings. The 400' level shows a vein of 12' estimated width, with bornite-chalcopryrite ore, said to average 5.8% copper and 5.5 oz. silver per ton.

The Cobre Negra mine, in the Virginia district, 6 miles S. W. of Lordsburg, is reported to carry melaconite, malachite, azurite and chalcopryrite, and is developed by shafts of 332', 180', 60', 85' and 85'. Idle since 1908.

Equipment: includes a 40 h. p. hoist, good for 600', at the Nellie Bly mine, and several mine buildings.

Production: 1916, about 6 cars a month, of ore averaging 4.5% copper, and 4 oz. silver per ton, with 50% to 60% silica, 5% to 6% iron, and 8% to 10% lime.

TULLOCH GOLD & COPPER CO.

NEW MEXICO

Idle. Silver City, Grant Co., N. M. D. H. Tulloch, president.

Inc. 1907.

Property: 50 claims, 1,200 acres, on Edith mountain in the White Signal district, said to show good ore near surface. Developed by 2 shafts, 1 of 200', on the Dagger Point claim, showing ore claimed to average 14% copper. A crosscut tunnel on the Wild Horse claim, run along a dike of iron gossan, showed ore averaging 3% copper. No recent reports received.

TYNDALE COPPER MINING CO.

NEW MEXICO

Address: Lordsburg, N. M.

Officers: W. T. McCaskey, pres.; T. A. Lister, v. p.; J. P. Porteus, sec.-treas. and mgr.; also directors.

Inc. June 21, 1917, in New Mexico. **Cap.**, \$250,000; shares \$10 par; non-assessable; 10,800 issued.

Property: 10 claims, 180 acres, in Virginia district, adjoining the Bonney mine of the Lawrence Mining Co. on the east. Claims are said to show a fissure vein in andesite.

Ore: is oxidized to 275' depth and contains 5.02% copper, 0.25 oz. gold, and 5.57 oz. silver per ton.

Development: by shafts, deepest 270'; sinking to 630' and 1,500' of drifting to be done.

Equipment: 20 h. p. gasoline hoist.

Production: 350 tons of ore in 1916.

TYRONE—EL PASO COPPER CO.

NEW MEXICO

Address: 1115 N. Kansas St., El Paso, Texas. **Mine office:** Tyrone, N. M.

Officers: R. M. Dudley, pres.; T. Lia, v. p.; N. F. Work, sec.-treas.; with J. F. Ross, J. H. Maxey, R. K. Bell, H. L. Watson, J. B. DuBase and P. J. Mortinez, directors.

Inc. Nov. 31, 1917, in New Mexico. **Cap.**, \$1,500,000; shares \$1 par; non-assessable. Operating expenses in 1916 were \$1,600.

Property: 23 claims, 400 acres, 2 miles S. of Tyrone, N. M., said to show disseminated copper-silver-sulphide ore in porphyry, assaying 3.4% copper and 2 to 6 oz. silver per ton.

Development: by 260' shaft being sunk during Sept., 1917.

UNITED STATES COPPER CO.

NEW MEXICO

Address: P. A. Newman & Co., 20 Broad St., New York. **Mine office:** Hanover, New Mexico. J. D. Kohlmann, mgr. of Hanover mines; J. T. Janes, mgr. of Pinos Altos mines.

Officers: C. B. Manville, pres. and gen. mgr.; W. F. Barnes, sec.; A. C. Hoyt, treas.; with W. H. Park, John Orlebeke, N. A. Karsten, Geo. W. Rodenberg and Paul A. Newman, directors.

Inc. May 1, 1911, in New Mexico, as reconstruction of the Philadelphia Copper Mines Co. **Cap.**, \$1,500,000; shares \$1 par; 500,000 shares issued. Registrar & Transfer Co., New York, registrar; Security Transfer & Registrar Co., New York, transfer agents.

Property: at Hanover, 9 claims, 2 patented, including the Philadelphia mine; at Pinos Altos, 11 claims, including the Hardscrabble mine, all in Grant Co., N. M.

Development: at Hanover by 60, 65, 180 and 300' shafts; also tunnels, with 3,500' of workings. The mine is equipped with steam plant hoist of 600-ton daily capacity, compressor, drill-sharpener, assay office, houses and hotel.

Production: is 300 tons of ore monthly, varying from 6 to 22% copper, with \$18 gold and silver per ton. Shipments total \$125,000.

Development: at Pinos Altos, by 29 shafts from 20 to 150' deep, mostly inclines on the veins. Two vertical shafts are being sunk. At 140' in one there is 5' of low-grade copper ore, carrying chalcocite and high silver content.

Equipment: includes steam plant, compressor, etc., and 8,000' daily capacity saw mill.

Production is reported as \$71,000.

In a flamboyant prospectus it is stated that the Chino, Hanover-Bessemmer, Republic M. & M., Colorado Fuel & Iron, New Jersey Zinc, Calumet & Arizona, St. Louis Smelters, General Electric, Hanover Copper and Phelps, Dodge properties closely surround the company's Hanover group, but no distance is given. With copper at 20c per lb., and 6% ore, a yearly net profit of \$1,296,000 is calculated. Property was examined by J. T. Janes, H. C. Holthoff, J. H. Stewart, J. C. McKee, G. E. Coxe, J. D. Kohlmann and Lee, whose reports seem favorable. Regarding the Hardscrabble, J. D. Kohlmann said: "I have proved to my entire satisfaction . . . that the granodiorite dike has more merit in some respects than the now famed porphyry deposits."

Paul A. Newman, who has been distributing the stock of this deceptively named company, has started suit in New York against Jas. W. McAlpine, former president of the company, for \$100,000 damages for failure to deliver 675,000 shares of company's stock, as agreed. It is alleged that but 100,000 shares were delivered for which Newman paid \$66,000. The early advertising by Newman is reported to have stated that the company "is now mining large quantities of high-grade 22½% copper ore," had \$3,000,000 or more of ore and was "about to become a big shipper and mine of mines," etc., and ad nauseum.

UTTER, GEO. H.

NEW MEXICO

Address: Silver City, N. M.

Property: the Carlisle, East Camp, Jim Crow, New Year, and Summit groups of mines in Steeple Rock district, N. M., acquired from the Steeple Rock Development Co.; also the Billali mine.

The Carlisle is under bond to the Carlisle Mining Co. of 170 Broadway, New York, and the Jim Crow to another Eastern concern.

Properties are all patented, developed and show gold and silver, the Carlisle alone showing sulphide ore.

WESTERN MINING & DEVELOPMENT CO.

NEW MEXICO

Held a lease and option on the Bonney mine, but sold rights to the Lawrence Mining Co. (which see), which in turn sold an interest to the San Toy Mining Co., which see.

GUADALUPE COUNTY

PINTADO CONSOLIDATED COPPER CO.

NEW MEXICO

J. L. Matt, supt., Santa Rosa, Guadalupe Co., N. Mex.

Property: covers a 12' layer of copper-bearing sandstone, overlaid by 6' of barren sandstone in Pintado canyon. Carload lots shipped to El Paso smelter averaged 3% copper. The ore is quarried, and leached in a 100-ton leaching plant, erected 1916.

LINCOLN COUNTY

CHICAGO COPPER MINING CO.**NEW MEXICO**

Office and mine: Oscura, Lincoln Co., N. M.

Officers: E. G. Rafferty, pres., treas. and gen. mgr.; H. H. Miller, v. p.; H. E. Riddle, sec.; preceding, with H. R. Rafferty and M. Loquis, directors.

Inc. Jan. 31, 1906, in New Mexico. Cap., \$1,000,000; shares \$100 par; non-assessable.

Property: 22 claims, unpatented, include Copper Boy and Copper Queen mines, 18 miles from a railway, in the Oscuro mountains, also real estate in Oscuro. Developed by a 60' shaft, and tunnels of 60', 120', 222' and 1,550', with about 3,000' of workings, from which former owners shipped several carloads of ore, said to have returned \$270 per ton. Has steam power and a 2-drill Sullivan air compressor. Reported shipping ore.

WHITE OAKS MINES CONSOLIDATED, INC. **NEW MEXICO**

Office: Room 45, 45 Broadway, and 500 Fifth Ave., New York. Mine office: White Oaks, N. Mex. Richard Wightman, pres.

Inc. in New York. Cap., \$200,000; shares \$5 par. Traded in on New York curb. U. S. Corporation Co., 36 Nassau St., New York, registrar and transfer agent.

Property: about 300 acres in the White Oaks district, Lincoln Co., including the Old Abe mine, the North and South Homestake and the Welen claims, worked in the past for gold; also coal lands. Company claims in its literature to have produced 10 tons tungsten ore and concentrates per month since July 1, 1915.

Equipment: includes electric hoists, 2 stamp mills, and concentrating plant equipped with 5 Joplin hand jigs and one Richards jig.

In May, 1916, the stock sold up to \$16 per share; in June, the price broke from \$11 to \$5. Reported, 1916, that "internal dissension arose in the White Oaks Co.'s management, and rather elaborate plans for reopening the mines have apparently been abandoned."

LUNA COUNTY

NEVADA HILLS MINING CO. (Tungsten)**NEW MEXICO**

Address: Gage, Luna Co., N. M.

Property: 8 claims, purchased in 1916 for \$15,000, in Victoria mining district, near Gage, said to show a vein 20' wide of tungsten ore in lime formation with quartz gangue, opened on the 40' level. Developed by 2 shafts, 130' and 90' deep. The property was formerly worked for silver values. Developing in 1916, and milling plant to be built.

MORA COUNTY

AZURE MINING CO.**NEW MEXICO**

See under Grant Co., N. Mex.

CUCHILLA COMPANY**NEW MEXICO**

Idle. Address: c/o Stephen B. Davis, Jr., East Las Vegas, New Mex.

Property: 1,500 acres of mineral land between the towns of Lucero and Guadalupita, Mora Co., N. M., slightly developed by tunnels and shafts. Company is inactive at present and has only nominal earnings and expenses.

REPUBLIC MINES CO.**NEW MEXICO**

Office: 526 Exchange Bldg., Denver, Colo. Mine office: Lucero, Mora Co., N. M.

Officers: Felix J. Woodward, pres.; Walter Littlefield, v. p.; Marcus Finch, sec.-treas. and gen. mgr.

Inc. Dec. 8, 1908, in Colorado. **Cap.**, \$500,000; increased, 1909, to \$1,000,000; shares \$1 par.

Property: comprises about 7,500 acres, patented, half freehold and half under bond and lease. Claims are 30 miles from a railroad, stretching for 8 miles along Coyote creek, from Mora river to the adjacent mountains, showing a series of 3 parallel cupriferous beds of slate and arenaceous shale, alternating with limestone, having an approximately N.-S. strike. The lands are said to include coal, limestone and iron ore deposits.

Geology: there are 3 main beds, of 3 to 8' claimed average thickness, with 3 minor beds, said to show considerable chalcocite, claimed to give average assays of 8 to 17% copper, with an estimated average tenor of 6%. The company's "expert," Prof. Tyler, is said to have estimated the values of its orebodies, to depth of 350', at \$45,000,000. Though the surface showings are said to be attractive, the geological character of the deposit does not warrant a belief that the property will ever support such a statement.

Development: by shallow pits, with a 50' shaft and several tunnels, longest 650', with about 4,000' of workings.

Marcus Finch, sec.-treas., writes in May, 1917: "We refuse to give you any facts in relation to our property, believing you to be incapable of publishing a fair, unbiased statement of facts." Our readers know that the Handbook publishes absolutely unbiased and fair reports and may draw their own conclusions from Mr. Finch's attitude and his record.

The Republic mine at Hanover is reported, 1917, to be developing a splendid orebody of high-grade zinc-blende on the 100' and 150' levels. This mine is still a prospect, but a good one.

TRES HERMANAS ZINC MINE

NEW MEXICO

See Azure Mining Co. under Grant County, N. Mex.

OTERO COUNTY

Includes Highrolls, Jarilla (or Brice, Oro Grande, Silver Hill) and Tularosa districts.

BOSTON & BRICE COPPER CO.

NEW MEXICO

A reorganization of the Jarilla Consolidated Copper Co. Mine at Brice, Otero Co., N. M.

Officers: E. E. Locklin, pres.; W. W. C. Spencer, treas. and gen. mgr.; with Clinton Gowdy, G. E. Moffett and John Colthrop, directors.

Inc. 1917, in New Mexico. **Cap.**, \$2,000,000; shares \$1 par; fully paid and non-assessable; issued, \$1,000,000. Annual meeting, first Monday in May.

Property: 40 claims, about 800 acres, in Jarilla (Silver Hill) district, Otero Co., N. M., carrying sulphide ore in contact deposits between limestone and monzonite porphyry. Vein said to be 3 to 30' wide, 300' to a half mile long, and proven to 170' depth, averaging 3 to 5% copper, 2 oz. silver and \$1 gold per ton.

Development: by 5 shafts, deepest 172', and the Harvey tunnel, 165' long.

Company is a merger of and holds the properties formerly owned by the Eureka Mines Cons. Co., Boston Jarilla Copper Co., Amarillo Mining Co. and Eureka Placer Mining Co., whose combined capitalization of \$8,000,000 is reduced to \$2,000,000.

BY-CHANCE COPPER CO.

NEW MEXICO

Owned by Jarilla Copper Co., which see.

EXCELSIOR MINING & DEVELOPMENT CO.

NEW MEXICO

Property: near Orogrande, Otero Co., N. M., includes the Nashville

and Three Friends claims, said to carry a 4' vein of 4% silver-copper ore, also lead carbonate up to 50% in tenor. Controlled by Ben L. Farrar and associates of El Paso. No recent returns. Probably dead.

GARNET COPPER CO.**NEW MEXICO**

Address: Ohaysi, N. M.

Officers: James H. Parker, pres., and C. Jungk, sec.

Inc. in New Mexico, in 1916. Cap., \$60,000; shares \$1 par.

Company operates the Garnet, Mae Belle, James Fisk and Shoo Fly mines at Ohaysi, Otero Co., N. M.

Development: deepest shaft is down 450'. The deposit occurs in garnet-lime zone of altered sedimentaries at porphyry contact, and ore contains copper and gold values. Ore is sent to the El Paso smelter. From 25 to 30 men are employed.

IRON KING MINE**NEW MEXICO**

Operated by the Oro Iron Co., which see. Oro Grande, Otero Co., N. M.

JARILLA CONSOLIDATED COPPER CO.**NEW MEXICO**

Has been reorganized under name of Boston & Brice Copper Co., which see.

JARILLA COPPER SYNDICATE, INC.**NEW MEXICO**

Brice, via Oro Grande, Otero Co., N. M.

Officers: R. B. Hutchinson, pres.; J. J. Mundy, v. p.; T. B. Rains, sec-treas. and acting mgr.

Inc. July, 1912, in Arizona.

Property: the By-Chance group comprising the Stokes, Butterfly, Buckeye and By-Chance claims, all owned outright, is in the Jarilla district, 4 miles from Oro Grande on the El Paso & S. W. railroad. District shows Paleozoic limestone and shale cut by intrusive masses of monzonite porphyry. The By-Chance claim, the only one operated, has a contact metamorphic deposit of chalcopryrite-hematite-garnet ore lying alongside of a porphyry mass with ore along a fracture zone in the limestone.

Development: includes 150' vertical working shaft with a level at 86' on which the blanket orebody, 12 to 30' thick, has been stoped. A 60' winze from this level is reported to show a second and lower orebody estimated to have an average assay value of 3% copper, with streaks of copper glance running up to 30%.

Production: to Oct. 1, 1913, 6,000 tons of ore shipped to El Paso and Douglas, averaging 2% copper and \$2 gold per ton. Shipments to middle of 1914 average 600 tons monthly with returns which just about covered development and operating expenses. Operations resumed late in 1915. No later information.

LA LUZ COPPER CO.**NEW MEXICO**

La Luz, Otero Co., N. M.

Officers: J. C. Yoes, pres.; W. T. Fulton, v. p.; Jas. G. Barrett, sec-mgr.; Otto Sergeant, treas.; with G. W. Wilson, directors.

Inc. Feb. 1, 1915, in New Mexico. Cap., \$250,000; shares \$1 par. Annual meeting April 1.

Property: 8 claims, 160 acres, about 4½ miles N. E. of La Luz, said to carry a vein 7' wide, averaging 6% copper with small gold and silver values. No development done, but management plans driving a tunnel. Letters returned, 1917. Property probably closed down.

LUCKY GROUP**NEW MEXICO**

M. D. Gaylord, mgr., Brice, via Oro Grande, Otero Co., N. M.

Property: the Lucky, May, Copper King and Lincoln claims in Jarilla district said to carry malachite ore a few inches to 3' thick in bedding

planes and along seams and cross fractures. The ore averages 7% copper. A chimney of ore 50' wide is said to carry \$4 to \$11 per ton in gold, largely free.

Development: by tunnel, exposing several orebodies at 300' depth. In Sept., 1913, an experimental plant of the Dawson patent process was installed at the mine and a tramway was constructed, 1914.

Production: at the rate of 50 tons per day carrying 2 to 5% copper and \$3.50 to \$10 gold with a bonus of \$2 for iron and lime. J. R. and H. D. Darroch reported to have bought a half interest in the mine. Employed 15 men. No 1917 returns.

ORO IRON CO.**NEW MEXICO**

Address: Ohaysi, Otero Co., N. M.

Officers: Winchester Cooley, pres.; T. M. Wingo, sec.; J. H. Parker, gen. mgr.; Edward Salvesson, supt.

Cap., \$20,000; shares \$1 par.

Property: the Cinco de Mayo, Iron Duke, Iron King, Iron Queen, Iron Mask, and Laura claims at Ohaysi developed by surface workings. Extracting hematite and magnetite iron ores.

Equipment: Chicago Pneumatic compressor and 5 drills. From 50 to 100 men employed.

OTERO COPPER CO.**NEW MEXICO**

Brice, via Oro Grande, Otero Co., N. M.

Property: the Garnet mine group, showing deposits of copper-gold ore in fissures, replacements and contact deposits near monzonite porphyry.

Development: by 500' shaft with an ore-shoot on the 230' level said to run 5% copper and \$6 gold. The mine is equipped with a gasoline hoist.

Property reported, Sept., 1913, under bond and lease to an English syndicate, represented by L. Maurice Cockerill, with J. W. Camphouse in charge as manager.

Letters returned unclaimed, 1917, from former address.

SACRAMENTO COPPER CO.**NEW MEXICO**

Address: 310 Two Republics Bldg., El Paso, Texas. **Mine office:** D. C. Sutton, mgr., Tularosa, N. M.

Officers: Ed. Mechem, pres.; Eli Knight, v. p.; R. B. Rawlins, sec-treas., with W. P. Stiles, T. J. Stafford and J. M. Gale, directors.

Inc. March 28, 1916, in New Mexico. **Cap.,** \$750,000; shares 50c par; non-assessable; 250,000 issued.

Property: 54 claims, 1,080 acres, 6 miles N. E. of Tularosa, N. M., covering Copper Basin, at head of Coyote creek, at base of White Mtns.

Development: by churn drill work, in Sept., 1917, 2 churn drills were operating. It is said that at a depth of 100' copper ore was cut and 34' of ore passed through, assaying 1 to 7%; at 400' there was 10' of 2 to 9% ore. Whole area is to be drilled before a mine equipment is ordered. Company has built a camp, sunk various test pits and cuts, sunk a 200' incline, still being deepened, and owns and operates a Cyclone drill.

TULAROSA COPPER CO.**NEW MEXICO**

Office: Tularosa, N. M. **Mine office:** Bent, Otero Co., N. M.

Officers: E. P. Kern, pres.; H. E. Forrester, v. p.; G. B. Bent, sec. and gen. mgr.; W. F. Drake, treas., with J. A. Thatcher, A. J. Merrill and P. M. Lynch, directors.

Inc. March 5, 1905, in New Mexico, as successor of Tularosa Mining & Milling Co. **Cap.,** \$5,000,000; shares \$5 par; issued, \$3,500,000. Stock listed on New York curb. Registrar & Transfer Co., New York, transfer office.

Property: 807 acres, 307 acres patented, at Bent, on the Tularosa river. Mine is 12 miles N. E. of Tularosa on the E. P. & S. W. R. R., about 100 miles N. E. of El Paso, Texas.

Geology: the property is underlaid by a flat sheet of diorite resting on quartzite and covered in general by the basalt sandstone of the Red Beds of the region. This diorite outcrops at the Virginia mine, as the company's workings are called, and dips gently in every direction away from this point. The ore is found in the uppermost part of the diorite, which is much altered to a depth of 35 to 55' below its surface. This ore bed shows lenses of glance, 2 to 18" wide, running in all directions, which together with stringers and veinlets of ore, make a stockwerk proved to be ore-bearing over an area 200' wide and about 1,200' long. The altered rock between the lenses also carries disseminated copper glance and the ore as a whole averages 2½% copper; 30 to 55' below the diorite surface, the rock is fresh except along fractures; stringers of ore occur, however, at depths of several hundred feet.

Development: at the Virginia mine there is an open pit 60x120' across and 35' deep which is opened on the richest part of the deposit. The 1st level corresponds to the bottom of the pit; the 2nd level is 25' deeper. These workings are said to block out 85,398 tons of ore in an area of 105x180' in extent. Twelve diamond-drill holes from 88 to 400' deep prospect the ground, and the results form the basis for an estimate of 800,000 tons of indicated ore of an average value of 2½% copper.

Property was to be drilled in 100' squares and the limits of the orebody fully determined. One drill hole encountered 136' of ore at a depth of 300'.

Equipment: includes a 12,000' power ditch with hydro-electric plant, consisting of Platt-Francis turbine, alternating-current generator and complete electrically-driven concentrating plant.

The mill was remodeled and enlarged to 300 tons capacity in 1912, new rolls, a hydraulic classifier, another Wilfley table and 5 No. 3 Deister slime tables being added under the supervision of Godfrey D. Doveton. It is said that about 7,000 tons of ore was run through the 30-ton experimental plant in the 4 years ending July 1, 1910, giving a return of 221,230 lbs. fine copper, a net return of almost exactly 1.5% copper. The mill put 15 into 1, giving concentrates said to average 37% in copper tenor, with about 1 oz. silver per unit of copper, but the figures indicate 25% copper tenor for concentrates, if made at the ratio named.

In a circular published by H. E. Thompson & Co., 25 Broad St., New York, it is stated that Tularosa has all the potent essentials to make just as great and valuable a property as Chino, Ray, Inspiration and Miami; and is today practically the one big, undeveloped porphyry copper area that shows the existence of a wonderful orebody that needs only development, which is being aggressively pushed.

Compared with other deposits of similar character, this one is, in our opinion, small and the ore bed thin, averaging perhaps 35', while the ore reserves are not large enough to compare with those of any of the copper porphyries. The property does not warrant a large mill.

The orebody may, however, extend over a greater area, and a drilling campaign should be made. The new parties in control have had wide experience in mining and possess ample means to test the property thoroughly.

ZORO GOLD & COPPER CO.

NEW MEXICO

Address: G. E. Moffett, supt., Alamogorodo, N. M.; E. B. McClintock, pres., El Paso, Texas.

Inc. 1916, in New Mexico. **Cap.**, \$250,000; shares \$1 par; non-assessable; 140,000 issued.

Property: 3 claims, 55 acres, in Silver Hill district, Jarilla mountains, Otero Co., N. M., said to show a contact deposit in limestone. Ore carries 2.5% copper, 0.1 oz. gold and 1 oz. silver.

Development: about 1,200' of tunnels.

Production: lessees in 1916 mined ore containing 120,000 lbs. copper.

QUAY COUNTY

RED PEAKS COPPER CO.

NEW MEXICO

Address: Norton, N. M.

Officers: W. P. McCall, v. p.; D. F. Thomas, sec.-treas.; with J. E. Whitmore, W. S. Townsend, J. Parker and Benham Cain, directors. J. S. Thornton, mgr.

Inc. Oct. 3, 1916, in New Mexico. **Cap.**, \$1,500,000; shares \$1 par; about 800,000 shares outstanding.

Property: 17 claims, 340 acres in Cap Rock district, 30 miles S. E. of Tucumcari, reported to carry a disseminated deposit of oxidized copper ore, with 1.1 to 1.4% copper. The mine is developed by open cuts and will be mined by steam shovel. A 1,000-ton leaching plant is planned for 1918.

A very remarkable and ridiculously amusing "report" on property by Jos. W. Boileau, who is said to be a "metallurgical engineer and geologist," states that the ores carry 2½% copper, 20% nickel and 17% aluminum and that "volcanic bombs (rich in copper nickel ore)" abound over the property. Unfortunately such crass statements, with accompanying piffle, are taken seriously by men not versed in mining.

RIO ARRIBA COUNTY

ADMIRAL GOLD AND COPPER MINING CO. NEW MEXICO

Idle. Office: Tusas, Rio Arriba Co., N. M. G. F. Hall, mgr.

Inc. 1900, in New Mexico. **Cap.**, \$500,000; shares \$1 par.

Lands: 8 claims, 160 acres, in the Bromide district, show 3 fissure veins carrying silver, copper and gold ores, opened by 3 shafts, deepest 150'. Inactive owing to lack of funds.

TUSAS PEAK GOLD & COPPER MINING CO. NEW MEXICO

Idle. Office: Portage, Wis. Mine and mill at Tusas, Rio Arriba Co., N. M. R. H. Owen, pres.; R. J. Rosenfeld, sec.-treas.

Inc. April 28, 1902, in New Mexico. **Cap.**, \$2,000,000; shares \$1 par. **Bonds,** \$100,000 authorized; issued, \$16,000.

Property: 13 claims, 230 acres, and a 5-acre mill site, in the Bromide district, 14 miles W. of Tres Piedras, and 10 miles from a railway. Principal development is on the Tampa mine, having a 13' vein of copper ore, with a 5' paystreak said to average 7.5% copper, balance of ore being of concentrating grade. The Tampa has shafts of 80', 85' and 425', with about one-half mile of workings, showing ore reported by company to assay 5 to 44% copper, 1 to 4.5 oz. silver and \$1.20 to \$3.80 gold per ton, with some ores assaying up to 2.3 oz. platinum per ton and carrying some molybdenum. The main shaft shows ore of good average tenor, but in small quantities, and the management believes that it will be necessary to sink to 500 or 1,000' depth in order to develop good orebodies.

Equipment: includes a hoist and 3-drill air compressor, with an hydraulic dam on Tusas creek, sawmill and a 40-ton leaching plant, planned to treat oxidized ores, but not in operation.

SANDOVAL COUNTY

COSSACK MINING CO.**NEW MEXICO**

Property: Lone Star Group, formerly owned by Navajo Gold Mining Co., near Bland, Sandoval Co., New Mexico. A. J. Underwood, supt.

Ore: gold-silver, in veins, running nearly N.-S. and from 12 to 40' wide. Ore averages \$6 per ton in gold and is amenable to cyanide treatment.

Development: about 5,000' of workings, including crosscut tunnels.

Equipment: 100-ton cyanide plant and concentrating mill. No recent returns.

SENIORITO COPPER CORPORATION**NEW MEXICO**

Office: 34 Pine St., New York. **Mine office:** Seniorito, Sandoval Co., New Mexico.

Officers: H. B. Walmsley, pres.; W. E. Greenawalt, v. p.; J. A. Kern, sec.; H. W. Webb, treas. J. T. McLaughlin, supt.; W. L. Bain and Oswald Becker, cons. eng.

Inc. Nov., 1916, in New Mexico. Cap., \$1,250,000, in \$1,000,000 common shares at \$1 par, and \$250,000 cumulative 8% pfd. shares at \$10 par, convertible on call at par to common.

Property: 22 claims, 400 acres, in the Nacimiento district, Jemez mountains, 2½ miles from Seniorito, N. M. The Copper Glance and Conglomerate No. 1 and 2 are the most important claims.

Development: considerable tunneling, etc., in 1903, exposing a large deposit of low-grade ore. A U. S. Geological Survey report in 1910 said that the Copper Glance claim ore consisted of sulphides, carbonates and silicate of copper in white, to reddish sandstone or grit. The ore beds aggregate about 100' thick. The average ore will probably be low grade. The same applies practically to the Conglomerate claims, where there was said to be 300,000 tons of 3% ore.

Leaching trials were made on the ore by W. E. Greenawalt of Denver, producing copper at under 5c per lb., including mining and milling. An array of metallurgical talent watched the tests, according to names given in a prospectus. The property was sampled in Oct., 1916, by R. S. Rainsford for J. G. White & Co., resulting in a mill being built with a capacity of 250,000 lbs. of 99% copper per month. Taking copper at 20 to 35c per lb., it was assumed that the profit would be 10 to 25c, or \$300,000 to \$750,000 per year, allowing for a 10c cost, which is double that estimated. Property apparently has considerable merit, but it is in our judgment a mistake to figure on so low a cost of production for any considerable period of time.

SAN MIGUEL COUNTY

PECOS COPPER CO.**NEW MEXICO**

Office: the Arcade, Cleveland, Ohio. **Mine office:** Cowles, San Miguel Co., N. M.

Officers: Alfred H. Cowles, pres., Sewaren, N. J.; I. C. Gifford, v. p.; Frederick W. Swan, sec.

Inc. 1904, in Michigan. Cap., \$100,000; shares \$25 par; fully issued and fully paid. The company has a floating debt of \$65,000, owed to stockholders, of whom there are only 5, the company being a close corporation. Mine holdings under lease, since 1915, to Pecos Mines Co.

Property: 15 claims, 268 acres, and 552 acres including valuable coal veins and placer ground, all patented, in the Hamilton district, 12 miles

from Santa Fe. Holdings include water rights to the Pecos river for 2½ miles, with 2,000 h. p. available for development.

Lands show lower Carboniferous limestone. The property carries a contact "vein," vertical, 200' wide, outcropping for 750' and lying alongside an altered schistose diorite. The band of shipping ore is 9' wide with further width of concentrating material. The ore, being complex, is difficult of treatment.

Development: includes 370' Evangeline shaft. Report by W. E. Burlingame, 1907, claims 168,304 tons blocked out on four levels. In 1915-17 much new development has been done by lessees, and the ore reserves are reported to be more than double those of 1907, the pay streak averaging 50' in width.

Equipment: includes a 165 h. p. steam plant, with 2 hoists, 1 good for 600' depth, and a 3-drill Rand compressor.

PECOS MINES CO.

NEW MEXICO

Operating under lease the property of the Pecos Copper Co., which see.

ROMERO MINING CO.

NEW MEXICO

Address: H. C. DeBoca, Las Vegas, N. M.

Officers: T. W. Hayward, v. p.; H. C. DeBoca, sec.; J. M. Cunningham, treas.; with W. G. Haydon and H. W. Kelly, directors.

Cap., \$250,000; shares \$1 par; non-assessable; all issued.

Operations in 1916 cost \$1,500 for assessment work only.

Property: 14 claims in El Porvenir district, San Miguel Co., N. M.

Development: 800' of tunneling, etc., exposed molybdenite in pockets. The MoS_2 is closely associated with chalcopyrite. Mine is described in Bull. 111 of U. S. Bureau of mines.

SANTA FE COUNTY

ROCKY MOUNTAIN MINES CO.

NEW MEXICO

Office: care G. L. Brooks, pres., Albuquerque, N. M. Mine at Cerrillos, Santa Fe Co., N. M. H. O. Brooks, sec. and mill supt., and E. L. Grose, directors.

Inc. Apr. 4, 1913, in N. M., to work the Tom Payne mine and other properties. **Cap.,** \$1,000,000; shares \$1 par; non-assessable; 470,000 issued.

Property: 9 claims, 100 acres, in the Cerrillos district, held under lease and bond. Claims show orebodies in zone of crushed monzonite and andesite, averaging 2-5' in width. Vein said to be continuous for 700'.

Development: by former companies, includes 3 shafts, 60 to 175' deep, and 3 drift tunnels, 317, 450 and 550' long, said to show ore carrying 0.30% copper, 8% lead, 14% zinc, 3 oz. silver and \$0.03 gold per ton. The Tom Payne claim is the one now worked steadily, also the Eureka claim near Central, N. M.

Equipment: includes a 12 h. p. hoist, several buildings and concentrator with 1 Dodge crusher, 4 Wilfley tables, 2 slime tables. Smelter, 6 miles from the mine, has not been operated by present company, but mill has worked continuously since July 1, 1915. Lead concentrate is shipped to Illinois smelters and zinc concentrate to Kansas and Oklahoma plants.

SAN LAZARUS MINES CO.

NEW MEXICO

Idle. Office: 2837 Hennepin Ave., Minneapolis, Minn. Mine near San Pedro, Santa Fe Co., N. M.

Officers: R. C. Thompson, pres.; Dr. Edw. Gorgen, v. p.; L. J. Hemen, sec.; Clarence R. Thompson, treas.; Geo. W. Churchill, gen. mgr.

Inc. March 9, 1904, in New Mexico. **Cap.,** \$2,000,000; shares \$1 par; non-assessable; issued, \$1,500,000.

Property: 7 patented claims, 125 acres, shows a contact deposit between syenite and limestone, of 3' average width, N.-S. strike and dip of 15 to 25°. This deposit carries copper carbonates and chalcopyrite ore estimated by the management to average 3 to 12% copper, without lead or zinc, 15 oz. silver and \$2 to \$6 gold per ton. Lands are in 3 groups, 2 miles from San Pedro, adjoining the Santa Fe Gold & Copper Mining Co.

Development: by a 405' incline shaft, and tunnels of 300', 350', 200' and 450', estimated to show 1,000 tons of ore.

Equipment: includes a small steam plant and 20-ton concentrator with Dodge crushers, Huntington mill and 1 Wilfley table. Have no recent information from company, save as to area of property.

SANTA FE GOLD & COPPER MINING CO. NEW MEXICO

Office: 11 Broadway, New York. **Mine office:** San Pedro, N. M.

Officers: E. J. Macnamara, pres.; Edw. H. Eckhoff, treas., with Chas. N. King, Ernest W. Brown, M. Kaufman, Frederick C. Fischer, W. B. Anderson, E. C. Westervelt and Oscar B. Van Sant, directors.

Inc. Jan. 25, 1899, in New Jersey. Cap., \$2,500,000; shares \$10 par. Old Colony Trust Co., Boston, transfer agent; State Street Trust Co., Boston, registrar. Shares listed on Boston Stock Exchange and New York Curb. Annual meeting, fourth Tuesday in January.

Property: the San Pedro mine, 36,400 acres land, consisting of 3,400 acres of copper claims, and 33,000 acres of miscellaneous lands, comprising the San Pedro Grant in Santa Fe, Sandoval and Bernalillo counties, New Mexico. The San Pedro mine is 17 miles from Stanley on the New Mexico Central railroad.

Development: by a single 200' shaft and 1,600' adit on a blanket vein of 150' average width dipping at an angle of less than 15°, about half the orebody being workable. Ore as smelted averages 3% copper. The metal occurs as chalcopyrite, in a garnet and quartz gangue and is almost self-fluxing.

Equipment: includes a steam plant with hoist and 15-drill air compressor. The smelter at the mine has one 125-ton blast furnace, burning Colorado coke and producing matte of about 50% average copper tenor, which is shipped to El Paso, Tex., and Omaha, Neb., for conversion.

Employs 350 men, a good class of Mexican labor. Production started Jan. 1, 1901, but smelting has been suspended many times since that date with mining development alone carried on until copper prices warranted the resumption of ore extraction and smelting operations.

Production:

	Copper Lbs.	Silver Oz.	Gold Oz.	Cost per lb. Copper (a)
1916.....	1,492,472	25,593	3,179	.....
1915 (c).....	1,747,090	24,570	2,104	10.6c
1913.....	1,757,315	35,763	1,150	.....
1912 (b).....	801,895	13,133	494	.....
1907.....	1,223,457	17,625	786	14c
1903.....	370,483	.....	.....	.....

(a) After crediting gold and silver. (b) Last 6 months. (c) May 24 to Dec. 31, inclusive.

Operations were suspended in 1914 at the inception of the European war; resumed May, 1915.

The property possesses a large tonnage of quite low-grade ore, besides a limited tonnage of smelting ore, recently developed. Company has no outstanding indebtedness, and can operate when copper prices are above

12c a lb. With the metal selling at a lower figure it is good policy to close down and conserve the ore supply.

In Feb., 1917, smelting operations were suspended as the ore was too poor. Development is being continued, and the future depends on results below the 500' level.

SIERRA COUNTY

ANIMAS PEAK GOLD MNG. CO.

NEW MEXICO

Property: at Hillsboro, Sierra Co., N. M., formerly owned by the defunct Hillsboro Cons. Mng. Co. of odious fame. Present management, in 1915, planned refinancing company and development along same lines in accordance with available funds. Work on 200' double compartment shaft started March, 1915. On the 200' level an oreshoot, 3' wide, is said to average \$35 per ton in gold. No recent returns secured.

BLACK RANGE TUNNEL & MINING CO.

NEW MEXICO

Address: E. D. Randolph, sec.-gen. mgr., 219 Main St., Lafayette, Ind.

Officers: H. E. Black, pres.; A. O. Behrn, v. p.; W. C. Mitchell, treas., with T. F. Gaylord, B. L. Phillips and Martin Hardsocg, directors; C. B. Hullinger, supt., Chloride, Sierra Co., N. M.

Company presumably a reorganization of the Black Range Copper Mining Co. and Black Range Reduction Co. (see Vol. X), both now dead.

Property: the Silver Monument mine, showing a vein of silver-copper ore.

Development: 2,300' tunnel and shaft. Management working in cross-cut on 300' level, 1916, where large flow of water was encountered. Main vein has apparently not yet been found. Equipped with steam plant, Rand compressor and a 25-ton concentration mill.

EL CLIFF MINING CO.

NEW MEXICO

Probably dead. Mine at Hermosa, N. M. See Vol. XI, Copper Handbook.

GOLD BELL MINING CO.

NEW MEXICO

Address: Deming, N. M.

Inc. 1916, to develop a silver property N. E. of Hillsboro, Sierra Co., N. M.

ILLINOIS & SARATOGA MINES.

NEW MEXICO

Address: C. T. Brown, Socorro, N. M. Mine at Kingston, Sierra Co., N. M.

Nothing has been done on these mines for several years, but work may be resumed during 1918.

LAS ANIMAS PEAK GOLD MINES CO.

NEW MEXICO

Office: 1516 No. American Bldg., Chicago, Ill. **Mine office:** Hillsboro, N. M.

Officers: Hon. E. W. Kirkpatrick, pres.; R. Liebman, v. p.; C. B. Van Deman, sec.-mgr.; W. A. Nason, treas.; with L. E. Marvin, W. McCarty Moore and J. H. Palmer, directors. E. B. Van Deman, supt.

Inc. 1914, in Arizona. **Cap.**, \$1,000,000; shares \$1 par; 450,000 issued. Annual meeting third Wednesday in January.

Property: 12 claims, unpatented, 240 acres, 4 miles N. of Hillsboro, Sierra Co., N. M., shows gold-silver ore in a fissure vein, said to be 3-12' wide, striking N. and dipping 70°. Developed by several shafts to depth of 435'. A new 2-compartment shaft has been sunk and management estimates 100,000 tons of ore blocked out.

Equipment: includes 50 h. p. steam hoist, Cameron pump and compressor. Old milling plant dismantled and new mill will be erected with flotation process, 1917.

Property was a good producer under former owners, the Philadelphia M. & M. Co., which went into bankruptcy in 1907. Litigation followed and mine remained idle until acquired by present company in 1914. Management plans further extensive development work.

MONITOR SILVER, LEAD & ZINC MINING & MILLING CO.

NEW MEXICO

Offices: 115 Broadway, New York, and McLaughlin Bldg., Santa Fe, N. M.

Officers: Chas. E. Berner, pres.; Chas. W. Berner, v. p.; Gustave F. Ettensperger, sec.-treas.; with Sidney H. Hirsch and Francis C. Wilson, directors. Ricketts & Co., New York, mgrs.

Inc. Feb. 5, 1916, in N. M. **Cap.**, \$1,000,000; issued \$800,000; shares \$1 par. Security Registrar & Transfer Co., New York, transfer agent and registrar. Listed on New York curb.

Property: 500 acres in Hermosa, Palomas mining district, Sierra county, N. M. During 1916 company examined and developed under working options 8 out of 22 properties submitted. On the Antelope \$60,000 was spent for 1,260' of exploration with 232' of work in ore, and plant was overhauled.

Equipment: includes a concentrating plant, hoist, compressor, saw-mill, steam power and houses.

SOCORRO COUNTY

Includes Cooney, or Mogollon, Magdalena, or Kelly, Mill, or Hop canyon, Rosedale, San Andreas, San Lorenzo, Silver Mountain and Socorro districts.

ANACONDA SKOOKUM COPPER GROUP

NEW MEXICO

Address: c/o E. H. Rodgers, 310 West Missouri St., El Paso, Texas. Owned by E. H. Rodgers, L. H. Davis and J. F. Dowling.

Property: 4 claims, unpatented, located at north end of the San Andreas Mts., Socorro Co., N. M., 26 miles west of Oscuro, on the E. P. & S. W. R. R. Claims are said to cover 6,000' of a quartz lode in granite, varying in width from 20' to 100', and to show disseminated copper sulphide ore, assaying 2½% copper, 1½ oz. silver and \$2 to \$3 gold per ton.

Development: Opencuts and pits along the strike of the lode. Churn drilling and 100' tunnel are planned.

BEARUP GROUP

NEW MEXICO

Owned by D. E. Bearup, Cooney, N. M. Located in the Mogollon-Cooney district, Socorro Co., N. M.

Claims: 4 on Gold Hill and 9 in western part of district. The Gold Hill claims show the Maud S. lode. Vein where opened has width of 2' to 13', and is said to assay \$12 per ton. There is also a narrow high-grade streak.

Development: by tunnels, longest 600'. Total amount underground workings, 1,500'. Small shipments have been made of ore extracted during development work, 50 tons said to assay \$98 to \$235 per ton and 50 tons shipped to concentrator said to assay \$21 per ton. There is a small 2-stamp mill and gasoline engine on the property. Employs 6 men. No recent returns secured.

CALUMET-NEW MEXICO MINING CO.

NEW MEXICO

Office: 154 W. Randolph St., Chicago, Ill. **Mine office:** Magdalena, Socorro Co., N. M.

Officers: Alex. McCallum, pres.; Alpheus McCallum, v. p.-treas.; J. A. Pement, sec.; preceding with Jacob Ehrenberg, directors; J. A. McCallum, supt.

Inc. in New Mexico. **Cap.**, \$1,000,000; shares \$1 par; outstanding 908,609 shares.

Is a 1915 reorganization of Calumet Montana Mining Co. (See Vol. XI.)

Property: 12 claims, 10 patented, 240 acres, in Magdalena mining district, 2 miles from a railroad, and 5 miles from Magdalena, shows ore assaying up to 21.2% copper, 20 oz. silver and \$19.84 gold per ton; with occasional lead and zinc.

Development: by tunnels with about 3,000' of openings. Company also controls 3 claims in the Pinos Altos mining district, N. M., developed by 570' of shafts and drifts on a fissure vein of ore said to assay 36% zinc, 9% lead, 9 oz. silver and 4 oz. gold. Company did 600' of development work in 1916. Selected ore is being shipped.

CLEVELAND & WEATHERHEAD CO. NEW MEXICO

Address: Mogollon, Socorro Co., N. M. Weatherhead Bros. of Cleveland, O., and E. C. Cleveland, Mogollon, incorporators.

Property: the Deadwood and Sunburst mines and mill, near Mogollon, showing the Queen, Deadwood and Confidence-Last Chance veins which average 8' to 10' in width, extend for 2,500' through the claims and carry gold-silver ore of milling grade.

Development: by 500' shaft with total workings of 5,000', which expose 4 ore shoots, 2 of which are 300' long, the others not yet determined.

Equipment: includes 60-ton mill with concentration and cyanide equipment, De La Vergne engine, electric hoist, etc.

Production: to date totals over \$300,000.

DEADWOOD MINING & MILLING CO. NEW MEXICO

Mogollon, Socorro Co., N. M. Earl C. Cleveland, gen. mgr.

Ore: gold-silver occurs in 2 veins, said to be traceable for 3,000' and to average \$10-\$12 per ton.

Developed: by 500' shaft. Mine is equipped with 70-ton concentration mill and cyanide plant. Idle.

DIVIDEND MINING & MILLING CO. NEW MEXICO

Moved from Journal Bldg., Boston, Mass., left no forwarding address. Mine near Estey, Socorro Co., N. M.

Officers: J. M. Bryson, pres.-gen. mgr.; J. E. Simpson, v. p.; B. F. Coburn, sec.-treas.; preceding with F. B. Street, J. Wm. Rice, Samuel Porter, A. B. Spear, Jas. B. Putnam and Halbert E. Parkhurst, directors; W. E. Morong, supt., at last accounts.

Inc. Sept., 1902. Cap., \$3,000,000. Authorized a \$150,000 five-year 7% bond issue.

Property: 2,000 acres, also coal lands about 16 miles distant. It has been claimed that about \$250,000 has been expended on the mine, which shows some sulphide ore, carrying good values in copper, with a little lead, and small values in gold and silver.

The company has been very free with "estimates" and promised that by merely producing 14,400,000 lbs. of copper yearly, millions of dollars could be earned. Company's advertising was indefensible, and the statement that "there has been no such opportunity for investment since the Calumet & Hecla and United Verde were first put on the market" leads to the conclusion that the promoters of the company were sadly lacking either in sense or truth. At last accounts was endeavoring to settle with bondholders by giving them the property.

ECONOMIC MINING & MILLING CO. NEW MEXICO

George Hopkins, pres. and mgr., Carrizozo, N. M.; Ed. Monroe, sec.; A. V. Swearingin, treas.

Property: 7 claims, in White mountains, 8 miles east of Carrizozo. Ore carries copper with silver and gold values in iron gangue, averaging \$12 per ton. Developed by shafts, tunnels and open cuts, exposing ore-bodies of low-grade copper ore with gold values. Management plans sinking tunnel and acquiring adjoining properties, said to have promising showings of high-grade ore. No recent returns.

HEMBRILLO COPPER MINING CO.**NEW MEXICO**

Mine in Socorro Co., N. M.

Officers: J. W. Eubanks, county surveyor, El Paso, Texas, pres.; W. M. Fly, Gonzalez, Texas, v. p.; H. C. Marks, sec.-treas.; John P. O'Connor, gen. mgr.

Inc. 1904.

Property: 12 claims, in Hembrillo canyon, on the eastern side of the San Andreas mountains, 35 miles W. of Tularosa, with a wagon road thereto, said to carry 3 strong veins with N.-S. strike converging to the S. The central or main vein is but a few inches wide at the surface, but widens to 6' in the shaft. Vein lies between quartz-porphry and limestone and is said to have a nearly vertical dip.

Development: by the Platte crosscut tunnel 1,000' long, in April, 1914, which has cost over \$20,000 and has cut the vein 500' below the outcrop. Before starting this tunnel company sank numerous pits showing copper ore, and a 150' vertical shaft in which the vein is seen to carry oxide and carbonate ores that average 12% copper and has a little chalcopyrite in the lower workings. The heavy flow of water led to the abandonment of this shaft. A 10-ton shipment to El Paso smelter in 1914 is said to have assayed 24% copper and 4.6 oz. silver per ton.

Idle. No recent returns.

HOP CANYON MINING & SMELTING CO.**NEW MEXICO**

Office: 154 West Randolph St., Chicago. **Mine address:** Magdalena, Socorro Co., N. M.

Officers: Alpheus McCallum, pres.; Elias G. Raffety, sec.-treas.; Os-curo, N. M.; above with Alexander McCallum and J. A. Pement, directors. J. A. McCallum, supt.

Inc. April, 1906, in New Mexico. **Cap.**, \$1,000,000; shares \$100 par; non-assessable; 8,852 shares outstanding.

Property: 11 claims, 220 acres, 3 miles from Santa Fe R. R., in the Magdalena mining district, shows a shear zone in rhyolite running N. 25° W., with steep dip N. E. Surface shows thin seams of oxidized ore, developed by 1,550' crosscut tunnel and shafts. Total amount of work is about 4,000'. A test shipment made to El Paso in 1915 contained 7.02% copper and 12.9 oz. silver. Company said to be clear of indebtedness and expected to ship ore in 1916. No later returns. Government report states conditions do not warrant the expectation of finding important bodies of ore.

KELLY MINE**NEW MEXICO**

Kelly, Socorro Co., N. M. Owned by Tri-Bullion Smelting & Development Co.

MOGOLLON MINES CO.**NEW MEXICO**

Address: Sidney S. Kidder, gen. mgr.; Chas. S. Phillips, mine supt., Mogollon, Socorro Co., N. M.

Officers: Frank H. Hitchcock, pres.; Alfred Levinger, sec.; J. H. Hoban, treas., all of New York City.

Directors: Frank H. Hitchcock, Eugene Meyer, Jr., and J. W. Sebinus. T. H. Leitch, chief accountant; A. H. Moulton, mill supt.

Inc. Dec. 6, 1912, in Maine. **Cap.**, \$1,778,410; all outstanding shares

\$5 par. New York Trust Co., New York, registrar. Annual meeting, 2nd Monday in October. On June 30, 1915, the Mogollon Mines Co. absorbed the Ernestine Mining Co., which was organized Nov. 18, 1902.

Gross earnings, 1916, \$396,213; operating expenses, \$343,205. Paid a 2% dividend in July, 1915; prior to this dividends had been suspended for some time, earnings have been devoted to development and betterment of property.

Property: 16 claims, 12 patented, 216 acres, at Mogollon.

Ore: gold and silver sulphide, in quartz veins in andesite and rhyolite, said to average \$12-\$15 per ton. Main vein, known as the Last Chance, strikes S. E.-N. W.; dips 60° to 70° and is 10'-26' wide.

Development: incline shaft 900' below main tunnel, which is 2,972' long; greatest depth of workings, 1,780'; underground workings total 27,131'; new work in 1916 totaled 2,290'; for 1917, to Aug. 1, 2,792'. Shrinkage stoping is used. Main workings are on Last Chance and Top claims.

Equipment: includes electric hoist; Ingersoll-Rand compressor; De La Vergne oil engines; electric power; 40-stamp mill and cyanide plant, capacity 160 tons daily.

Production: 44,904 tons of ore were treated, 1916, yielding 7,171 oz. gold and 371,350 oz. silver. High price of silver in 1917 made treatment of dump ore profitable. In 1917 to Oct. 1, mill treated 38,562 tons, yielding 268,179 ounces gold-silver bullion.

OAKS CO.

NEW MEXICO

Alma, Socorro Co., N. M. W. J. Weatherby, pres.; H. A. Hoover, sec. Earl C. Cleaveland, gen. mgr.

Dividends: four 1% dividends were paid on pfd. stock, Dec. 1, 1916; Jan. 1, Feb. 1, March 1, 1917. On April 1, 1917, a 1½% dividend was declared, payable quarterly on pfd. stock.

Property: the Pacific, Hub and a portion of the Johnson groups, 500 acres, in the Cooney, or Mogollon district, about 80 miles by daily stage from Silver City, the nearest railway point. Also has a bond on 300 acres additional, including the Eberle, Deep Down, Maud S, Deadwood and McKinley groups.

The company is developing its mines and shipping ore, also driving the Oaks tunnel, which will start at Mineral creek and crosscut the Gray Hawk, Socorro, Pacific and other veins in its 9,800' length. It will be used as a main drainage and haulage tunnel for the district. The Eberle, McKinley, Maud S., Deep Down and Johnson No. 7 mines are developing and ore is shipped weekly to the Socorro mill.

OZARK SMELTING & MINING CO.

NEW MEXICO

Office: 601 Canal Road, Cleveland, Ohio. **Mine office:** Magdalena, Socorro Co., N. M. Philip Argall & Sons, of Denver, Colo., cons. engrs. Smelter: Coffeyville, Montgomery Co., Kans.

Officers: Geo. A. Martin, pres. and gen. mgr.; Oliver Box, asst gen. mgr.; L. P. Pressler, supt.; W. S. Stevens, mill supt.; W. E. Cortis, smelter supt. The company is a subsidiary of the Sherwin-Williams Paint Co.

Property: includes the Graphic mine, 30 claims, 227 acres, with total holdings of 800 acres, in the Magdalena district, showing limestone, shale and quartz, carrying contact ore deposits between limestone and schist, of about 50' proven width, 500' length, and known depth of 500'. The upper workings show large quantities of lead and zinc carbonates, ores being mainly smithsonite and sphalerite, with some cerrusite and argentiferous galena, and occasional cuprite and native copper. Ores are mainly low in grade, with principal values in zinc. The ore-shoot, of about 500' length on the 7th, 8th and 9th levels, is about 100' wide on the 9th level.

Development: is by a 300' shaft, and two 1,500' cross-cut tunnels, with about 8 miles of workings, the lower levels showing a slightly argentiferous sulphide complex of zinc, lead and copper. Property regarded as one of the largest zinc deposits of America.

Equipment: 125-ton mill was erected, 1912, to treat the large tonnage of low-grade complex zinc-lead-iron sulphide ore already developed, by the froth flotation process, using it as an adjunct to older methods of concentration. A 50-ton mill does dry concentration on ores above 20-mesh, and wet concentration on ores below that size. Electric power is used. Employs 400 men.

Production: mainly zinc ore, is shipped to the works at Coffeyville, for the manufacture of lead and zinc oxides, as the base for pigments, of which the Sherwin-Williams Co., in control of this corporation, is one of the largest American manufacturers. Company also has an option on the Kelly mine at Kelly, N. Mex., owned by the Tri-Bullion Sm. & Dev. Co., and is working same with much success.

Lessees paying \$4,000-\$5,000 royalties monthly, 1917, and shipping 25 tons copper ore daily from the Kelly mine.

SOCORRO MINING & MILLING CO.

NEW MEXICO

Office: 200 Fifth Ave., New York. **Mine office:** Mogollon, N. Mex.

Officers: Wm. Childs, Jr., pres.; Harry Balfe, v. p.; Robt. T. Neeley, v. p.; J. Diehl Fackenthal, sec.; Adam K. Luke, treas.; with Wm. A. Barber, Henry D. Hotchkiss, R. E. Dowling, A. L. Williams, David Luke, directors.

Staff: W. Rowland Cox, cons. engr.; D. B. Scott, mgr.; G. C. Baer, supt. H. N. Reed, mill supt.

Cap., \$2,000,000; **par,** \$5.

Bought entire holdings of Mogollon Gold & Copper Co. for \$100,000 at public sale in Socorro, N. Mex., August, 1915. Sale ordered to satisfy judgment of \$416,626, obtained by Equitable Trust Co., New York, holders of bonds to that amount.

Property: 58 claims, partly patented, 1,100 acres, including the Cooney. Peacock, Little Charlie, Independence and Fluoride groups, sometimes known as the Silver Bar mine, in the Cooney district of the Mogollon mountains, 85 miles N. E. of Silver City, the nearest rail point. The Fanny is the principal mine.

The property shows porphyry and andesite, carrying the Fanny fissure vein of 5 to 10' average width, with a paystreak of about 3' average and 30' maximum width, having numerous narrow feeders, some of which carry high gold values. Ores include slightly auriferous and strongly argentiferous chalcopryrite, bornite and chalcocite, claimed to carry increasing silver values at depth, and the east vein has been said to show native copper at depth of 600'. The Cooney and Peacock mines are said to have produced \$1,250,000 worth of ore in the past.

Development: The company operates 3 mines, the Fanny, Johnson and Pacific. The Fanny mine has an 1,100' shaft and the Johnson mine a mile west has two 500' incline shafts. There are also various tunnels on the several groups with an approximate total of 30,000' of underground workings.

Reported in Sept., 1917, that high grade ore was being extracted from 1,100' level of the Socorro mine.

The Pacific mine was optioned to Socorro M. & M. Co. by the Oaks Co., 1916, and an aerial tram was erected to carry ore to the Socorro mill of 230 tons capacity.

Equipment: includes hoists, Imperial compressor, aerial tramway and

240-ton mill, with stamps, Huntingtons and Pachuca tanks. The power plant has 1,000 h. p. De La Vergne crude oil engine.

Recent production: 66,387 tons in 1914; 67,848 tons in 1915; 73,349 tons in 1916. Production in June, 1917, was 35,000 oz. of silver.

The silver mines at Mogollon are 75 miles from Silver City, the nearest supply point, but little information is available concerning them.

STEEPLE ROCK DEVELOPMENT CO. NEW MEXICO

Out of business. Formerly at Steeple Rock, N. M.

Property: the Carlisle and Jim Crow groups, 33 claims, sold to George H. Utter, in 1914, who sold it 1915 to H. K. Welch and S. McKeever, of New York, who organized the Carlisle Dev. Co.

Mine shows big fissure vein, 20'-40' wide, developed to depth of 637'. Ore carries chalcopyrite, sphalerite and some galena. A \$150,000 Huff electrostatic plant is planned. Operating 1916.

TRI-BULLION SM. & DEV. CO. NEW MEXICO

Office: 10 Wall St., New York. **Mine office:** Kelly, Socorro Co., N. M.

Officers: J. O. Wall, pres.; S. W. Traylor, v. p.; with G. C. Van Tuyl, Jr., W. B. Nash, H. V. M. Dennis, Jr., J. M. Henderson, A. S. Somers, S. F. Dominick, Gustavus Taylor and Frank Coenen, directors; D. O. Deyer, sec.-treas.

Inc., 1908, in Arizona. **Cap.,** \$5,250,000; shares \$5 par; in 50,000 participating cumulative 4% stock with 1,000,000 common; issued 6,700 shares preferred and 999,900 shares common. Listed on New York Curb. Empire Trust Co., New York, transfer office.

Property: includes the Kelly mine, for many years the company's principal asset, which is a zinc, lead and copper producer in New Mexico, operated since May 1, 1915, under lease by Ozark Smelting & Mng. Co. It is 2½ miles from Magdalena on the Santa Fe R. R. Also owns the Starlight group of copper claims in Arizona.

The Kelly mine, 350 acres, patented, is said to show veins of ore yielding lead and zinc carbonates in the upper workings, running from 25 to 30% lead with small silver values and 25 to 40% zinc. The sulphide ores occurring in depth, give average smelter returns of 25 to 35% zinc, 12 to 15% lead, ½ to 2% copper and 6 to 8 oz. silver per ton.

The Nit and Silver Bell groups were acquired in 1912. The Nit mine, adjoining the Graphic, has an underground connection with the Waldo mine of the Ozark Smelting & Milling Co. The workings of this mine disclose a 50' vein of 4.7 to 6% copper ore, 454' E. of the 215' shaft, in a crosscut from the bottom of a 45' winze sunk from the bottom level.

Since the Ozark Sm. & Mng. Co. took a lease on the Kelly mine, it has uncovered a fine body of zinc-copper ore in new ground. The Ozark Co., a subsidiary of the Sherwin-Williams paint manufacturers, owns and operates a 200-ton mill with flotation equipment.

The Tri-Bullion Co. suffered a loss of over \$32,000 from embezzlement by its former treasurer, 1913-15.

Property now in good hands, and with an able consulting engineer has a promising future.

TAOS COUNTY

BITTER CREEK MINING CO. NEW MEXICO

Address: Taos, N. Mex.

Officers: Fred S. Lewis, pres.; Wm. T. Hinde, v. p.; Congdon C. Lowe, sec.-treas.-mgr.; with Wm. McKean and Alvin Burch, directors. L. O. Haberstick, supt., Red River, N. Mex.

Inc. July, 1916, in New Mexico. **Cap.**, \$1,000,000; shares \$1 par; 420,020 shares outstanding. U. S. Corporation Co., New York, registrar and transfer agents.

Property: 4 claims, 80 acres at Red River, Taos county, N. Mex., said to show telluride ore in fissure veins in andesite. Values are gold and silver.

Development: by prospect shaft and several shallow tunnels. Developing, October, 1917.

CHAMPION COPPER CO.

NEW MEXICO

Offices: 7 Government St., Kittery, Me., and 1853 Commonwealth Ave., Boston, Mass. **Mine address:** Copper Hill Box, Dixon, Taos Co., N. M.

Officers: A. Morandi Bartlett, pres.; Benj. B. Earl, v. p.; Arthur M. Cripps, sec.-treas.; preceding, with Ralph Thompson, Chas W. Kokerda, directors. Jas. A. Burton, gen. mgr., Dixon, N. M.

Inc. July 7, 1911, in Maine. **Cap.**, \$200,000; shares 10c par; full paid and non-assessable. Listed Boston Curb. Annual meeting March. Commonwealth Tr. Co., Boston, transfer agt.

In report issued March 1, 1917, company reports assets of \$32,743 cash, \$136,302 in accounts receivable; \$2,159 as stockholders liability, and \$28,796 as cost of property, development and expenses to Dec. 31, 1916. Work at the mine was resumed March 6, 1915. In July, 1914, present corporation acquired the property at foreclosure sale for \$15,499.

Property: 5 claims, patented, 103 acres, also four 5-acre mill sites and a 40-acre water right, on Copper hill, in the Copper Mountain district of Taos county, 9 miles east of Embudo, the nearest railroad station, and 25 miles N. E. of Taos. Mine is said to have 8 practically parallel veins of 18" to 20' width, between a schist footwall and quartzite hanging wall, carrying cuprite, malachite and chrysocola, succeeded at depth by chalcocite and gray copper, ore all argentiferous and auriferous, with chalcopyrite beginning to show in lower workings, all with quartz gangue.

Development: includes shallow shafts and surface cuts on several claims, a 190' shaft on the Champion, a 180' shaft sunk on a 4' vein in the Oxide mine, and a 500' tunnel, which has stoping ore and cuts a 45° blanket vein. Company plans sinking Champion shaft to 500' and opening drifts at 100' intervals. During 1917, 170' of development work was done and 100 tons of rock was hoisted, and 25 tons milled.

Equipment: includes a Leyner air compressor, Schramm gasoline engine and compressor for 4 drills, in the mill, with a power house adjoining. A 1,000' ground tram leads from the mouth of the Champion tunnel to ore bins. Improvements include a 15,300' gravity pipe line, of 7" spiral steel-riveted pipe. Was not regarded favorably by the late Horace J. Stevens.

EDISON MINING & MILLING CO.

NEW MEXICO

Idle. Property, near Red River, Taos Co., N. M., carries gold-silver-copper ores. Equipment includes a steam plant and 10-stamp mill.

TAOS MINING CO.

NEW MEXICO

Mine office: Twining, N. Mex.

Officers: A. Clarence Probert, pres.-mgr., P. O. Box 56, Taos, N. Mex.; John B. Bidwell, v. p.; J. Wright Giddings, sec.; H. F. Probert, treas. with Harry W. Davis, directors.

Inc. Nov. 11, 1914, in Delaware. **Cap.**, \$2,000,000; shares \$10 par; \$1,173,090 outstanding. Annual meeting, last Monday in January.

Property: 15 claims, 4 patented, 333 acres in Rio Hondo mining district, near Twining, said to carry copper-gold-silver ore in schist and gneiss, averaging 2½% copper, \$4.17 gold and 5 oz. silver per ton. Developed by 1,800' vertical tunnel and several shorter tunnels.

Equipment: includes air compressor and concentrator.

In June, 1917, company was preparing to reopen the Fraser Mountain copper mine, 19 miles by road from Taos, with J. M. Bidwell in charge. The plant at Twining is to be overhauled.

NEW YORK

Companies are arranged in alphabetical order.

AMERICAN ORE REDUCTION CO.

NEW YORK

Incorporators: Wm. l'Huillier, 52 Broadway, New York; R. A. Pryor, Jr.; G. B. Hayes, J. C. O'Brien and Major T. J. Whelen, all of New York.

Inc. 1917 in Delaware. **Cap.**, \$5,000,000. Will manufacture machinery for metallurgical operations.

DOUGLAS, LACEY & CO.

NEW YORK

Company was notorious promoter of numerous mining and oil propositions and was in hands of a liquidating organization, known as the Amalgamated Properties, Inc., at last accounts. Mr. Stevens' opinion of this firm and their clever scheme for obtaining money from small investors is fully described in Vol. X, under the title given above and that of the Amalgamated Gold & Copper Co. of Arizona.

EAGLE SMELTING & REFINING WORKS

NEW YORK

B. Lissberger & Co., prop., Woolworth Bldg., New York. Is not an ore smelter, but makes alloys.

GIRARD DEVELOPMENT CO.

NEW YORK

Garrit B. Kip, Girard C. Herrick and E. Hicks Herrick, 7 Wall St., New York, chief stockholders. Company is a New York corporation interested in several mining properties in the United States.

GRANT MINE

NEW YORK

Mine near Carmel, Putnam Co., N. Y. The orebody consists of a complex of arsenical sulphides, carrying copper, quicksilver, gold and iron. The crude ore is estimated to have a gross value of about \$25 per ton, but, on account of its refractory nature, has no present commercial value, and cannot be utilized without special metallurgical treatment. Closed down for several years.

MATHESON LEAD CO.

NEW YORK

Is a subsidiary of the National Lead Co.

Office: 111 Broadway, New York. **Works** at Long Island City, N. Y.

Officers: W. J. Matheson, pres.; R. P. Rowe, v. p.; E. J. Cornish, treas.; with R. A. Shaw, directors; M. D. Cole, sec.

Inc. in New York. **Cap.**, \$1,000,000; shares \$100 par. Entire stock issue owned by the National Lead Co. Authorized bond issue, \$1,000,000, 5% bonds, due April 1, 1929. Operates a 10,000-ton plant for the manufacture of white leads and oxides.

NICHOLS COPPER CO.

NEW YORK

Office: 25 Broad St., New York. **Works office:** Laurel Hill, Queens Co., N. Y. Employs about 1,500 men.

Officers: C. W. Nichols, pres.; J. B. F. Herreshoff, v. p.; W. C. Webster, sec.; Edw. R. Nichols, treas.; M. E. Harris, auditor.

Inc. May, 1905, in New York. **Cap.**, \$10,000,000; reduced 1912 to \$7,000,000; \$1,000,000 preferred stock issued 1914; shares \$100 par; bonds \$3,000,000. Is the successor of Nichols Chemical Co.

Dividends: to Oct., 1914, at rate of 6% per annum, paid quarterly on common stock; then a break of 2 years, with a disbursement of 4% in Dec., 1916.

The Laurel Hill Works include a smelter and electrolytic refinery, with steam and electric power.

The smelter has 20 reverberatory furnaces, taking 40 to 250-ton charges, each furnace heating a tubular boiler with waste gases. There is 1 Herreshoff water-jacket blast furnace of 600 tons rated daily capacity. Matte and slag flow, in an uninterrupted stream, to a large settler, whence slag skims into pots and matte is tapped into an iron bed. Waste gases pass into a 1,000' main flue, of iron and brick, leading to a 300' chimney.

The electrolytic plant is operated on the series system, and has 550 tanks. Anodes are cast. The final product is cast mainly into wire bars. This company enjoys a deservedly high reputation for the purity of its product and the efficiency of its metallurgical practice. Is the largest electrolytic refining plant in the world; capacity about 45,000,000 lbs. of copper per month.

The works do a very extensive custom refining business, treating mainly ores and matte from outside producers in the smelter, and western blister copper in the electrolytic plant. The works handle all the bessemer copper from the Phelps-Dodge properties, and from the Old Dominion, Calumet & Arizona, East Butte, Granby and Ducktown companies, and others. The mining properties at Capelton, Quebec, are operated by the Albert Copper Co., a subsidiary of the Nichols Copper Co.

Reported 1917, that company had an option on a pyrite deposit near Mokoman, 31 miles from Port Arthur, Ontario.

A labor strike will affect the 1917 output.

NORTHERN ORE CO.

NEW YORK

Edwards, St. Lawrence Co., N. Y.

Officers: T. I. Crane, pres.; W. S. Pilling, treas.

Inc. in New York and operated as a close corporation.

Property: 650 acres, extending over 12 miles in a N. E. direction from Fowler to Edwards, lies within a talc-zinc belt, showing highly metamorphosed pre-Cambrian crystalline rocks. Mine has limestone and serpentine formation with veins, 6" to 14' wide, of sphalerite and pyrite, striking N. E. and dipping 40-50° N. W.

Development: to depth of 500' by 2 vertical shafts and diamond drill holes.

Equipment: includes steam and electric power, machine shop, power house and office building. The 150-ton concentrating mill started operations 1915. Ore is delivered from the mine over a trestle to the ore bins, where it is fed automatically to the rock crusher below. From the crusher the ore passes to rolls and jigs, and finally to James concentrating tables. Wet magnetic separators effect the separation of the zinc and iron sulphides.

Production: shipments of pyrite concentrate are at the rate of 45 tons daily.

ST. LAWRENCE PYRITES CO.

NEW YORK

Offices: 41 Broad St., New York and DeKalb Junction, St. Lawrence Co., N. Y.

Officers: Edward E. Thalmann, pres.; F. T. Rubidge, v. p. and gen. mgr.; W. J. Kingsbury, sec.; R. M. Atwater, Jr., treas.; O. F. Pattberg, supt.

Property: located in DeKalb Twp., St. Lawrence Co., includes the Stella mines, and is one of the four largest pyrite mines in the U. S.

Ore: pyrite, occurring in lenses or veins in gneiss and schist. The orebodies strike and dip in the same general direction as the gneisses, strike

N. E., and dip 20° to 30° N. W. The walls are not sharply defined; the average assay is about 21% sulphur.

Development: by 2 shafts 1,600' apart on parallel deposits. The north shaft, the Stella, is idle; here the orebody extends 400' along the strike, averages 10' in thickness and has been worked to a depth of 900' on the dip. The operating shaft, the Anna, opened by levels 50' apart vertically, has an orebody opened for 1,500' on the strike, and average thickness of 20'. The ore is put through a crusher at the shaft before sending to the mill.

Equipment: includes a 700-ton mill with gyratory crushers, trommels, rolls, Hancock and Harz jigs, Overstrom and Deister Machine Co. tables. In cold weather the concentrates, to prevent freezing, are dried in a Ruggles-Coles cylindrical dryer. Concentrate assaying 44% sulphur, is sold to sulphuric-acid manufacturers and to paper mills. Power is electrical, obtained from a hydro-electric company for about \$30 per h. p. per year. The property is thoroughly described in Eng. & Mining Journal, April, 1913, p. 689.

Production: approximately 150,000 tons ore per year, yielding about 60,000 tons concentrates.

ST. NICHOLAS ZINC CO.

NEW YORK

Address: 37 Wall St., New York. **Mine office:** Summitville, Sullivan Co., N. Y.

Officers: Kirby Thomas, managing director; J. M. Mitchell, supt.

Inc. in Delaware. Cap., \$1,000,000; shares \$1 par; non-assessable.

Property: 1,050 acres between Summitville and Mamakating, 90 miles N. W. of New York City.

Geology: fissure vein in sandstone or "grit" beds, which have been tilted to form the Shawangunk range. Fissure dips with slope of hill and bedding of the grits to N. W. about 45°. On surface vein is indicated for 700', but underground for 400'. Ore is chiefly lead and zinc sulphides, with a little copper.

Development: upper workings opened vein 300' below its outcrop and lower tunnel 800' lower, a total depth of 1,100'. Vein is from 1 to 8' thick and ore 8" to several feet, averaging 2' in upper workings.

Kirby Thomas, who reported on the mine in 1916, estimated 8,000 tons of developed ore, 10,000 tons of probable ore and 58,000 tons of prospective ore. The developed ore should average 10% lead and 20% zinc.

Equipment: 100-ton concentrating mill erected April, 1917. Concentrate sold to American Metals Co.

TOTTENVILLE COPPER CO.

NEW YORK

Works at Tottenville, Richmond Co., N. Y. A. Weiss, gen. mgr. Has an extensive copper refinery for the production of ingot copper and alloys.

Annual capacity, 100,000,000 lbs. Brand is known as "C. T. C." copper.

UNITED METALS SELLING CO.

NEW YORK

Office: 42 Broadway, New York.

Officers: John D. Ryan, pres.; T. Wolfson, v. p.; C. W. Welch, sec-treas., with Wm. Rockefeller and C. F. Kelly, directors. C. S. Henry & Co., Ltd., 12 Leadenhall St., London, E. C., Eng., European agts.

Inc. Jan. 29, 1900, in New Jersey. Cap., \$5,000,000; shares \$100 par; dissolved in 1915 and reorganized March 15, 1915, in Delaware. Is controlled by the Anaconda Copper Mng. Co., through ownership of entire share capital.

The company does a general commission business in metals, mainly in copper, and is the largest copper broker in the world, being the sales agent for the Anaconda Copper Mng. Co. and affiliated corporations, and

for a number of other producers, having the marketing of upwards of 400,000,000 lbs. of copper yearly.

NORTH CAROLINA

Companies are arranged in alphabetical order.

ASHBORO COPPER MINING CO. NORTH CAROLINA

Dead. Formerly operated the Scarlett, or Ashboro mine, N. of Ashboro, Randolph Co., N. C., which see. Company failed to meet payments and lands reverted to owner, F. R. Thorns, 112 Duane St., New York City, in 1916. Described Vol. XII.

BLUE WING MINING CO. NORTH CAROLINA

D. M. Hill, sec., 60 Federal St., Boston, Mass.

Company has voted to sell all its assets and go out of business, 1917. Fully described in Vol. XII.

CAROLINA COPPER CO. NORTH CAROLINA

Office: 15 Atwater St., West Detroit, Mich. Mine near Cullowhee, Jackson Co., N. C. Lewis C. Waldo, pres. and treas.; S. H. Knight, v. p.; Geo. E. Berriman, sec.; preceding officers, S. H. Knight, Geo. W. Clark and F. W. Olds, directors.

Inc. Oct. 12, 1901, in Michigan. Cap., \$2,500,000; shares \$25 par; issued, \$1,585,000.

Lands: 1,450 acres, freehold, including the Wayehutte mine, show 4 veins, of 27' estimated average width, carrying mainly chalcopyrite, with estimated average values of 3% copper, 4 oz. silver and \$1 gold per ton, opened by a 55' shaft and a 200' tunnel. Lands also include an undeveloped water power. Regarded as promising if worked under proper direction. Never operated.

COPPER KNOB MINE NORTH CAROLINA

Owned by Monaton Mining Co., which see.

CULLOWHEE MINING & REDUCTION CO. NORTH CAROLINA

Idle. Cullowhee, Jackson Co., N. C.

Officers: S. B. Ezell, pres.; D. D. Davies, v. p.; Thos. A. Cox, sec. and managing director; Chas. Davies, smelter supt. at last accounts.

Inc. 1905, as successor of Cullowhee Copper Co.

Property: 1,900 acres, 12 miles from Sylvia, nearest rail point, shows a considerable body of sulphide ore, claimed to average about 5% copper and \$4 gold per ton, probably correct for small lots of ore, but cannot be realized from a large tonnage.

Equipment: includes hoists and a Sullivan air compressor, with steam and water power, latter with a plant 3 miles from works. The 30-ton smelter, near Sylvia, blown in Jan., 1909, with semi-pyritic smelting, suspended operations late 1910, and probably will remain idle until rail connections are secured.

GARDNER-HILL MINING CO. NORTH CAROLINA

Company's gold-copper property, 9 miles from Greensboro, N. C., is being reopened after an idleness of over 50 years.

GOLD HILL CONSOLIDATED CO. NORTH CAROLINA

Office: Room 309, No. 42 Broadway, New York. Mine at Gold Hill, Rowan Co., N. C. Walter Geo. Newman, pres.

Inc. 1910 as successor of Gold Hill Copper Co., a notorious promotion that caught many Wall Street operators. New company, under same management, became bankrupt and property sold at auction, Jan. 27, 1910, for \$45,000. Company does not own the adjacent Union Copper mine.

Property: consisted of 1,050 acres in Rowan and Stanley Counties, the Gold Hill mine, where gold was discovered, A. D. 1799. Gold quartz veins were discovered 1831, and in 1845 this mine was the largest gold producer in the United States.

Development: by 2 shafts of 615' and 830', and 2 lesser shafts. The mine was operated in 1913 and part of 1914. Shipments to the Perth Amboy smelter returned 1.5% copper and about \$3 gold per ton, with small silver values. Copper occurs in minute particles of chalcopyrite in hard quartz schist and recovery by wet concentration is not commercially profitable.

Equipment: includes ten 100 h. p. boilers and a 10-stamp mill.

This company and its companion, the Union Copper Mining Co., enjoyed decidedly checkered careers. Operations conducted on a considerable scale, 1901-1903, were unsatisfactory and failed to show up the much advertised orebodies. A receivership ensued which was ended early 1906, but a receiver was again appointed, Aug., 1906, for the old company, on the application of Walter Geo. Newman, on claims aggregating \$352,000. In June, 1915, the Court again appointed a receiver for the property, which has been shut down and apparently abandoned by the company.

Mr. Newman evidently used this property solely for stock-jobbing purposes. The mine is considered worked out and low grade, but worthy of some drilling in depth. At best the company could never have paid honest dividends on its capitalization, and under its present president is not regarded as worthy of any confidence whatever.

MOGUL MINING CO.

NORTH CAROLINA

Address: F. Oliver, Charlotte, N. C., and A. S. Proskey, Rawhide, Nev.

Cap., \$1,000,000; shares \$1 par. Listed on New York Curb. U. S. Corporation Co., N. Y., transfer office.

Property: has a 10-year lease on the Mint Hill mines, a gold property in Union county, 18 miles from Charlotte, N. C. Also controls the Proskey-Regent mine at Rawhide, Nev., by ownership of the Proskey Regent Mines Co.

Development: by 38 shallow shafts, one 100' deep, said to show six veins at Mint Hill, carrying \$35 ore. Plant with 120-ton ball-mill erected to treat free-milling ore. The lease calls for 15% royalty.

The Regent mine is said to have produced 3,000 tons of \$20 to \$200 ore, a statement which must be taken with caution, since the whole Rawhide camp is a failure, from an operator's standpoint.

The North Carolina property appears to have been shut down in 1917.

The shares of the company were skyrocketed on the Curb in 1917, by raw and rank manipulation. The men named as directors in the company's prospectus do not admit any connection with the company.

MONATON MINING CO.

NORTH CAROLINA

Hopkins, Ashe Co., N. C. J. B. Shale, pres., 301 W. 108th St., New York City, D. W. Lloyd, mgr., Garren, N. C.

Owns the old Copper Knob mine, 160 acres, freehold, also 90 acres miscellaneous lands, said to show a 30" fissure vein in hornblende slate, carrying carbonate and sulphide ores, mainly bornite. Carload shipments to A. S. & R. Co. of N. J. said to average \$15 per ton in gold, silver and copper. The slate wall rock also carries metal. Property was opened 1880. Has steam power, hoist, 2-drill air compressor, and a 5-stamp mill.

SALISBURY COPPER CO.

NORTH CAROLINA

Idle. Mine near Gold Hill, Rowan Co., N. C. T. B. Brown, pres.; W. S. Blackmer, sec.-treas.

Inc. 1904, in Arizona. Cap., \$100,000; shares \$100 par.

Property: 50 acres, freehold, showing altered schists, carrying a fissure vein with N.-E. strike, and estimated at 4' width. Developed by a 100' shaft, showing chalcopryite reported to average 5% copper and \$5 gold per ton. Ore can be treated by flotation and property probably worthy of careful prospecting.

Letters returned from above address.

SCARLETT COPPER MINE

NORTH CAROLINA

Address: Frederick R. Thorns, owner, 112 Duane St., New York City. R. I. Dickens, supt., Ashboro, N. C.

Property: at Ashboro, Randolph Co., N. C., formerly operated by the Ashboro Copper Mining Co.

Ore: is a sulphide, carrying principally copper and zinc, with iron, alumina, a trace of silver and gold, and occurs in contact and fissure veins, running N. 40° E., with dip of 35°. Pay shoot reported to be from 2-5' wide.

Development: by 120' vertical shaft and several tunnels, longest 220'.

Equipment: includes 25 h. p. hoist, compressor, pump and steam power. Prospecting and development work only being done, 1917.

TWIN-EDWARDS COPPER MINE CO.

NORTH CAROLINA

Greensboro, Guilford Co., N. C. Inc. Sept., 1902. **Cap., \$100,000; shares \$100 par.**

Owns sundry old properties, including the Twin mine, with an 18' vein, which was worked previous to the American Civil War. Property shut down many years, but company understood to be only dormant, not dead.

UNION COPPER MINE

NORTH CAROLINA

Office: care Sig. H. Rosenblatt, 18 Broadway, New York. **Mine address:** Gold Hill, Rowan Co., N. C.

Lands: 550 acres, freehold, about 15 miles from Salisbury, in Rowan and Cabarrus counties, well watered and timbered. The property has schists, carrying 5 veins with average strike of N. 20° E. and practically vertical dip, of 2 to 20' width, 3 of which carry copper ores, the other 2, reported to carry silver and gold ores respectively, being but slightly developed. The copper veins are mineralized zones carrying lenticular shoots of ore, longest about 100' in length.

In 1916, No. 7 and 12 shafts were unwatered to 140' and work started on a shoot of 3% copper ore, which is 5' wide and exposed for 250'. From December, 1916, to April, 1917, ore was shipped from shaft and dumps. Three drill holes near the Big Cut and No. 5 shafts cut 4% sulphide ore.

Development: is on the Big Cut copper vein, trenched at intervals for a distance of about 1 mile, and having 10 shafts, deepest 650'; these shafts show a vein of 20' wide. The Big Cut vein shows oxidized ores and a little native copper in the upper workings, succeeded by chalcopryite, with quartz gangue. A careful sampling by Dr. A. R. Ledoux gave averages of 4.40% copper, 4 oz. silver and 40c to \$1.20 gold per ton. No. 7 shaft, of 200' depth, shows a vein 4" wide at surface and 3 to 4' wide on the bottom level, where the ore is claimed to average 4.5% copper. There are 14 shafts all told, and about 5,000' of workings. The property has been claimed, in the press, to have produced about \$1,000,000 worth of gold in early days.

One vein is said to carry zinc ore of low value, but is little developed.

Equipment: machinery plant is extensive.

Buildings include a machine shop, smithy, engine house, boiler houses, office building, 50-room hotel, dwellings and stable.

OKLAHOMA

(For map of the Miami Zinc Field, see page 948.)

(Companies are arranged alphabetically.)

The Miami Zinc-Lead field is the newest great mining region of the United States, and presents the superficial aspect of a Western mining boom, though fortunately it lacks, thus far at least, the wildcat stock companies which so often disgrace the earlier stages of development of our far Western mining districts.

The importance of the Miami field can be judged from the fact that although less than two years old, it contains 200 operating concentrating plants, each with one or more working shafts, and that nearly 1,000 churn drills are prospecting the field. The Kansas companies are separately described under that State name.

The following excerpts from a report on the district by the R. W. Hunt Company, give an excellent idea of its salient features.

The Miami Zinc-Lead Field lies in Ottawa County, the extreme north-east County of the State of Oklahoma, and extends into Cherokee County, Kansas. As now developed, it is 3 miles wide and 5 long. The Oklahoma towns in the field are Commerce, Quapaw, Century, Cardin, Tar Creek and Picher. Baxter, Kansas is at the north edge of the field. The Oklahoma portion of the field is in Township Twenty-nine (29) North, Range Twenty-three (23) East, Ottawa County. The Kansas portion of the field is in Township Thirty-five (35) Ranges Twenty-three (23) and Twenty-four (24), Cherokee County.

Geology: The mineralization of the Miami Field appears in trough deposits of zinc and lead ores, found in the Grand Falls cherts of the Boone Limestone Series at various depths below surface from 100 to 300 feet. Beneath these cherts a very compact limestone forms a floor which water does not easily penetrate.

Water carries zinc and lead in solution until it reaches the faults in the overlying cherts. It rises through these fault cracks and penetrates through the fractured and bedded cherts, depositing lead and zinc in them. The greater the fracturing of the cherts, the greater the deposit of metal, both as to quantity and value. The Miami or main fault of the district runs Northeast-Southwest through the District from Baxter, Kansas, to Commerce, Oklahoma, and represents a throw of about 15 feet. Cross faults and fractures extend from this to East and West at varying angles. The principal ore bodies are formed along these cross fractures and in the ground on both side of them for a few hundred feet.

The main fault was sufficiently open to permit constant circulation of water, while the side fractures retained water in a quiet state more favorable to precipitation of metal from the solutions contained. The Northwest-Southeast side fractures have the best ore bodies so far discovered.

The proven portion of the Miami Field proper is within a limited area of about five miles long by about three miles wide, in which small area 99 concentrating mills are built or are building, and more are planned to be built this year. This remarkable development has all occurred practically within the past eighteen months. Drilling in this area is continued principally to obtain additional information regarding ore bodies already discovered. Outside of this proven area drilling is extending to the West, East and North. In all nearly 700 churn drill rigs are in use, and from 400 to 500 new holes are finished weekly.

Developments in the field generally show two principal sheets or beds of ore; the upper at a general depth of 150 to 200 feet, and the lower be-

tween 250 and 300 feet, each bed of ore being from 15 to 30 feet thick, and in some instances twice this thickness. It appears certain that the ore bodies will prove to be much more extensive, and especially much richer than drilling indicates, as actual operations in this District have demonstrated when the mines are opened up by shafts and drifts the ore is from 50 per cent to 100 per cent richer than shown by assays of drill hole samples.

At present many operating mills in Miami are producing better than 10 tons of concentrates from each 100 tons of mine ore. This is locally termed 10 per cent recovery. It is probable that the field as a whole will average 8 per cent recovery, though some mills are actually recovering better than 15 per cent in concentrates. This is proving to be one of the richest lead and zinc fields in the world, and, as its production increases, will force the closing of leaner mineralized districts.

Prospecting is done by means of Churn Drill Holes; Keystone type of drill rigs are used. A 300-foot hole costs from \$450 to \$500, and is drilled in from ten to fourteen days. Samples are taken every few feet of the entire cuttings from the mineralized area passed through, which are assayed for zinc and lead.

The ordinary amount of drilling on 40 acres is from 10 to 30 holes. Old operators in the district are satisfied if they find two or three holes near each other carrying good ore, and will not drill further under such conditions, but sink shafts and build mills at once.

Shafts are sunk to the bottom of the ore body; the ore is mined, using the room and pillar system; trammed to shaft; hoisted to mill bins, crushed by rock breakers and rolls, and concentrated in jigs and on tables, so that the crude mine ore is reduced to a concentrate containing about 60 per cent metallic zinc and 80 per cent metallic lead. This is bought by smelters in the bins at the mills, and there is no further expense.

The entire process of mining and milling is extremely simple and cheap and does not require expert labor.

Mining and milling machinery is standardized and largely made in Joplin. It is not high priced and can be quickly obtained. Wages are on a sliding scale, depending on prices of concentrates, ranging from \$3.00 per day at \$50.00 per ton, to \$4.50 per day at \$100.00 per ton.

Division of costs, so far as obtainable, indicate: Labor, 50 per cent; Supplies, 30 per cent; Power, 15 per cent; General Expense, 5 per cent.

Average of Miami, in 1917, costs are:

Crude Ore:

Mining, Milling, General for 100 tons Mine Ore.....	\$160.00
Concentrates:	
If 10 tons concentrates produced, cost per ton.....	16.00
If 8 tons concentrates produced, cost per ton.....	20.00

Indicative of what some of the operators are attempting in this field, may be mentioned the campaigns being conducted by some of the larger operators. **The Eagle-Picher Lead Company**, on first entering this field, is reported to have expended a prospecting fund of approximately \$100,000, merely in its exploratory work. The blocking out of its ore bodies after discovery involved as much if not more than the original expenditure. The investment of this concern prior to the beginning of its production period was near \$750,000. This concern now has the largest single production of any company in the district.

The Commerce Mining & Royalty Company, the pioneer prospecting and development company of that field, has never ceased drilling since its

original strike of ore in 1905 in the old Commerce camp. Its drills are kept going constantly, and its expenditure in exploratory work has reached extremely large proportions.

The Church & Mabon interests have conducted some of the largest prospecting undertakings in the field, and as a criterion of how thoroughly their work has been done, may be mentioned that upon one forty-acre tract alone, 80 drill holes have been put down. This concern has developed a large number of forty-acre tracts, many of which have proved to be some of the best producers the district has yet known.

More recently the Miami Zinc Syndicate has taken over leases aggregating 4,000 acres, north of the Kansas and Oklahoma State line and west of Baxter Springs, Kansas, and has conducted upon it a drilling campaign, which is still under way, with only a small part of the acreage tested out.

The largest undertaking, however, that has been started is that of the Chanute Spelter Company, which has to its credit approximately 16,000 acres of ground and whose operations promise to be the most extensive of the entire district. From 20 to 30 drills are kept at work doing exploratory and development work. The field of its operations extends from the Kansas-Oklahoma line north and northwestward to Asbury, Missouri. Ranking close behind the Chanute Spelter Co. is the Waco Mining Co., with 7,100 acres in leases and fees, and P. B. Butler, with 6,500 acres in leases. These large holdings, principally in the Kansas field, are being systematically developed on a large scale. Others who have done a large amount of exploratory and development work are Frank Danglade, T. J. Franks, J. G. Marcum, Vinegar Hill Zinc Co., N. B. Gatch, H. Barndollar and many others.

ADMIRALTY ZINC CO.

OKLAHOMA

(See this title under Kansas division.)

Office: W. B. Shackelford, gen. mgr., Quapaw, Okla. O. F. Brinton, mine and mill mgr.

Property: 120 acres at Douthat, Okla. Shafts are down 220' and have opened 6 to 16% blende and galena ore. Four mills are treating 1,400 tons daily, and by November 15, 1917, management expected to be producing 600 tons of concentrate per week.

AMERICAN PIPE LINE CO.

OKLAHOMA

A subsidiary of the Amer. Z., L. & Sm. Co. and described under that title.

ANNA BEAVER MINING CO.

OKLAHOMA

Is operating a mine and mill in the Tar River field, Okla. Cages are used instead of buckets for hoisting, somewhat of an innovation here.

BAKER MILLING, SMELTING & REFINING CO.

OKLAHOMA

John Baker, pres., writes that he has never deceived anybody, and simply holds the charter, keeping it in force for the present, with no stock for sale. Unfavorably regarded. See Vol. XI, Copper Handbook.

BARTLESVILLE ZINC CO.

OKLAHOMA

Owns the "Lanyon Starr Plant," formerly held by the Lanyon-Starr Smelting Co., and is in turn controlled through stock ownership by the American Metal Co., Ltd.

BIG BEN MINE

OKLAHOMA

Recently sold by the Big Ben Mining Co. to E. L. Bucy of Bartlesville and P. L. Grace of Altus for \$75,000.

Property: a lease on land S. of Douthat, Okla., covering 40 acres. Drilling showed ore at 175'. A shaft is down to ore level and a mill is proposed.

CARTHAGE MINING CO.**OKLAHOMA**

Address: Emma R. Knell, Carthage, Mo.

Cap., \$32,000; shares \$100 par; \$16,000 paid in.

Property: 20-acre lease in the N. E. Oklahoma zinc field.

DULUTH-MIAMI MINING CO.**OKLAHOMA**

Address: Geo. Knox, Quapaw, Okla.

Property: 30 acres at Quapaw, Ottawa Co. Drilling said to have cut some ore assaying up to 37% blende.

FIRST NATIONAL MINING CO.**OKLAHOMA**

Address: Century, Okla.

Property: E. of Century, Okla. Two shafts are down to ore at 145'. Rich ore is being handjigged.

GALENA MINING & DEVELOPMENT CO.**OKLAHOMA**

Property is at Century, Okla., in the Joplin zinc-lead region. Development work has been done on a lease near the Lucky Kid and property is to be thoroughly opened.

HARE MINING & MILLING CO.**OKLAHOMA**

Address: Picher, Okla.

Property: 1 mile W. of Picher. A 200-ton mill has just been completed. Equipment includes gas driven compressors and steam hoist.

HOMESTAKE MINING CO.**OKLAHOMA**

Address: Quapaw, Okla.

Property: a 60-acre lease of the Douthat land, N. of Quapaw. Three mills will soon be in operation.

LANYON STARR SMELTING CO.**OKLAHOMA**

Dissolved. Fully described Vol. XII.

LENNAN ZINC & LEAD CO.**OKLAHOMA**

Operating a lease on the Commerce Mng. & Royalty Co. mine, Miami, Ottawa Co., Okla. An ore face 60' in height is being worked by drifting under the old workings of the 400' level. Equipped with concentrator.

Producing since 1914.

MELROSE MINING CO.**OKLAHOMA**

Address: Quapaw, Okla.

Property: 1 mile N. of Quapaw. Drilling exposed ore from 138 to 210' deep. One shaft is down 170', part of the way in a soft, black shale. No. 2 shaft is being sunk. A 300-ton mill is ready for concentrating the ore.

MIAMI ZINC & LEAD CO.**OKLAHOMA**

Address: Miami, Okla. T. F. Lenan, gen. mgr.

Operates large zinc-lead property in Miami district. Workings to depth of 330' are to be deepest in the field. Three electrically-driven, mills yield over 200 tons of concentrate per week.

MUSKOGEE LEAD & ZINC CO.**OKLAHOMA**

Address: Quapaw, Okla.

Property: 60 acres, just W. of Quapaw. Ore has been encountered at 165' and 180' and a mill is to be built.

NIANGUA MINING CO.**OKLAHOMA**

Address: Picher, Okla.

A new concentrator is under construction. Gas engines will drive the plant and compressor and hoisting will be done by air.

ONTARIO SMELTING CO.**OKLAHOMA**

Address: Quapaw, Okla.

Company is erecting a lead smelter with furnace room 34' x 130' and a bag house 67 x 90', to be ready about the end of 1917. This is the first lead smelter in the Oklahoma section of the Missouri-Kansas-Oklahoma region.

RAINBOW LEAD & ZINC CO.**OKLAHOMA**

Address: R. H. Drennan, Oklahoma City.

Officers: F. E. Herring, pres.; O. D. Halsell, v. p.; R. H. Drennan, sec-treas.

Inc. in Oklahoma. Cap. \$100,000. Closely allied with the Ottawa Lead & Zinc Co.

Property: E. of Picher and N. W. of Quapaw. At the Rainbow, ore is found at 165' depth, and is from 20' to 35' thick. A 300-ton mill is being built here and a 200-ton plant for the Ottawa.

REBEKAH MINING CO.**OKLAHOMA**

Address: Picher, Okla.

Property: 252 acres N. W. of Picher, was purchased a year ago for \$30,000. Drilling revealed some rich zinc ore. Two shafts are being sunk and a 300-ton mill is under construction.

REPUBLIC MINING CO.**OKLAHOMA**

Address: W. J. Scafe, mgr., Joplin, Mo.

Officers: W. H. Langford, pres.; F. J. Huttig, v.-p.; F. Huttig, sec.

Cap. \$250,000.

Property: a lease on the Wright land near Tar River, Okla. Two shafts are in rich ore to 224' depth. A 250-ton mill is operating.

SAMBO MINE**OKLAHOMA**

Address: Supt. Sambo mine, Lincolnville, Oklahoma.

Purchased Nov., 1917, by R. P. Sharpe of Miami, and R. M. Ferguson, et al. of Mangum, Okla., for \$150,000.

Property: 40 acres of land and a mill in town of Lincolnville next to Nemo and Moran Mining companies. Mill to be enlarged to 500 tons daily. Mine has 5% ore, between 75' and 100' levels.

ST. LOUIS LEAD & ZINC CO.**OKLAHOMA**

Address: Quapaw, Okla.

Property: S. W. of Quapaw. Drilling has proved ore and one shaft has been sunk. A mill has been started. Gas driven compressors are to be installed.

ST. LOUIS SMELTING & REFINING CO.**OKLAHOMA**

Address: Care E. D. Nix, Miami, Okla.

Company's holdings reported sold Nov. 2, 1917, to Texas-Oklahoma Syndicate for \$5,000,000. Company has two large mills E. of Picher and N. of Quapaw.

Property: 160 acres at St. Louis, Okla., on which two large modern mills are erected to serve the ground already proven and ready for mining. Also 1,240 acres within the proven mineralized area just east of the mill properties.

A new \$15,000,000 company is to be incorporated. The more prominent men interested are: C. C. Slaughter, cattleman, of Texas; Walter Morris and L. P. Gamble of Dallas, Tex., and O. D. Halsell of Oklahoma City.

STANDARD ZINC & LEAD CO.**OKLAHOMA**

Address: Tar River, Okla. Ore 30' to 60' thick has been cut by drills and two shafts are down 80' on drill holes. A 300-ton mill is to be erected.

TULSA-SAPULPA-MIAMI ASS'D MINES CO.**OKLAHOMA**

Address: H. R. McCreary, sec., Tulsa, Okla.

Property: leases around Wyandotte, S. W. of Miami, Okla. Ore is expected to be cut by new shaft at 150'.

UNDERWRITERS LAND CO.**OKLAHOMA**

See same title under the Missouri mines.

WOLFTON MINING CO.**OKLAHOMA**

Office: Webb City, Mo. Charles T. Orr, pres. and gen. mgr.; Jas. B. Millar, treas.

Operated in conjunction with Athletic Mining & S. Co. and Bertha A. Mining Co.

Property: near Picher, Okla., is in the well known Miami belt, carries high grade zinc ore, and has a 1,200 ton mill (per 24 hours). See above named companies, in list of Missouri mines.

WOLFTON MINING CO.**OKLAHOMA**

Address: Henry Gneissing, supt., Picher, Okla.

Cap. \$200,000. Company has a 60-acre lease on the Whitebird land E. of Picher, and is to erect two 500-ton mills.

OREGON

All companies are grouped by counties and the arrangement is alphabetical.

BAKER COUNTY

This county embraces the Auburn, or Baker, Cable Cove, Conner Creek, Cornucopia, Cracker Creek, Eagle Creek, Greenhorn, Homestead, or Iron Dike, Rock Creek, Sumpter, Virtue and Weatherby districts.

AMALGAMATED MINES CO.**OREGON**

Office: Baker, Ore.

Officers: Wm. Deffren, pres.; W. Burnham, sec.; G. J. Burnham, treas.

Cap., \$1,000,000; shares \$1 par; 754,824 shares issued.

Property: 8 quartz claims in Eagle creek distr., Baker county. Developing.

BAKER MINES CO.**OREGON**

Office: 60 Wall St., New York. Frank S. Baillie, supt. Inc. 1913 as a leasing company to work the Last Chance mine, formerly worked by the Cornucopia Mines Co. The mine is at Cable Cove, near Sumpter, Baker Co., Ore., about 18 miles W. of Copperfield, on the Oregon R. R. & Navig. Co. line.

Ore: massive white quartz containing pyrite, chalcopyrite, zinc blende and gold in the Last Chance vein, strike N. 20° E., dip 45° west.

Development: 700' tunnel cutting the vein at 500' depth on the dip, and a 265' winze sunk in the vein with several hundred feet of drifting on the 100' and 200' levels, also crosscuts to surface for drainage.

Equipment: 20-stamp amalgamation mill, cyanide plant, aerial tramway, laboratory, offices and dwelling houses. Employs about 25 men.

BURNT RIVER DREDGING CO.**OREGON**

Address: 506 Oregonian Bldg., Portland, Ore. O. E. Tisch, pres.; D. D. Wallace, sec.-treas.

Cap., \$250,000; shares \$1; \$39,125 outstanding.

Property: 680 acres, known as the Pomeroy dredging ground, 8 miles S. of Durkee in Baker county. Company reported to plan installing a \$15,000 gold dredge, 1918.

COLUMBIA GOLD MINING CO.**OREGON**

Operated the Columbia gold mine, near Sumpter. Company sold its entire property, 1917, and will soon retire from business.

COMMERCIAL MINING CO.

See Rainbow Mine, Rye Valley, Baker Co., Ore.

CORNUCOPIA MINES CO.**OREGON**

Office: 60 Wall St., New York City. Robt. M. Betts, mgr., Cornucopia, Ore.

Property: the Union-Companion mine at Cornucopia, Baker Co., Ore., 25 miles from a railroad. Gold was discovered in this district in 1880, and in 1895 the Union-Companion claims, although but slightly developed, were sold for \$60,000, and a 20-stamp mill built.

The vein is said to be traceable on surface for 6,800' with strike of N. 20° E., dip of 45° W., and 2-5' wide, maximum width 20'. Wall rock is granodiorite and schist. Vein material is massive white quartz containing 3 to 5% of pyrite, which carries the gold. There is some silver sulphide present, also appreciable quantities of chalcopyrite, arsenopyrite and blende. Ore ranges in value from \$10 to \$20 per ton.

Development: by incline shafts, with the 700' the lowest level at last accounts, said to show 4 ore-shoots having an average width of 3' and an aggregate length of 1,200'.

Mill: 20 stamps, weight 950-lb. each, making 98 drops per minute through 7". Ore is crushed in a 0.125% KCN solution. Stamp duty is 5.15 tons per stamp. Fine grinding is done in two 5' x 22' tube mills, each driven by a 50-h. p. motor. The cyanide plant is equipped with Dorr thickeners, 3 Pachuca tanks, and 2 continuous revolving drum filters. An extraction of 87 to 89% of gold and silver is obtained. Average consumption of supplies per ton of ore is cyanide, 1.4 lbs.; lime, 3 lbs.; zinc dust, 0.9 lb. Power is furnished by the company's hydro-electric plant, 2 miles from the plant. Current is transmitted at 6,600 volts and transformed to 2,200 volts for use. Cost of treatment is said to be \$2 per ton. Production figures not available. See Min. Res. of Oregon, Vol. I, No. 8, pp. 36-49. Company is reported to be doing extensive experimental work on its low grade ores with the object of building a new and large mill if tests are successful.

GIRAFFE MNG. & MLG. CO.**OREGON**

Office: Miller, Ore.

Officers: G. Cartwright, pres.; A. O. Weatherman, sec.; Grace Nichols, treas.

Cap. \$150,000; shares \$1 par; 75,000 issued.

Property: 7 gold claims in Mormon Basin, said to show ore occurring in a narrow mineralized granodiorite porphyry dike cutting argillite with intrusive bodies of serpentine and dikes of basalt. Limestone occurs a short distance to the north of the property and granodiorite to the east.

Development: by shaft and tunnel. On No. 2 Giraffe claim, at 85' in depth, gold bearing ore assaying about \$4 per ton was cut. A crosscut is being driven to cut the dike at 300' depth.

Production: 200 tons from the Giraffe No. 1 claim yielded \$7.50 per ton by amalgamation.

GOLDEN CHARIOT MINING & MILLING CO.**OREGON**

Address: Sumpter, Ore.

Officers: Chas. Wiedemann, pres.; O. E. Conner, mgr.; Rose Rennekamp, sec.

Inc. in Oregon. Cap., \$350,000; shares \$1 par.

Property: 400 acres. at 4,500' elevation, 2½ miles from Sumpter, Ore., is said to show a fissure vein in limestone. The gold-bearing ore is reported to occur in shoots, 6' wide on the 210' level.

Development: to 300' by vertical shaft, to be sunk another 200'. Core drilling to 500' below 210' level; winze below reported in free milling ore.

Equipment: includes 50 h. p. friction hoist, steam-driven compressor and pumps.

GOLDEN EAGLE MINING CO.**OREGON****Office:** The Dalles, Ore. J. C. Hostetler, sec.-treas.**Cap.,** \$441,000; shares \$1 par.

Property: 8 claims in Greenhorn district, Baker Co., Ore. Past production, \$75,000. Claims said to show a number of non-persistent fissures; only three of them ore-bearing. No. 2 vein has been followed to depth of 200', and besides free gold, the ore contains some galena and copper. Possibilities at depth are said to be poor.

Development: by tunnels aggregating 2,600', to depth of 175'; also shaft 75' below lowest tunnel.

HECLA CONS. MINING CO.**OREGON****Office:** Baker, Ore.

• **Officers:** J. L. Rand, pres.; M. E. Brooks, sec.-treas.

Cap., \$1,000,000; shares \$1 par; all issued.

Property: 11 claims, on the west side of Hurricane Creek, about 9 miles from Joseph, in the Wallowa district, Oregon. Claims cover a large area of limestone and superimposed schist, cut by quartz porphyry dikes.

Ore: chiefly galena and sphalerite with some pyrite, occurs in small. lenticular bodies less than 1' wide and 2-3' long. Some cerussite ore (lead carbonate) and occasional copper staining also occurs.

HIGHLAND MINE**OREGON****Address:** Baker, Oregon.

Formerly owned by Highland Gold Mines Co. and worked by Highland Dev. Co.; latter company dissolved, Jan., 1917. Reported sold under bond and lease, Aug., 1916, to Delbert E. Metzger.

Property: 6 claims, in Rock Creek district, Baker Co., Ore., 14 miles from Haines, the shipping point. Claims show 4 ore shoots carrying lead-silver-gold values.

Development: by 6 tunnels with about 5,000' of work.

Equipment: has 50-ton mill. Average recovery has been 2 oz. silver and .25 oz. gold per ton. Tailings reported to contain \$1.80 to \$2.20 per ton in gold and silver.

Production: from 1905 to Apr., 1914, was 6,322 tons of ore and concentrates, yielding \$311,552.

Immediate cause of closing down property was an injunction issued 1914, restraining the company from polluting Rock Creek.

HOMESTEAD-IRON DYKE MINES CO., INC.**OREGON**

Halstead Lindsley, gen. mgr., Room 1508, No. 60 Broadway, New York. D. M. Goodrich, pres.; Chas. C. Goodrich, sec.-treas.

Cap., 1,000 shares, all issued.

Operates property of Iron Dyke Copper Co., which see.

IBEX MINE**OREGON****Address:** Sumpter, Ore.

Property: near Granite Creek, Cracker Creek district, 8 miles N. W. of Sumpter, Ore.

Development: the work done in the past 15 years consists of about 8,000' of tunnels, etc., with 3,000' of it on the gold-bearing vein. The vein averages 5' in width, but has a maximum of 25'. It occurs entirely in argillite, contains sulphides, and is generally low-grade.

IMPERIAL MINING CO.**OREGON**

C. L. Arzeno, mgr., 9 E. 5th St., Covington, Ky.; Alfred Heisler, supt.

Property: Imperial mine at Cable Cove, 11½ miles from Sumpter, the nearest railroad station. Ore occurs in quartz fissure veins in granodiorite. The Imperial, or main vein, is 3 to 4' wide and has been extensively developed.

During 1916 this vein was again encountered in a crosscut 70' E. of the main drift in the Miner tunnel and 168' lower than the nearest workings above. Work was immediately begun to reach the rich ore opened in the level above.

Equipment: includes an 85-ton mill. Has been a small and irregular producer, totaling \$75,000.

IRON DYKE COPPER CO.

OREGON

Mine near Homestead, Baker Co., Ore.

Officers: F. F. Curtze, pres.; F. A. Brevelier, sec.; A. A. Claus, treas.; E. Galligan, supt.

Inc. in Pennsylvania. **Cap.**, \$500,000; shares \$1 par; \$380,000 issued. Erie Trust Co. holds title by trust deed and bond. Worked by Homestead-Iron Dyke Mines Co., Inc.

Property: a copper deposit discovered 1897, about 2,000' from railroad at Homestead. Lower tunnel, 300' above town, is about 1,300' long, cutting the orebody at 800' in and connected by raise with 3 tunnels above. The mine has several thousand feet of workings. The lower tunnel shows massive chalcopryrite and pyrite ore about 6' wide, said to extend upward to the upper tunnel. Ore said to contain \$2 to \$3 gold, 3 oz. silver and 5% copper per ton.

Reopened 1915, after years of idleness, and in 1917 is largest copper producer of the State.

Shipments during 1916 averaged at least 2,500 tons of 6% copper ore to Utah smelters. Ore also contains \$5 per ton in gold and silver values.

In June, 1917, a wide body of 5% ore, with high precious metal content, was opened at a depth of 850'.

A 125-ton concentrating plant commenced work in Sept., 1916, using flotation as part of the process with a 90% recovery claimed.

Mine is a steady producer and apparently has promising possibilities.

KOEHLER MINE

OREGON

Address: A. Koehler, Baker, Ore.

Property: in the Virtue district, 4½ miles from Baker, was a producer of high-grade antimony ore in 1915. Has a well-defined vein, up to 10' in width, carrying antimony and gold ore. Massive and disseminated stibnite both occur.

Output to date is said to be \$15,000, and mine still contains considerable ore.

LAST CHANCE MINE

OREGON

Owned and operated by Baker Mines Co., which see.

LISTEN LAKE GOLD MNG. CO.

OREGON

Office: Baker, Ore.

Officers: F. W. Thomas, pres.; C. I. Flynn, sec.

Cap., \$500,000; shares \$10 par; all issued.

Property: 4 quartz claims and the McNamee placer about 6 miles from Austin on the Sumpter Valley railroad, in Greenhorn mining district, Baker Co., Ore.

Development: by 120' shaft shows a silicified shear zone in gabbro, that is in places as much as 50' wide, and shows small amounts of pyrite and chalcopryrite along fractures. Dump material is said to carry low copper values and a fraction of an ounce of gold.

Shaft is under water below 10' from surface.

OREGON-IDAHO INVESTMENT CO.

OREGON

Baker City, Baker Co., Ore.

Officers: Jas. A. Howard, pres.; John Arthur, v. p.; Fred R. Mellis, sec.-treas.

Cap., \$50,000. Is a small, close corporation organized as a developing and holding company, but whose chief business since 1909 has been the operation of the Baker City, Ore., ore-sampling plant, burned April, 1911, but rebuilt later in the year.

Property: includes the Poorman group, 8 claims, 160 acres, surveyed for patent, on Balm Creek, 25 miles N. E. of Baker. The group shows a copper-bearing vein for 2,000' that has a gossan cap 200' wide in places.

Development: by an 800' tunnel with several short crosscuts at depth of 100', showing 2.5 to 3.5% copper, present as chalcopyrite.

Has lease and bond on the Taber Fraction and has use of the Bourne Gold Mng. company's tunnels to operate mine.

PACIFIC MOLYBDENUM MINES, INC.

OREGON

J. B. Philips, mgr. Property at Greenhorn, Baker county, is reported to show an 8' vein of molybdenum, running from 20 to 25%.

The mill is to be equipped with a 1,000-ton oil flotation unit in 1917-18.

POWDER RIVER GOLD DREDGING CO.

OREGON

Office: Insurance Exchange, California St., San Francisco, Cal. **Operating office:** R. W. Derby, supt., Sumpter, Ore.

Officers: W. P. Hammon, pres.; R. K. Barrows, v. p.; A. E. Boynton, sec.-treas.; with A. L. Dahl and F. J. Mott, directors.

Inc. Oct. 18, 1911, in California. **Cap.**, \$500,000; shares \$1 par, all issued. **Bonds:** \$300,000 authorized, of which \$3,000 are outstanding. Annual meeting 4th Monday in October.

Gross earnings in 1916 were \$640,635, of which \$624,869 was from the gold recovered. Operating costs were \$182,374; sundry expenses, development, etc., \$176,426, leaving \$281,835 net profit.

Dividends: aggregate 85c per share, or \$425,000, to Oct., 1917.

Property: about 1,500 acres placer ground, near Sumpter, Ore., half of which is considered payable. The gravel channel is from 300 to 2,000' wide; it will average 1,000' wide, 18 to 20' deep, and the pay gravel rests on a soft, decomposed rock called "clay webfoot." Dredge digging may be termed tough, and as a result, the bucket-lips wear out in 5 months' use.

Equipment: 2 dredges, the only ones in Oregon electrically driven. One has 9 cu. ft. and the other 7½ cu. ft. buckets, and can dig a total of 10,000 yards daily. Power consumed is 750 h. p. for each boat.

Production: yielded \$624,869 in 1916. Out of Oregon's annual gold yield of about \$1,800,000, this company contributes a third.

QUEEN OF THE WEST MINES CO.

OREGON

Office: 209 Pillsbury Bldg., Minneapolis, Minn. **Mine office:** Cornucopia, Ore.

Officers: A. Y. Bayne, pres.; Lewis W. Campbell, sec.; H. U. Maurer, treas.; R. G. Amidon, mgr.

Inc. in West Va. **Cap.**, \$1,000,000; shares \$1 par; 993,466 shares outstanding.

Property: 11 claims in the Cornucopia district. Baker county, developed by tunnels and equipped with 10-stamp mill, concentrating plant, 50-ton cyanide plant, 3,600' aerial tramway, capacity 6 tons per hour, water power and air compressor.

Geology: described in Min. Res. of Oregon, 1916., Vol. 2, No. 4, p. 186.

RAINBOW MINE

OREGON

Mine at Rye Valley, Baker Co., Ore. Howard S. Lee, mgr.; Frank W. Parker, supt.; Walter W. Dake, Jr., mill supt., at last accounts.

Property: a group covering the Rainbow vein, a brecciated zone 5'-50' wide made of rock fragments cemented by quartz.

Development: 500' shaft, with 1,500' of drifting on vein on 200' level. Operates 15-stamp mill, 100 tons a day with tube mill, Dorr classifier and thickener, Pachuca tank, Kelly press and Merrill filter. See Min. Res., Oregon, Dec., 1914; Vol. 1, No. 8, p. 220.

Reported 1917 to have reverted to the Commercial Mining Co.

RED BOY MINES CO.**OREGON**

Stock worthless as property was sold for \$34,500 at sheriff's sale in 1916 and bid in by bondholders.

Reorganized June, 1916, as Red Boy Mng. & Dev. Co., which see.

RED BOY MNG. & DEV. CO.**OREGON**

Address: Baker, Ore.

Officers: Ray Nye, pres.; F. A. Harmon, v. p.; A. J. Winter, Jr., sec.; Paul Colson, treas.

Inc. June, 1916. **Cap.**, \$250,000; shares \$1 par; all issued. Is a re-organization of the Red Boy Mines Co.

Property: the Red Boy mine in Granite district, Grant county, credited with past production of \$800,000. Present operations consist of prospect work and re-cyaniding low-grade concentrates. The geology is fully described in Mineral Resources of Oregon, Vol. 2, No. 4, pp. 188-191.

SANGER GOLD MINES CO.**OREGON**

Office: J. K. Romig, sec., Baker, Ore. F. W. Paine, pres.

Inc. in Oregon. **Cap.**, \$2,000,000; shares \$1 par; 1,295,146 issued.

Property: 600 acres of quartz and placer claims on W. side of Eagle Creek, in an area which has produced about \$1,500,000, but where since 1900 there has been little work done beyond small placer operations.

Geology: quartz veins in a black clay slate. Ore contains 3% sulphides and is considered to be similar to many Californian gold quartz veins. Owing to older slates being fractured, cut by dikes, etc., prospecting is difficult.

Development: by tunnels and an incline shaft 400' deep. In upper workings the vein shows ore 15" wide, worth \$20 to \$25 per ton; in the lower, below the zone of oxidation, the ore is 24" to 48" wide, and assays \$12 per ton. In 1916 several open cuts and short tunnels were driven to pick up the extension of the vein.

Property worth further exploration, as geologic conditions are good.

SNOW CREEK MINING CO.**OREGON**

Baker, Baker Co., Ore.

Officers: Henry B. Smith, pres., Bay City, Mich.; Fred D. Smith, v. p., Ithaca, N. Y.; C. H. McColloch, sec.; R. J. Davison, treas., with J. H. Bowlby, directors.

Inc. June 25, 1914. **Cap.**, \$200,000; shares \$1 par; outstanding, 132,000 shares.

Property: 5 claims, 85 acres, including the Snow Creek mine, formerly owned by Oregon Mines Exploration Co., near Greenhorn P. O. Ore carries gold, silver, lead in contact deposit, 3' to 8' wide; country rock is diorite and slate. Ore extracted in the past is said to have assayed \$12 per ton in gold and silver and 5% lead.

Development: 225' vertical shaft and tunnels, aggregating 1,315'. Claims 9,400 tons of ore blocked out.

Equipment: includes 10-stamp mill. Total output to date about \$40,000.

Title was obtained by present company under foreclosure of mortgage. Sinking shaft 100' deeper and developing was planned, 1916.

SUMPTER SMELTER**OREGON**

See Northwest Smelting & Refining Co., Sumpter, Baker Co., Ore.

VIRTUE MINES DEVELOPMENT CO.**OREGON**

Baker, Ore.

Officers: J. K. Romig, pres.; M. Boswell, sec.-treas.**Cap.,** \$1,500,000; shares \$1 par; 1,384,075 issued.

Property: bonded in 1916 to G. W. Field & Co., of Boston, for \$500,000, consists of 16 claims and placer ground, a total of 400 acres in the Virtue district, Baker Co., Ore. From 1878 to 1898 the gold yield was about \$2,189,000, the largest production being \$259,000 in 1898. Mine was idle for nearly 15 years, but in 1917 it was reported working and electric power was installed.

Claims said to show quartz veins in serpentine striking N. W., dipping 45° to 80° S. W. and averaging 14" in width. Ore carries gold and a little pyrite and chalcopyrite.

Equipment: includes hoist, boilers, 20 stamps, vanners, cyanide plant and electric power.

WHITED MINING CO.**OREGON**

Address: Aldred Whited, Unity, Ore.

Inc. Nov., 1916, in Ore. Cap., \$15,000; \$1 par.

Property: 8 claims situated 5½ miles south of Unity, Baker Co., Ore. Two veins under development show shoots of gold-bearing quartz, the largest one along the hanging wall of a porphyry dike.

Development: includes 2 crosscut tunnels with drifts on the veins.

Equipment: embraces a 10-stamp mill with amalgamating plates and Wilfley tables. Was developing late in 1916.

CLACKAMAS COUNTY**OGLE MOUNTAIN MINING CO.****OREGON**

Office: 1003 Main St., Oregon City, Ore.

Officers: J. B. Fairclough, pres.; W. J. Wilson, sec.-treas.**Cap.,** \$1,000,000; \$1 par; all issued.

Property: 22 claims, 14 miles from Gates on the S. P. R'y and 35 miles E. of Silverton, in the Ogle Creek mining district, Clackamas Co., Ore.

Ore: the mine carries low-grade gold ore which occurs in a well-defined fissure vein that averages about 5' in width. The average value is \$5 per ton.

Development: by a 1,460' tunnel driven 560' below the two old tunnels, in order to cut the downward extension of vein. Several small veins have been cut, but contain only very low-grade ore.

Company lost much money building a mill which proved a failure, and it is now doing very little work at property.

CROOK COUNTY

Includes Bear Creek, Butte and Ochoco districts.

AMERICAN ALMADEN QUICKSILVER & GOLD MINING CO.**OREGON**

Office: 100½ Fourth St., Portland, Ore.

Officers: W. B. McKinney, pres.; E. N. Wheeler, sec.-treas.; G. W. Tillotson, Howard, Ore., mgr.

Cap., \$1,500,000; shares \$1 par; all issued.

Property: 3 claims in Sec. 20, T. 14 S., R. 20 E., 11 miles from Howard, in the Ochoco district, Crook county, developed by tunnels. Ore contains cinnabar in altered andesite.

OPHIR MAYFLOWER MINE**OREGON****Address:** A. J. Champion, Howard, Ore.**Property:** 8 miles from Howard, in Ochoco district, Crook Co., Ore., 41 miles from railroad at Redmond.**Geology:** the rocks are andesitic, occurring as flows interbedded with tuffs and breccias. Mineralization is in wide fracture zones of altered rock.**Development:** by 1,400' crosscut tunnel, and one 200' above. Drifts follow the fracture zones. Ore in one shoot is 1 to 6' wide and 70' long; shipments averaged \$70 gold. A second shoot, 20' long and 4' wide, averaged \$125 per ton. The values in the lower tunnel only carry about \$3 per ton.**Equipment:** includes a small amalgamating-concentrating stamp-mill.**CURRY COUNTY**

Includes Agness, China, Collier Creek, Mule Creek, Ophir, Sixes River, and other districts.

BOULDER CREEK GOLD MINING CO.**OREGON****Office:** 80 Sixtieth St., Portland, Ore.**Officers:** R. D. Hewitt, pres., Agness Ore.; John Gardner, sec.-treas.**Cap.,** \$25,000; shares \$100 par; \$21,076 outstanding.**Property:** the Star group of mining claims, about 240 acres, in Sec. 25, T. 34, R. 13 W., Ophir district, Curry County, on which \$4,800 has been spent in the following improvements: 4,800' ditch, sawmill, dam, 1,000' of piping and 800' pipe giant. Results of operations not reported.**GOLD BAR MINE****OREGON****Address:** T. W. Billings, Illahe, Curry Co., Ore.**Property:** placer claims in the Agness district. Worked intermittently since 1856, but regularly only since 1911. Bedrock is black shale; gravel is 9' thick with 4' of overburden. Yields have been fair. Property has plenty of water for washing.**HYDRO SIXES MINES CO.****OREGON****Office:** 57 Post St., San Francisco, Cal.**Officers:** W. J. Bell, pres.; G. W. Root, sec.; C. J. Pease, treas.**Cap.,** \$70,000; \$1 par; all issued.**Property:** 1,200 acres placer ground between Otter and Elephant Rock Creek, just below the forks of Sixes River, Curry Co., Ore. Company uses water under 150' head, from Big Otter Creek.

Employs 50 men. Company has spent \$100,000 improving and equipping property.

SIXES MINING CO.**OREGON****Offices:** 748 West 3rd St., Salt Lake City, Utah, and 625 Market St., San Francisco, Cal.**Officers:** L. R. Eccles, pres.; C. B. Edington, sec.; John Pingree, treas.; W. A. Bechtel, S. F. mining agent.**Inc. in Utah. Cap.,** \$1,125,000; shares \$5 par; 157,900 issued.**Property:** has option on placer claims, 300 acres, owned by the Divelbiss family, on the Sixes River, Curry Co., Ore., 11 miles from Port Orford. Ground contains considerable black sand which holds both gold and platinum, about 10% of the gravel value said to be in the platinum. Three distinct gravel channels are known, one of which is to be dredged, the others hydraulicked. For sluicing a 4½ mile flume is available. It is planned to extract the metals from the black sands.

DOUGLAS COUNTY

Embraces Riddle, Green Mountain and other districts.

ELDORADO COPPER MINING CO.**OREGON**

Address: Andrew Laidlaw, Columbia Bldg., Spokane, Wash.

Incorporators: Andrew Laidlaw, S. W. Miller, C. P. Ritter, F. W. Beyer and Henry Banfield.

Inc. 1916, in Washington. **Cap.**, \$2,000,000; \$1 par. Company organized to take over the Banfield mine, 32 miles east of Riddle, Ore., on the S. P. railway. The price is said to be \$300,000, partly in stock.

Property: 9 claims, known as the Banfield mine, and formerly owned by the Douglas-Umpqua Mng. Co. Claims said to show nine veins, 3 of which have been developed. Ore estimated to average 4% copper with slight gold and silver values.

Development: by 6 tunnels, lowest 900' below surface, with about one mile of workings, estimated by management to block out 300,000 tons of ore.

This is an old mine which has been under development for 16 years.

GRANT COUNTY

Embraces Granite, Greenhorn, New Eldorado, Quartzburg and Susanville districts.

BEN HARRISON MINE**OREGON**

Sold April, 1917, to E. H. Dewey, of Nampa, Idaho. Former owners are said to have spent \$200,000 on the property.

Property: 10 claims, 7,000' above sea level, in Grant Co., Ore., in N. W. corner of Sec. 36, T. 9 S., R. 34 E., 23 miles by road west of Whitney, and 28 miles by road from Sumpter, the nearest railroad stations.

Ore: occurs in the Ben Harrison vein, strike N. 3° E., dip 67° E., which varies in width from 18" to 21', with an average stoping width, where opened, of 77". The vein is a brecciated replacement in granodiorite. Ore minerals are pyrite, stibnite, chalcopyrite, sphalerite, pyrrargyrite and stephanite, with gold of about equal value to the silver in the ore.

Development: by adits, the lowest at the 600' level. Several hundred feet of drifting has been done on the various levels and at the beginning of 1915 there was said to be above the 500' level, 87,000 tons of ore blocked out on 3 sides, with an average value of \$10 per ton. The 600' level has had several hundred feet of drifting done; here the ore is said to be 20% higher in value than the ore in the upper levels.

Equipment: includes 20-stamp mill, tube mill, classifiers and vanners. A 75% extraction was obtained in the mill. This low recovery and high cost of transportation of concentrates caused the former owner to plan building a roasting and cyanide plant.

See Mineral Res. of Ore, Vol. 1, No. 8, p. 176.

BLUE MOUNTAIN MINING CO.**OREGON**

Office: 9 E. Fifth St., Covington, Ky. **Mine office:** Sumpter, Baker Co., Ore. **Works office:** Cable Cove, Grant Co., Ore. G. H. Vonderahe, sec.-treas.

Officers: C. L. Arzeno, pres., gen. mgr.; B. J. Stagge, v. p.; A. E. Buxsel, asst. sec.-treas.; Clemens Backhus, Jr., E. Weitkamp, Jos. Grever, Geo. H. Vonderahe, Bernard Moeller, Alvin Davidson, directors. A. Heisler, supt.

Inc. in Arizona. **Cap.**, \$2,000,000; shares \$1 par; fully paid; non-assessable; 1,373,999 issued. Authorized \$50,000 6% bonds; \$47,500 outstanding Annual meeting 4th Friday in April.

Property: 27 claims, about 500 acres, 200 patented, is said to be covered with timber with the exception of 35 acres, in Cable Cove district, 11 miles N. W. of Sumpter in Baker and Grant counties, Ore., at head of the north fork of John Day river. Claims include the Baby McKee group, Annex, Last Chance and others, said to carry the Eagle, Rawson, Cloud and Marty veins with gold-silver ore.

Ore: occurs in fissure veins in granodiorite, running slightly E.-N. and dipping in opposite directions. One vein has an average width of 4', a proven length of 2,200' and proven depth of 700'. The Eagle vein is said to be 60' wide and developed for 6,800' in length.

Development: includes a 1,900' main working tunnel with a 262' cross-cut at 1,500'; showing a 6' vein opened up for 25' with concentrating ore. The 640' Baby McKee tunnel, now caved, yielded specimen rock years ago. Company owns the Alpine mill, besides a 10-ton experimental mill and the 85-ton Imperial mill.

In 1916 company took a lease on the Imperial Gold Mng. Co. property, 20 patented claims, of which the Blue Mountain holdings are an extension. The property carries 5 veins with ore shoots 100'-200' long, carrying arsenopyrite 38.70%, galena 8.20%, zinc blende 12.10%, pyrite 3.4%, copper pyrite, 1.4%, lime 2.7%, insol. 30%. This assays 1.5 oz. gold per ton, 12 oz. silver, 7% lead, 8% zinc, 18% iron, 30% insol., 17.8% arsenic and 15% sulphur.

Ore reserves: at the Imperial tunnel are reported to be 1,000 tons averaging \$110 per ton and 13,000 tons \$10 ore. Company appears to have too small a capital to develop its property.

BRIGHT CARBONATE MINING CO.

OREGON

Office: 118 East Webb St., Pendleton, Ore. Geo. Darveau, pres.; John Seibert, sec.-treas.

Cap., \$60,000; shares \$1 par; all outstanding.

Property: 3 claims in the Greenhorn range, Grant county, at an elevation of 7,250', is reported to carry a quartz vein in granodiorite, containing mainly gold and silver values. Mine but slightly developed and still in the prospect stage.

BUFFALO MONITOR MINE

OREGON

Operated under lease by Wm. Narkaus, 1916-17. Mine, about 5 miles from Granite, in Grant county, reported to have 3 veins, carrying pyrite, chalcopyrite, tetrahedrite, galena and stibnite; the main or Monitor vein is said to be 50' wide. Production to date amounts to \$75,000. The lessee has installed compressor and air drills.

EQUITY COPPER & GOLD MINING CO.

OREGON

Address: Rev. W. J. Hughes, pres. and gen. mgr., 2441 Center St., Baker City, Ore. **Mine P. O.:** Prairie City, Grant Co., Ore.

Officers: F. M. Saxton, v. p.; Mrs. Kate Palmer, sec.; G. J. Bowman, treas.; preceding with Hon. T. E. Johns and Rev. R. W. Hughes, directors.

Inc. 1901, in Oregon. **Cap.,** \$150,000; shares 10c par, non-assessable. Paid a dividend of \$3,000.

Property: 16 claims, unpatented, 320 acres, with a 5-acre mill site, in the Quartzburg district, 7 miles north of Prairie City. Reported to show 11 orebodies, 3 under development by tunnels, traceable one-half mile, showing sulphide ore estimated by company to average 2 to 3% copper, 2% lead, 2% zinc, 4 oz. silver and \$18 gold per ton.

The frame mill has 5 stamps, a Blake crusher, New Standard tables and 3 slime tables. Presumably idle.

GOLDEN GATE MINING CO.

OREGON

Office: 145½ S. Main St., Marion, Ohio.

Officers: M. F. Douce, pres.; J. F. Lust, treas., both of Marion, Ohio; G. L. Bender, sec., Greenhorn, Ore.

Cap., 1,500,000 shares, \$1 par.

Property: 2 miles N. of Greenhorn, Grant Co., Ore., said to show a quartz vein in greenstone, pinching and widening to 48 inches.

Development: 2 tunnels on vein; upper 800' long, lower with other workings, 2,400'. Best ore found near mouth of lower tunnel. Two shoots said to be 225' and 60' long with maximum width of 20"; a third is 200' long and up to 42" wide. Ten stamps crushed ore in 1915, but operations were unprofitable, and in 1917 it was reported that mine was closed down and equipment sold.

HEPPNER MINING CO.

OREGON

Office: Heppner, Ore. **Officers:** D. B. Stalter, pres.; J. O. Hager, sec.; S. A. Wright, treas.

Cap., \$1,000,000; shares 10c par; \$97,458 cap. stock issued.

Property: 13 claims, about 18 miles from Austin, the nearest shipping point. Claims show over a dozen quartz veins from 1-20' wide, that carry free gold and some pyrite near the surface. Management claims to have secured a \$16 assay from a 20' sample across the lowest vein. Company has done 256' of tunnel work.

HIDDEN TREASURE GOLD MINING CO.

OREGON

Known locally as I. X. L. mine.

Office: Baker, Ore.

Officers: F. T. Kelly, pres.; N. M. Kelly, sec.

Cap., \$1,250,000; shares \$1 par; 1,090,600 issued.

Property: 11 claims, near Greenhorn, Grant Co., Ore., reported to show 3 veins carrying gold ore. Developed by 2 shafts. Some work done, 1915.

NEW ELDERADO MINING & REDUCTION CO.

OREGON

Office: Austin, Ore.

Officers: E. B. Reed, pres.; E. H. Saxe, sec.-treas.

Cap., \$100,000; shares \$1 par; 1,750 issued.

Property: known as the Pioneer, on the south slope of Greenhorn range, New Eldorado district, Grant Co., Ore., is said to show granodiorite cut by coarse-grained dikes of granodiorite porphyry. Dikes remain hard after the granodiorite alongside has become soft in the altered zones. The altered zone carries veins of bluish quartz from a few inches to 5' wide. Besides gold the ore contains a little antimony, blende, and low silver-gold values.

NORTH FORK MINE

OREGON

Address: Glen and Henderson, Granite, Grant county, Oregon.

Property: a gold-bearing gravel deposit known as the North Fork, or Klopp mine, situated on S. bank of north fork of the John Day river, Granite district. Hydraulic mining was done on a large scale in early years, and on smaller scale recently. Total gold yield about 5c per yard from 6,800,000 cu. yds. Gravel is a compact mass of sandy clay, carrying round to angular cobbles and boulders, sometimes as large as 10' across. These boulders are mainly granitic rocks, but there are some schists and lavas and a little unmetamorphosed argillite. Investigation shows that the deposit is the terminal portion of an old drift sheet laid down by the North Fork glacier.

OLIVE CREEK MINING CO.

OREGON

Office: Baker, Ore.

Officers: Thos. M. Tobin, pres., 9332 So. Chicago Ave., Chicago, Ills.; S. A. Tobin, sec.; A. J. Weckler, treas.

Cap., \$1,000,000; shares \$1 par; all issued.

Owens the Olive Creek and Quartz gulch placers in Greenhorn mining district, Grant Co., Ore.

UNITED GOLD MINING CO.

OREGON

Office: 505 Hyde Block, Spokane, Wash.

Officers: A. B. Lee, pres.; C. C. Robbins, sec.-treas.; E. C. Brain, agent, Granite, Ore.

Inc. in Washington. Cap., \$1,000,000; \$1 par; 568,050 issued.

Property: the Cougar mine, 3 miles N. of Granite, Grant Co., Ore., leased from the Cougar Gold M. & M. Co.

Geology: country rock is black, silicious and semi-slaty argillite. Ore was probably deposited by a combination of replacement and quartz filling of the smaller fractures. Gold occurs in pyrite and ore is not easily amenable to treatment. Three shoots of ore have been exposed.

In June, a 75 to 100-ton flotation plant was being erected. Tailings will be cyanided later.

VINCENT CREEK GOLD & COPPER CO.

OREGON

Address: Austin, Grant Co., Ore.

Officers: Burton Miller, pres.-gen. mgr.; Ernest Blackwell, v. p.; Nellie H. Miller, sec.-treas., and J. S. Edwards, directors.

Inc. Dec. 5, 1907, in Oregon. Cap., \$200,000; shares \$1 par; issued 100,002 shares.

Property: 6 claims, 100 acres, in the Greenhorn district, 5 miles N. W. of Austin, on the S. V. R. R., shows a strong vein, traceable 1,500', said to average 14' in width and 3.5% copper. The country is greenstone and copper mineral chalcopyrite.

Development: by a 25' shaft and 215' tunnel being driven 600' with back of 400'. In Feb., 1916, a 20' vein of copper ore was opened in this tunnel. There are 3 buildings. Mine has no power equipment.

WEST SIDE GOLD & SILVER MINING CO.

OREGON

Address: R. Baird, sec. and mgr., Yamhill, Ore.

Officers: J. A. Simmons, pres.; G. W. Perkins, v. p.; R. Baird, sec.; W. G. Busbee, treas.; the foregoing, with C. C. Laughlin, N. H. Perkins, H. C. Gist, directors.

Inc. April, 1900, in Oregon. Cap., 1,000,000 shares; 1c par; outstanding, 814,307; non-assessable. Annual meeting, first Monday, January.

Property: 3 patented claims, about 57 acres, at Greenhorn City, Baker and Grant counties, under lease and bond to R. Baird, who, in 1915, mined about 550 tons in course of development. Minerals are gold, silver, copper, lead. A number of veins cutting through greenstone and schist run at right angles, the N.-S. veins dipping E., and E. W. veins south.

Alteration and faulting are considerable. Ores contain free gold sulphides in quartz and dolomite; cinnabar is also reported. Shipping ore is said to average about \$60 per ton and milling ore \$20.

Development: by several shallow shafts, comprises about 1,000' of workings, greatest depth being about 40'.

Equipment: includes a small steam pump. About \$10,000 spent in development during past two years. Developing in 1917.

HARNEY COUNTY

TROUT CREEK M. & M. CO.

OREGON

Office: Canyon City, Ore.

Officers: O. J. Darst, pres.; F. S. Slater, sec.-treas.

Cap., \$100,000; shares \$1 par; all issued and paid up.

Property: the Bullion Quartz mine near Burns, Harney district, Ore., said to show granite cut by large porphyry dikes. Vein is up to 14' wide, and the ore carries gold, silver, lead and zinc.

Development: by tunnels and shaft. Shipments were made to Utah, by way of Crane, 22 miles from the mine, in 1916.

JACKSON COUNTY

Includes Ashland, Elk Creek, Gold Hill, Jacksonville and Upper Applegate districts; also part of Greenback district.

BRADEN MINE

OREGON

Gold Hill, Jackson Co., Ore. Owned by C. R. Ray, of Tolo, Jackson Co., Ore., and at last accounts was leased to the Opp Mng. Co. Located in S. E. $\frac{1}{4}$ section 27, T. 36 S., R. 3 W., 3 miles from Gold Hill. Opened up about 30 years ago. Largest production for any one year was \$30,000 in 1907.

Ore: gold in 2' vein, strike N. 30° E., dip 25° S. E. Vein filling is quartz and sulphides. Ore assays about \$9 gold per ton.

Development: several thousand feet of drift tunnels, longest over 1,200'.

Equipment: includes a 20-stamp mill.

For geology, see U. S. G. S., Bull. 546, p. 39.

GOLD HILL QUARTZ MINING CO.

OREGON.

Office: Medford, Ore.

Officers: C. R. Ray, pres.-treas.; E. W. Liljegrán, sec.

Cap., \$60,000; shares \$100 par.

Property: some claims, 2 miles S. E. of Gold Hill, Jackson, Co., Ore. Little has been done, save assessment work.

GOLD NOTE MINE.

OREGON.

Address: E. B. Crouch, Grants Pass, Ore.

Property: on Baker creek, 17 miles from railway at Leland, Greenback district, Jackson Co., Ore.

Development: 300' of work said to have opened 4 to 5% copper sulphide ore, also some gold. Leaching to be tried.

GOLD STANDARD MINING CO.

OREGON

Office: Ashland, Ore.

Officers: P. S. Casey, pres.; F. G. McWilliams, sec.

Cap., \$82,000; shares \$1 par.

Property: 30 acres, $2\frac{1}{2}$ miles W. of Jacksonville, Jackson Co., Ore. Vein supposed to be extension of adjoining Opp mine.

GOLDEN STANDARD MINING CO.

OREGON

Office: 308 Commercial Block, Portland, Ore.

Officers: K. K. Kubli, pres.; E. B. Wilson, sec.; E. J. Kubli, treas.

Cap., \$100,000; shares \$1 par.

Property: 82 acres (known as the Kubli) in Gallo Creek district, Jackson Co., Ore., said to show a 1 to 18" quartz vein opened for 200', carrying rich ore.

Equipment: 2-stamp mill and concentrator. Idle.

LUCKY BART GROUP

OREGON

J. H. Beeman, Gold Hill, Jackson Co., Ore., owner and mgr.

Property: 11 claims, partly patented, 220 acres in Sardina mining district, near Gold Hill, said to carry 5 known veins, averaging 2' in width. Ore is free milling, running from \$5-\$100 and said to average \$50 per ton. Developed by 2,000' tunnel to depth of 190'.

Equipment: includes 40-h. p. steam plant, 5-stamp concentrating mill. Concentrates said to average from 3-5 oz. gold and silver. Mine has been

operated more or less regularly for many years and over 14,000 tons of ore have been milled.

OPP MINE**OREGON**

Address: J. W. Opp, Jacksonville, Ore.

Property: 373 acres, situated 1½ miles W. of Jacksonville, Jacksonville Co., Ore., formerly operated by a company.

Geology: three main veins from 2 to 4' wide, occur in shale and andesite. Two ore shoots, one 300', the other 150' long, carry free gold with pyrite, the ore averaging \$5 per ton.

Development: by 18 adits, with 7,000' of workings. One crosscut is 850', another 550' long.

Equipment: 3,600' tram, 6-drill compressor, 20-stamp mill, 125-ton cyanide plant, etc., in good order.

PEARL MINING CO.**OREGON**

Office: Central Point, Ore.

Officers: W. C. Leever, pres.; J. W. Merritt, sec.-treas.

Cap., \$4,400; shares \$20 par; all issued.

Property: the Buzzard mine, 10 quartz claims, 27 miles N. E. of Trail, Jackson Co., Ore, in Elk Creek mining district.

Geology: ore deposit occurs in a N. W.-S. E. shear zone in andesite; the ore contains complex sulphides and is handjigged before shipment, 4 tons returning \$2,100.

Development: by 1,600' crosscut tunnel, total work 3,000', to depth of 170' on the vein. Mine being worked under lease, 1917, by Paul Wright, of Trail, Ore.

SHORTY HOPE M. & M. CO.**OREGON**

Address: H. S. Sanford, pres.; Ashland Ore.

Cap., \$1,000,000; shares \$1 par; 784,498 issued.

Property: 4 miles up Wagner creek from Talent, in Ashland district, Jackson county, Ore.

Geology: vein occurs in tonalite, diorite, and biotite hornblende contact rock and is from 3 to 10' wide. Ore contains gold, pyrite, some galena and chalcopyrite.

Development: by tunnels, one being 1480' long. **Equipment:** 10-stamp mill driven by water power.

Work appears to have been spasmodic, but not without promise.

UNITED COPPER CO.**OREGON**

Office: 95 Union St., Seattle, Wash.

Officers: S. S. Fluhart, pres.; B. E. Fluhart, sec.; R. N. Leezer, treas.

Cap., \$1,000,000.

Property: the Copper King mine, 18 miles east of Leland, Greenback district, Jackson county, Oregon, said to show a fissure vein in andesite. Ore contains chalcopyrite reported to average 4% copper. A concentration mill was erected in 1916. Rich ore was reported as opened in Aug., 1917.

UTAH QUICKSILVER CO.**OREGON**

Address: Alex Nibley, Edwin Jones, or W. Y. Cannon, owners, Salt Lake City, Utah.

Inc. Aug 1, 1916. **Cap.,** \$50,000.

Property: 35 claims in Gold Hill district, Jackson county, Oregon, under option to Boston people. The Ranier claim is reported to show cinnabar with pyrite occurring in an andesite fault breccia. Vein contains black quartz 12" to 15" wide and ore is generally low-grade. Mostly surface work done to date.

JOSEPHINE COUNTY

Includes Galice, Grants Pass, Greenback, Illinois River, Lower Applegate and Waldo districts.

ALMEDA CONSOLIDATED MINES CO. OREGON

Succeeded by Almeda Mines Co., which see. Fully described in Vol. XII.

ALMEDA MINES CO. OREGON

Offices: 1014 Board of Trade, Portland, Ore. and Opera House Block, Grants Pass, ore.

Officers: S. C. Spencer, pres.; L. E. Crouch, 1st v. p.; Nat P. Ellis, 2nd v. p.; H. E. Thurman, sec.; C. M. Huddle, treas.

Inc. July 28, 1916, in Oregon. **Cap.**, \$3,500,000; shares \$1 par; 3,000,000 shares common, 500,000 shares preferred. Successor to Almeda Consolidated Mines Co. Annual meeting, 2nd Tuesday in April.

Property: 17 lode claims, 340 acres, also 500 acres placer ground, in Josephine county, about 26 miles from Grants Pass, and 17 miles from Merlin, nearest railway station on the Southern Pacific, with daily stage line to Almeda. Lands include a 200-acre town site.

The quartz claims are in three groups known as the Almeda, on the north side of the river and the Rocky Gulch and Rand groups on the south side of the river.

The Almeda group consists of 3 claims developed by tunnels and a 535' shaft, with about 2 miles of underground workings. Orebody estimated by the management to show approximately 2,000,000 tons blocked out for production.

Considerable development work has been done on the Rocky Gulch and Rand groups by tunnels and crosscuts. The main vein is said to be 10' to 20' wide on the slate hanging wall, ore being strongly auriferous and slightly argentiferous chalcopryrite. Paralleling the main vein is a body of low-grade ore 20 to 30' wide, highly silicious, mainly chalcopryrite with occasional bornite, giving promise of greater values at increased depth.

Equipment: consists of a 100-ton blast furnace for matting, distillate engines to develop 225 h. p., compressors, motors, boilers, complete laboratory and all necessary buildings.

The 17 mile mountain road from Merlin to the mine is in good condition and motor trucks operate over it the entire year.

The mines are not being operated at present pending the installation of a 200-ton concentrator and electric power.

AMERICAN EXPLORATION CO. OREGON

Address: Grants Pass, Ore. Reported to have bought the Waldo copper mine, Sept., 1917, for \$135,000.

Mine, 2 miles from Waldo, Josephine Co., Ore., is credited with production of \$300,000 worth of copper ore in recent years. **Ore:** massive chalcopryrite associated with pyrrhotite and pyrite.

BILL NYE MINE OREGON

J. H. Beeman, mgr., Grant's Pass, Oregon. **Property:** near Grant's Pass, Josephine Co., Ore., shows sulphide ore in veins, said to average \$4 gold.

Development: by tunnels. **Equipment:** 10-stamp mill and cyanide plant. Operated jointly with Lucky Bart mine in 1915. Letters returned, 1917.

CHETKO COPPER CO. OREGON

Idle. Office: Ashland, Ore. Mine near Kerby, Josephine Co., Ore.

Officers: C. W. Evans, pres. and gen. mgr.; C. C. Hicks, v. p. and supt.;

A. E. Shepard, sec.-treas.; J. M. Keith, mine supt., at last accounts.

Inc. Aug. 10, 1905, in Ariz. **Cap.**, \$1,000,000; shares \$1 par; issued, \$730,516.

Property: 36 claims, 720 acres, fairly timbered, and 2 water rights, all

in Curry county, Oregon, about 70 miles from Grant's Pass, the nearest railroad point. Said to show 8 orebodies, with 2 under development, 1 reported by company as of 240' average width, traceable $1\frac{1}{4}$ miles, carrying native copper in schist, also covellite, bornite and chalcopyrite, claimed by company as of 9% average copper tenor, with \$4.75 gold per ton.

Development: by shafts of 45', 34' and 80', and by 6 tunnels, of 30 to 230' length, with 969' of workings, estimated by company to show 600,000 tons of ore, with 115,000 tons blocked out for stoping, all of which figures are regarded as excessive.

DOROTHEA GOLD MINES CO.

OREGON

Address: 122 Oregon Terrace, Medford, Ore.; and J. F. Reddy, Grant's Pass, Ore.

Officers: J. F. Reddy, pres.; Lincoln McCormack, sec.; Mary F. Reddy, treas.

Inc. 1916, in Oregon. **Cap.,** \$50,000; shares \$1 par; non-assessable; all issued.

Property: 200 acres, 120 patented, on Coyote creek, Josephine county, Ore. About \$20,000 has been spent on development to Sep. 17, 1917.

Claims show a contact deposit between serpentine and diorite; the mineralized zone is 2 to 12' wide dipping 20°, with N.-S. course. Ore shoot is said to be 200' long and 5' wide, and ore to average \$5 per ton.

Development: by 400' crosscut tunnel and 300' drift on vein, workings amounting to 1,000' to depth of 170'. Reserves given by company as 8,000 to 10,000 tons.

In Sept., 1917, a 5-stamp mill and concentrator were ready to treat the ore, which contained 30% chromic oxide in serpentine. A 65% concentrate is expected. Concentration of low-grade chrome ores is increasing, as less than 40% grade has a narrow market.

GOLCONDA MINE.

OREGON

Address: O. R. Moore, Salem, Ore.

Property: 2 chrome claims, 6 miles N. E. of Takilma, Josephine Co., Ore. Shipped 2,000 tons of ore averaging 40% chromic oxide in 1916. As usual with chrome deposits, they are irregular in shape and variable in quantity, but geologic conditions are considered good.

GOLD & PLATINUM MINES CO.

OREGON

Office: Grants Pass, Ore. I. F. Peck, pres.

Cap., 1,000,000 shares, \$1 par.

Property: 1,280 acres of placer claims on Cave creek, Josephine Co., Ore., for which dam, flume, sluice-boxes, etc., have been constructed.

GREENBACK GOLD MINING & MILLING CO.

OREGON

Address: Placer, Josephine Co., Ore. Mr. Childers, mgr. Owned by R. C. Robinson, Parish, N. Y.; and leased to W. L. Holmes of Buffalo, and H. L. Holmes of Geneva, N. Y.

Property: $1\frac{1}{2}$ miles N. of Placer, which is 8 miles from Leland (nearest railroad), in Greenback district, Ore. Claims said to show a vein of quartz, calcite, and pyrite in greenstone, cut off by serpentine to the east. Ore averages 20" in width, assaying \$8 per ton in upper levels.

Development: since 1897 opened by 12 levels to 500' vertical depth. Above No. 9 most of the ore has been stoped. A winze opened the ore below No. 9.

Equipment: largest plant in southern Oregon, consisting of 40 stamps (motor driven), 3 Risdon crushers, 12 concentrators, cyanide annex, 7,000' aerial tram, and compressor.

Exploration under way at present, employing 30 men. Mine has produced a good deal of gold.

GREYBACK COPPER MINES.**OREGON****Address:** Selma, Ore. John Hampshire, mgr.**Property:** 20 claims, 13 miles E. of Selma, in the Waldo district, Josephine Co., Ore.

Purchased in June, 1917, by Twohy Bros. Co., railroad contractors of California and Oregon.

Development: 700' of tunneling has, it is said, proved a large copper deposit to exist.**JIM BLAINE MINE.****OREGON**

Owned by George Epperly, of Placer, Ore., a former lessee.

Property: 1 patented claim, 20 acres in Placer district, Josephine county, shows gold-silver ore in quartz veins in porphyry formation. The orebody runs N. W.-S. E. and dips 65°. Developed by 200' tunnel to depth of 150'.**Equipment:** includes compressor and concentrating mill. Concentrates reported to average 1 oz. gold and 50 oz. silver. Mine produced 1,000 tons of ore in 1915, yielding a gross return of \$9,842. Ore is to be sent to Tacoma and the mill abandoned.**OAK MINE.****OREGON****Address:** G. A. Baker and Geo. Buell, owners, Grants Pass, Josephine Co., Ore.Mine is 6 miles E. of Hugo, on Jump-off Joe creek, N. W. of Walker Mtn. **Ore:** main vein is gold bearing, but there are also several small copper veins. Minerals in the ore include chalcopryrite, pyrite, sphalerite, galena, quartz, rare malachite and pyrolusite.**Development:** by tunnel with total of 800' of workings. Equipped with 20-h. p. gas engine and compressor.**OLD GLORY GOLD MINING CO.****OREGON**

William Stock, sec.-treas., Grants Pass, Ore.

Cap., \$1,000,000; shares \$1 par; 604,200 issued.**Property:** the Old Glory mine on Silver creek in western Josephine county, 4 lode and 2 placer claims, said to show a large lode of low-grade copper ore carrying gold and silver values. Property was to be equipped with machinery in 1916, but the president and general manager died and development will therefore be delayed.**OREGON GOLD MINES CO.****OREGON****Office:** 1208 W. Monroe St., Chicago, Ill.**Officers:** E. E. Dick, pres.; J. M. O'Grady, sec.; H. F. Comstock, treas.; H. D. Norton, atty.**Inc. in Arizona. Cap.,** \$2,000,000; shares \$1 par; 1,657,436 issued. Is a re-organization of the American Gold Fields Co.**Property:** the Granite Hill mine, 9 miles N. E. of Grant's Pass, Josephine Co., Ore., which was active from 1902 to 1907 and is credited with a production of \$75,000.**Ore:** quartz carrying chalcopryrite, galena and pyrite with gold values. occurs in veins in tonalite and greenstone. Main vein said to average 5' in width and ore treated in 1907 averaged \$5 per ton.**Development:** by 430' vertical shaft with total of 12,000' of workings. now under water.**Equipment:** includes 20-stamp mill, compressor steam hoist, 5 machine drills and 150-h. p. electric motor.**OSCAR CREEK CONS. MINING CO.****OREGON****Office:** 1st Natl. Bank Bldg., Grant's Pass, Ore. **Officers:** Chas. Burkhalter, pres.-treas.; A. H. Gunnell, sec.**Cap.,** \$250,000; shares \$1 par; all issued.**Property:** the Jewell & Moore group of 5 placer claims, 3 patented, also

3 additional unpatented claims and 92 acres of dump ground, 2 miles E. of Murphy and 10 miles S. of Grants Pass. Credited with production of \$40,000 to 1917.

Equipment: includes 3 miles of ditches and 300' flume line.

QUEEN OF BRONZE MINE

OREGON

John F. Hampshire, mgr.; Reed C. Crowell, supt.; R. H. Clark, cons. engr., Takilma, Josephine Co., Oregon. Mine purchased for \$150,000 by Twohy Bros. and associates, March, 1916.

Property: is in the Illinois Valley and near the Waldo Sm. & Ref. Co. holdings, 30 miles from Waters Creek on the railway. The new California & Oregon Coast Ry. will connect it with Grants Pass and Crescent City, Calif., 1916.

Mine has been a producer for 10 years, shipping ore with 9% copper and \$3.50 gold per ton, but with much ore of lower grade in the mine. Geology described in Min. Resources of Oregon, Vol. 2, No. 4, p. 184.

Thirty outfits are hauling ore to railway, 1,600 tons of copper ore shipped in July, 1917.

TAKILMA SMELTING CO.

OREGON

Office: 301 Mining Exchange Bldg., Colorado Springs, Colo. **Works office:** Takilma, Josephine Co., Ore. Chas. L. Tutt, pres.; Wm. T. Tutt, sec.; J. A. Hull, treas.

Inc. in Colorado. **Cap.**, \$250,000; shares \$10 par. Owns a controlling interest in the Waldo Smelting & Mining Co.

Gross earnings, in 1914-15, were \$55,000, with operating expenses of \$7,500.

Property: mining claims and smelter site in Waldo district. The Queen of Bronze mine (which see) was sold early in 1916 to Twohy Bros. and others of Portland.

Smelter: at Takilma, has a 125-ton water-jacket blast furnace, making matte, when in blast averaging 45% copper, 2.5 oz. silver and \$4.50 gold per ton, which is shipped to the Tacoma smelter for conversion. Owing to heavy rains in fall and winter, causing impassable roads, the smelter can be worked only in summer. The nearest rail point is Grants Pass, 42 miles distant. Equipment includes a sawmill.

Production: 7,543 tons of ore smelted yielding 1,563 tons of matte of about 45% copper tenor, indicating an average return of 8% copper from ore smelted, with production of about 1,350,000 lbs. fine copper in 1905, and 499,662 lbs. fine copper in 1907; the works have been idle since Jan., 1908.

THREELODES MINING CO.

OREGON

Office: Medford, Ore.

Officers: C. E. Wickstrum, pres.; N. L. Townsend, sec.; George Lindley, treas.

Cap., \$350,000; shares 35c par; all issued.

Property: 9 claims, and 9 others bonded, 2 miles W. of Galice, Josephine county, Ore., said to have been exploited in recent years for tin, tungsten, and platinum; in 1916 mine was supposed to be a molybdenum producer.

UNITED COPPER GOLD MINES CO.

OREGON

Idle.

Office: Murphy Blk., Salem, Ore. Mine at Selma, Josephine Co., Ore.

Officers: W. S. Low, pres. and gen. mgr.; E. O. Moll, v. p.; Daniel Webster, sec.; C. E. Lebold, treas.; preceding with W. C. Buckner, James Greig and H. Neugabauer, directors.

Cap., \$500,000; shares \$1 par; issued 219,654. Annual meeting, first Monday in August.

Property: on Pickett creek, near Merlin, has been sold and company now owns 11 claims, in Illinois district, Ore., about 12 miles N. W. of Selma.

Geology: ore occurs in serpentine near porphyry and diorite contacts. A dark gossan sometimes stained with copper is underlain at 15' depth by ore carrying 18% copper and 5 to 10 oz. silver and upwards of \$1 gold, according to management.

Development: amounts to 1,000', with a 500' tunnel and 200' crosscut, exposing 1,000 tons of ore. Property is 34 miles from S. P. R. R. Is regarded as a prospect which might be worked on a large scale were railroad transportation nearer.

VANGUARD GOLD-COPPER CO.

OREGON

Mine near Kerby, Josephine Co., Ore. C. E. Phillips, mgr.

Inc. 1910. Cap., \$1,000,000; shares \$1 par.

Property: 7 miles W. of Kerby, said to carry gold-copper ore. Idle.

WALDO CORPORATION.

OREGON

Office: 1621 L. C. Smith Bldg., Seattle, Wash.

Officers: D. E. Skinner, pres.; Louis Levensaler, v. p.; L. B. Stedman, sec.-treas.; G. M. Esterly, mgr.

Cap., \$100,000; shares \$100 par.

Property: placer ground in the Waldo district, Josephine Co., Ore., carrying auriferous gravel 10' to 25' deep that lies on a bed rock of conglomerate and sandstone with some serpentine. Gravel worked thus far is reported to have yielded 12½¢ per cu. yd.

Equipment: consists of 3 ditches, 2 giants and hydraulic elevator for lifting the gravel.

WALDO MINE

OREGON

Address: W. B. Whipple, mgr., Takilma, Ore. Owners: De Witt Van Ostrand, of Phillips, Wis.; J. F. Reddy and A. H. Gunnell, Grants Pass, Ore.

Property: 20 patented claims, 400 acres; with mill site, in Waldo district, Josephine county, formerly owned by the Waldo Sm. & Ref. Co. of Colorado, which sec.

Geology: claims show unrelated masses of chalcopyrite, pyrrhotite and pyrite in abbrecciated, or crushed rock zone, a large part of which is serpentine. Masses sometimes consist of mixed sulphides and serpentine.

A 50-ton mill has been erected to concentrate mine and dump ore. Some ore was shipped to Tacoma last year.

WALDO SMELTING & REFINING CO.

OREGON

Office: 301 Mining Exchange Bldg., Colorado Springs, Colo. Mine office: Takilma, Josephine Co., Ore.

Officers: Spencer Penrose, pres.; C. L. Tutt, v. p.; J. A. Hull, treas.; preceding officers, J. A. Hayes, Wm. T. Tutt, directors. E. C. Tucker, supt. Inc. Dec. 3, 1901, in Colorado. Cap., \$3,000,000; shares \$100 par. Is closely affiliated with the Takilma Smelting Co.

Property now owned by De Witt Van Ostrand and others, see Waldo mine.

LANE AND LINN COUNTIES

These two counties include the Blue River, Bohemia and Quartzville districts.

BLACK BUTTE QUICKSILVER MINING CO.

OREGON

Office: New York Block, Seattle, Wash.

Officers: John N. Powell, pres.; Marion T. Edwards, sec.; W. B. Dennis, Carlton Oregon, managing agent.

Inc. in Wash. Cap., \$5,000,000; shares \$100 par; fully issued.

Property: 1,040 acres, patented, in Sec. 16, 17, 9, 8, T. 23 S., R. 3W, Lane Co., Ore., about 17 miles by wagon road from Cottage Grove, said to carry a low-grade cinnabar deposit. Developed to depth of 900'.

Equipment: includes a 40-ton retort. Production not reported. About 30 men employed.

BLUE BIRD MINING CO.**OREGON**

Office: 67 N. Third St., Portland, Ore.

Officers: S. M. Carter, Blue River, Ore., pres.; F. W. Brooke, sec.; C. Marco, treas.

Cap., \$100,000; shares \$1 par; fully issued.

Property: Blue Bird mine, 7 unpatented claims, in Sec. 28, T. 15 S., R. 4. E., 6 miles from Blue River, Linn county, said to carry a deposit of oxidized ore, containing gold and silver values and some iron pyrite. Developed by 500' and 220' tunnels and several crosscuts. Values have yet to be proved.

CHAMPION CONSOLIDATED MINING CO.**OREGON**

Officers: H. C. Mahon, pres.; Portland, Ore.; J. A. Smith, v. p.; F. W. Kiesling, sec.-treas.; preceding, with J. Sutherland and Olaus Jeldness, directors.

Inc. June, 1916. **Cap.,** \$300,000; shares 10c par.

Property: 47 claims, 800 acres, at Champion, in the Bohemia district, western Oregon, including the Champion, Helena and Musick mines. The properties were discovered in 1858, and have been worked intermittently in the oxidized zones near surface with a reported gross production of \$2,500,000 in gold.

There are three parallel veins traceable for a mile and averaging 3' in width, and in some places 100' wide in andesite formation. Ore-shoots, as developed, are 5' to 15' wide. Below the oxidized zone, ore carries silver, lead, zinc and copper in addition to gold and much of it of shipping grades, also a porphyry dike 150' wide which assays from \$1.60 to \$3.50 per ton in gold.

Development: all three mines are developed down to and have been partially stoped to the 300' level, with about 14,000' of workings. The most extensive work is at the Champion mine. Work now in progress opening mines at greater depth, the Helena has one ore shoot, the Champion has two and the Musick, two.

Equipment: hydro-electric power plant, compressor plant, hoists, underground electric haulage, etc., and a 30-stamp mill with concentration plant to be increased to 300-tons and to be brought up to date by installation of fine grinding and flotation equipment.

GOLDEN RULE CONSOLIDATED M. & M. CO.**OREGON**

Office: Salem, Ore.; C. L. Johnson, sec. **Cap.,** \$500,000; shares 5c par.

Property: 26 claims, 15 miles S. E. of Disston, Bohemia district, Lane Co., Ore. Idle.

LINCOLN MINES CO.**OREGON**

Office: Albany, Ore.

Officers: A. M. Hammer, pres.; J. D. McLain, sec.; J. McChesney, treas., all of Albany.

Cap., \$250,000; shares \$25 par; all issued. Is the successor of the Albany M. & M. Co.

Property: 8 claims, known as the Albany mine, about 23 miles from Gates. **Ore:** lead-zinc sulphides with gold values occur near the surface in veins in andesite. Veins are said to be shear zones up to 50' wide with lenses of sulphides on the foot or hanging walls and distributed through the zone.

Spent about \$1,500 in development work, 1916.

NORTH FAIRVIEW MINING CO.**OREGON**

Address: Herbert Leigh, 38 E. 6th St., Eugene, Ore.

Officers: G. W. McQueen, pres.; Herbert Leigh, sec.; Darwin Bristow, treas.

Cap., \$300,000; shares 10c par; all issued.

Property: 15 claims N. of Fairview mountain, ½ mile from Bohemia post office, 15 miles S. E. of Disston.

Geology: mineralized fractured zone in andesite, 12' wide, said to have been traced for over a mile.

Development: 2 tunnels, one 300' long, 100' below outcrop; the other 150' long with depth of 450'.

VESUVIUS MINES CO.

OREGON

Office: Eugene, Ore. **Mine office:** Bohemia, Ore.

Officers: E. M. Johnson, pres.; F. J. Hard, sec.-treas.

Inc. in Ore. Cap., \$6,000,000; shares \$1 par; all issued.

Property: 50 claims, including the Vesuvius mine, 15 miles S. E. of Disston, Bohemia district, Lane county.

Geology: andesite flows interbedded with andesitic tuffs, traversed by a fracture zone in which the ore occurs. Galena, chalcopryrite, pyrite and sphalerite are the ore minerals.

Development: by 3 tunnels, the main one 2,000' long. Workings said to disclose 18" to 36" of ore which assays from \$7.50 to \$20.64 per ton.

Equipment: includes a 10-stamp mill with tables, steam plant, saw mill, etc.

WEST COAST MINES CO.

OREGON

Office: 20 Chamber of Commerce Bldg., Portland, Ore.

Officers: W. J. Zimmerman, pres.; W. M. Cake, sec.; W. W. Elmer, mgr.

Cap., \$1,500,000; shares \$1 par; 890,000 issued.

Property: the Champion, Helena, and Musick mines, 47 claims, 12 miles S. E. of Disston, Bohemia district, Lane county, Oregon. Mines are under lease to H. C. Mahon, of Portland. The Champion is said to have yielded \$1,700,000; the Helena, \$150,000, and the Musick, \$180,000.

Development: by tunnels. In the Champion the main lode is 3' wide and at 200' in depth and below, the principal ore minerals are pyrite, chalcopryrite, sphalerite and galena. The other mines contain similar complex ores.

Equipment: includes 3,000' aerial tram, 20 stamps, concentrators and hydro-electric power plant.

MALHEUR AND MARION COUNTIES

Includes Mormon Basin and North Santiam districts.

FREELAND CONS. MINING CO.

OREGON

Dissolved, March 25, 1914.

Property now owned by Cons. Copper Mng. & Power Co., which see. Fully described in Vol. XII.

GOLD CREEK MINING & MILLING CO.

OREGON

Address: Salem, Ore.

Officers: Otto Hansen, pres.; W. T. Staley, sec.-treas.

Cap., 3,500,000 shares, \$1 par.

Property: 17 claims, 16 miles N. E. of Gates, on S. P. R. R., N. Santiam district, Marion Co., Ore., said to show massive pyrite, chalcopryrite, galena, and sphalerite, in a vein in andesite.

Development: 1,500' crosscut tunnel, driven to cut vein at 2,000', at depth of 600'. This work is considered to have been unnecessary.

LEWIS & CLARK M. & M. CO.

OREGON

Office: Silverton, Ore.

Officers: Dr. F. M. Brooks, pres.; Thos. Skaife, sec.; M. Palmer, treas.

Cap., \$100,000; shares 10c par; \$71,000 issued.

Property: 5 claims, about 18 miles N. E. of Gates, on a branch of the S. R. Ry. Developed by tunnel said to show veins 1-5' wide in andesite. Ore contains copper and iron sulphides, gold and silver in zinc.

Working on a small scale.

RED, WHITE AND BLUE MINE **OREGON**

Owned and operated by Geo. H. Bodfish, Malheur, Oregon. Property at Malheur, said to show a quartz vein, 8 to 10" wide, carrying gold values that average \$5 to \$8 per ton. Developed by 134' vertical shaft and equipped with steam hoist, Cameron pump and 6-stamp concentrating mill.

SILVER KING MINING CO. **OREGON**

Address: Albany, Ore., or J. J. Langmack, Gerlinger Bldg., Portland, Ore.

Officers: J. J. Langmack, pres.; E. E. Williams, v. p.; Wm. S. Risley, sec.-treas.

Inc. March, 1909. Reorganized and capital reduced under Oregon Blue Sky Law, June, 1914. Present capital, \$500,000; shares \$1 par.

Property: 12 claims covering 4 veins on Little North Santiam river, near Elkhorn, Oregon, in the Cascade Mts., 75 miles from Portland, and 17 miles from railroad; good road with easy grade suitable for auto trucks from railroad to mine. The veins occur in and follow shearing zones, and carry ore with gold, silver, lead, and zinc. There is ample water power and timber for mining purposes on property. Several frame houses, blacksmith shop, mining tools, car and track in main tunnel.

Development: by 2 shafts, 80' and 40' deep; 2 prospect tunnels, 70' and 150', and a number of open cuts on veins, and main working tunnel in over 100', which is now being driven to cut the principal vein of the group at about 1,050' from portal, at a depth of over 900' on vein below the prospect tunnels. Tunnel will drain mine and permit extraction of ore by gravity system.

Average of samples from prospect tunnels show: gold, \$1.20; silver, 15 oz.; lead, 3 to 4%; and zinc, 3 to 4%.

UNION AND WALLOWA COUNTIES

Embracing Camp Carson, Homestead or Iron Dyke (in part) and Wallowa districts.

EUREKA MINING, SMELTING & POWER CO. **OREGON**

Idle. P. O. Box 63, Clarkston, Wash. W. E. Howard, sec. **Property:** 40 claims, patented, at Imnaha, Wallowa Co., Ore. Secretary reports, property idle for many years, awaiting railway facilities.

IMNAHA MINE **OREGON**

Address: S. L. Winchester, via Joseph, Wallowa Co., Ore.

Property: 25 miles N. of Homestead and 40 miles E. of Joseph, the railroad terminus.

Development: 4,000' of tunnels, etc., a 1,000' tunnel being driven in 1916. Vein said to be 3½' wide. Reserves estimated at 50,000 tons of gold ore.

Equipment: 10-ton mill driven by water-power.

MOUNTAIN GEM MINING & DEVELOPMENT CO. **OREGON**

Address: Joseph, Ore.

Officers: Harry Dawson, pres.; T. F. Tomkins, sec.-treas.

Cap., \$200,000; shares 10c par; \$124,211 subscribed.

Property: 11 claims on W. fork of Wallowa river, 10 miles from Joseph and 5 claims 25 miles S. of Lostime.

Geology: ore occurs in a contact zone between grano-diorite and lime-

stone with calcareous schists. Pegmatite and aplite dikes also are present. The ore is found associated with the characteristic contact-metamorphic minerals, garnet, quartz, calcite, etc., the values being in pyrite, chalcopyrite and molybdenite.

Development: crosscut tunnel driven through grano-diorite to the contact where fine-grained pyrite with some chalcopyrite was found, that was 5' wide. Output in 1915 was 14 tons of \$30 ore.

WALLOWA COUNTY MINING & DEV. CO.

OREGON

Address: J. A. Burleigh, Enterprise, Ore.

Officers: Jesse Walker, pres.; J. A. Burleigh, sec.; G. W. Williams, treas. **Cap.**, \$200,000; shares \$1 par; all issued.

Property: 14 claims, on Lick Creek, Wallowa county, said to show a 2' vein in greenstone, limestone and argillite, cut by aplite dikes.

Development: by 125' shaft.

PENNSYLVANIA

Companies are arranged in alphabetical order.

AMERICAN VANADIUM CO.

PENNSYLVANIA

Vanadium Bldg., Pittsburgh, Pa. Plant at Bridgeville, Pa.

Officers: James J. Flannery, chairman; J. L. Replogle, pres.; E. E. Ferdinandini, 1st v. p.; J. C. Gray, 2nd v. p.; C. B. Aylesworth, sec. and asst. treas.; H. A. Neeb, treas., with J. R. Flannery, P. J. Barry, Jos. DeWyckoff, B. D. Saklatwalla, and J. G. Butler, Jr., directors.

Inc. Feb. 15, 1916, in N. J., to mine vanadium ores and manufacture vanadium alloys. **Cap.**, \$700,000; shares \$100 par; increased 1916 to \$13,500,000, in \$5,000,000 preferred, \$6,000,000 common stock and \$2,500,000-6% short term notes. Oakland Savings & Trust Co., Pittsburgh, registrar. Company gives out no information.

ARIZONA-IDAHO COPPER EXTRACTION CO. **PENNSYLVANIA**

Office: 915 Union Bank Bldg., Pittsburgh, Penn. Wm. C. Hagan, pres.; Jos. E. Barnes, v. p.; Ernest H. Browne, sec.-treas.; Wm E. Greenwalt, mgr.

Inc. about 1908. **Cap.**, \$500,000; shares \$1 par; non-assessable; 429,000 shares outstanding.

Owns no mines; property is a copper extraction process which the company claimed would produce copper at from 4 to 6 cts, per pound. Company was offering 50,000 shares at 50 cts. per share, to raise cash required to enlarge the demonstrating plant at Denver, at last accounts.

DONORA ZINC WORKS

PENNSYLVANIA

Operated by the American Steel & Wire Co., a subsidiary of the United States Steel Corporation.

Works: at Donora, near Pittsburgh, Pa. Plant includes bins of 20,000 ton capacity, crushing plant for ore that requires reduction, 6 Hegeler 7-heatth roasting furnaces, mixing house, 10 Hegeler furnaces each containing 912 distillation retorts, pottery, power plant, and sulphuric acid plant. Furnaces are fired by producer gas.

EAGLE METALLIC COPPER CO.

PENNSYLVANIA

Address: care H. D. Deshler, Belvidere, N. J. **Branch office:** 228 Haas Bldg., Allentown, Pa. **Mine office:** R. F. D. 3, Fairfield, Adams Co., Pa.

Officers: F. H. Cuyle, pres.; Dr. P. A. Stem, v. p.; A. L. Wickert, sec.; Thos. Zellner treas.; Owen H. Nagle, gen. mgr.; preceding, with A. V. Diefenderfer, directors.

Inc. 1903, in New Jersey. Cap., \$500,000; shares \$1 par, and rein. Dec. 9, 1910, in Pennsylvania; \$150,000 in treasury after raising \$60,000 to build a smelter in 1911.

Property: 500 acres in Jacks Hollow, on the Maryland border, one-half mile from and crossed by the Western Maryland railroad, near Charmian.

Development: by open-quarry work from pit 200' across, connected with smelter by 750' aerial rope tram. The mine is apparently a large open-cut filled with water. Careful examination of exposed rock and surface material said to show no indication of copper whatever. It is also reported that a pile of crushed ore in smelter bins, 1915, did not contain the minutest particle of mineral. Samples of matte from furnace said to run 2% copper, which evidently came from the pyrite used for flux.

Equipment: includes a 250-h.p. steam plant, 150-h. p. engine and a 2½" core drill, with office and laboratory. Smelter built in 1911. Regarded as a valueless property.

NATIONAL COPPER MNG. & DEVEL. CO. PENNSYLVANIA

Out of business. Property, described in Vol. XII, is now owned by H. D. Deshler.

UNITED M., M. & COPPER SM. CO. PENNSYLVANIA

See description under Maryland.

VANADIUM COMPANY OF AMERICA PENNSYLVANIA

See American Vanadium Co., Penn.

Control of company bought Aug., 1916, by Kuehn Loeb & Co., New York, the Cassatt Co. of Philadelphia, J. Leonard Replogle, Chandler Bros. & Co., and Harrison Williams. The reorganized corporation will have a capital of \$13,500,000 instead of \$700,000 of the old company; \$5,000,000 will be preferred, \$6,000,000 common and \$2,500,000 6% short term notes will be issued. Old stockholders receive \$1,000 a share, \$650 in new stock and \$350 in notes. The old stock is said to have cost \$200 a short time ago, the reorganization being one of the juiciest melons Wall Street has ever known.

VIRGIN COPPER CO. PENNSYLVANIA

Last address: 12 West Bldg., York, Pa. **Mine office:** Charmian, Franklin Co., Pa.

Officers: John H. Dechert, pres.; Chas. E. Wills, v. p.; Clarence A. Wills, sec.; Harry S. Wiest, treas.

Property: about 1 mile N. of Charmian, in the Blue Ridge mountains, near the Maryland state line, shows ore carrying native copper, with silver and gold values said to give assays of \$25 to \$600 per ton.

Development: by 215' shaft sunk at 47°. Four diamond drill holes, of 165 to 800', were bored, 1907.

Equipment: includes small hoist and compressor. Is considered an unpromising venture. Idle.

PHILIPPINE ISLANDS

See ASIA in this book

PORTO RICO TERRITORY

ABUNDANCIA; MINA LA

Idle. Mine near Rio Blanca, Porto Rico, opened in 1869. Produced a small quantity of rich oxidized ore from a paystreak of 8 to 15", carrying bornite and chalcopyrite average 10 to 12% copper, in a vein of cupiferous pyrrhotite of 6 to 10' width.

SOUTH DAKOTA

Companies are arranged alphabetically.

AMERICAN MINING CORPORATION SOUTH DAKOTA

Address: Deadwood, S. D. Owns the Bismarck mine at Flatiron, a gold-silver-tungsten producer. Mill and cyanide plant on the ground.

AMERICAN TIN & TUNGSTEN CO. SOUTH DAKOTA

Owns the Cowboy mine at Hill City, Pennington county, developed by 300' incline shaft, and reported producing 90 tons of tin ore per day, 1917.

Equipment: includes concentrating plant at Hill City, which also treats custom ore from adjacent tungsten mines.

ANACONDA GOLD MINING CO. SOUTH DAKOTA

Address: Metropolitan Life Bldg., Minneapolis Minn.

Officers: Martin H. Brede, pres.; O. S. Lofgren, v. p.; H. M. Hokenson, treas., with A. S. Sandberg, L. J. Lundgren, O. H. Carlson, Nels Nelson, N. Westerdahl and G. A. Mattson, directors. O. A. Walstad, sec.; A. E. Hall, supt.

Inc. in South Dakota. **Cap.**, \$1,500,000; par \$1; half common and half preferred stock; \$777,792 issued.

Property: 34 claims, patented, 515 acres, in Roubaix district, near Deadwood, S. D., carries gold-quartz ore in a vein said to widen to 45' on 200' level.

Development: 340' shaft and crosscuts. **Equipment:** steam power and compressor. Plans sinking 3-compartment shaft to depth of 1,000', down 135'. May, 1917, and erection of mill on north end of property. Management endeavoring to raise \$50,000 for further development work.

BLACK HILLS COPPER CO. SOUTH DAKOTA

Idle. Office: Benton Harbor, Mich. Mine near Rochford, Pennington, Co., S. D.

Officers: E. A. Hoffman, pres.; George M Thresher, sec.; John H. Kerr, treas.

Inc. June 2, 1900, in South Dakota. **Cap.**, \$2,000,000; shares \$1 par.

Property: 27 claims, 510 acres, in the Hornblende district, shows fissure veins in slate, with heavy gossan capping, carrying carbonate and oxide ores. Orebody under development is said by company to average 20' width, and to be more than a mile in length, opened by incline shafts and crosscut tunnels, giving a total of about 1,200' of underground openings. Ores average 1.5 to 3% copper, with small values in gold, silver and nickel. Has steam power, with 60-h. p. hoist, good for 1,500', and 4 power drills. Property considered of doubtful value.

CUSTER PEAK COPPER CO. SOUTH DAKOTA

Office: Roubaix, S. D. Burt Rogers, sec., Black Hills Trust & Sav. Bank Bldg., Deadwood, S. D. D. Grupe, pres.; John O'Brien, v. p.; with John Plunkett, directors.

Cap., \$1,500,000; shares \$1 par; assessable; 100,400 shares outstanding. Owns the Jungle mine at the southeast base of Custer peak, showing a porphyry dike cutting schist with 5' of copper ore on both walls.

Development: includes 65', 90' and 250' shafts, showing an 8" streak of nearly solid malachite on the 60' level. The older holdings of the company. 1½ miles from the Jungle mine and S. W. of Deadwood, are said to carry average values of \$8 per ton in oxidized ore to depth of 100', changing below to pyrite and chalcopryite, showing on the 200' level, a vein of 85' width, assaying about 1% copper with \$1.60 in gold. After several years' idleness, work was resumed in 1916. By April, 1917, the shaft was repaired to 300' depth, and sinking another 200' commenced.

The State Inspector of Mines considers the Custer Peak one of the promising copper properties of the State.

Equipment: includes hoist, air compressor, pump and steam power. Treatment plant probable.

CUYAHOGA MINING CO.**SOUTH DAKOTA**

Address: Custer, S. D.; J. H. Snyder, v. p.

Property: the Spokane silver-lead mine. In 1917 the shaft was sunk to 200'. Ore containing 43% sulphur and some copper was shipped to Cleveland, Ohio, for chemical purposes. Good gold ore is being opened. A hoist and additional boilers were installed, 1916.

DAKOTA CONTINENTAL COPPER CO.**SOUTH DAKOTA**

Office: 300 Commonwealth Trust Bldg., Harrisburg, Pa. Company is a reorganization of the Continental Copper Mining & Smelting Co.

Property: near Sheridan, Pennington Co., S. D., in the Black Hills, known as the Dakota-Calumet, or Lillian, property, 52 claims, patented, 179 acres. Claims show quartz schist with a pyrrhotized zone, from 50' to 200' wide, traceable one-half mile. The mineralized zone shows bands of nearly pure pyrrhotite, with occasional traces of copper. At boundary between oxidized and unaltered material, a little copper is occasionally found, as a secondary concentration. Small amounts of rich ore were found at the surface and down to 25-30', but property is valueless as a copper mine. Extensive diamond drilling and exploration work makes this conclusion certain. A body of gold quartz ore of commercial grade was cut in diamond drilling.

Development: includes an 850' shaft, 1,170' crosscut tunnel and 9 drift tunnels. New work, 1917, comprises station and drift on 270' level and 100' of sinking.

Equipment: includes 300-h. p. steam plant, with hoist good for 1,200', 7-drill compressor, all necessary shops and an old smelter of no present value. Electric hoist installed, 1917.

Company has a bond on the Golden Summit gold mine, 3½ miles S. E. of Hill City and is developing same.

DEADWOOD-HEIDELBERG MINING CO.**SOUTH DAKOTA**

Deadwood, S. D.

Officers: Geo. V. Ayres, pres.; John Treber, v. p.; Jacob Goldberg, treas., with N. E. Franklin, A. T. Roos, mgr., and T. A. Solinsky, directors. Wm L. Treber, sec.

Inc. Aug., 1914, in S. D., as result of work of the Deadwood Business Club, in an attempt to promote the mining interests of the section. **Cap.,** \$125,000; shares 25c par. Annual meeting, in June. Operating expenses were \$4,057 for 13 months to September 1, 1916.

Property: 9 claims, unpatented, 185 acres, on Two Bit Creek, Lawrence Co., S. D., shows gold ore in a contact deposit between shale and porphyry, and is said to average \$5 per ton. Ore reserves said to be 5,000 tons.

Development: 7 tunnels, 65'-380' long, with deepest workings at 193' from surface; total development, 1915-16, amounted to 500' of surface trench work and 460' of underground work.

Production: to 1916 amounted to 147 tons ore. Management plans development work and sinking to the contact of the shale and underlying quartzite.

ECHO GOLD MINING CO.**SOUTH DAKOTA**

Dr. Henry H. Jewell, pres.; **Dr. Andrew J. Pitman,** v. p.; **L. B. Snelling,** sec.; **Frank B. Heald,** **John S. Rand,** **W. E. McQueston** and **Burt Rogers,** directors. **W. L. Mason,** sec.-treas., **Manchester,** N. H.

Inc. 1892, in South Dakota.

Property: 62 acres, in the Maitland district, 5 miles N. W. of Deadwood, Lawrence Co., S. D., said to show a quartz vein with gold, silver and lead,

in schist cut by phonolite dikes. Orebody, 210' long, assays from \$1 to \$980 per ton. Developed by 200' vertical shaft, and several tunnels, with total workings of 2,270'.

Equipment: includes a 25-h. p. electric hoist, air compressor and sinking pump. Management claims company is well financed, and is yet in the prospective stage.

It is said that in Jan., 1917, a body of sylvanite ore was cut in the 'rift on the 200' level.

GOLD DOLLAR MINE

SOUTH DAKOTA

In Crown Hill district, Black Hills, S. D. Leased to Coleman, Madill, and others.

Property is a regular gold producer, whose ore is treated in the Mogul mill near Deadwood.

GOLDEN REWARD CONSOLIDATED GOLD M. & M. CO. S. D.

Office: 475 Fifth Ave., New York.

Mine office: Deadwood, Lawrence Co., S. D.

Officers: C. T. Tegethoff, pres.; Harris Franklin, v. p., with R. W. Goelet, Henry de Forest, W. B. Devereux, Walter Luttgen, Ed. de Witt and W. A. Harriman, all of New York, directors. W. J. Johnson, sec.; N. E. Franklin, Deadwood, asst. sec.; Henry Schnitzel, gen. mgr.; F. R. Baldwin, gen. supt.

Inc. June 25, 1896, in South Dakota. **Cap.**, 1,000,000 shares; \$10 par; 841,793 shares issued to June, 1916. Stock transferred at company's office. Annual meeting 1st Tuesday in August at Deadwood, S. D. Gross earnings for 1915 were \$804,068; operating expenses amounted to \$703,837. Balance sheet shows assets, \$10,710,511, and liabilities, accounts payable, \$70,647.

Property: 442 patented claims, 3,391 acres at Terry, in Whitewood and Bear Butte mining districts, near Deadwood, includes, the Union and Astoria mines.

Ore: occurs as contact deposit in shale, carrying gold-silver values and 75% silica. Pay ore occurs in shoots from 5-100' long, said to give average assays of \$5 per ton.

Development: by several tunnels and vertical shafts from 100-350' deep, with about 15 miles of workings.

Equipment: includes electric power, electric double-drum hoist, compressor, 150-ton cyanide plant and 75-ton Wedge roaster. The furnace was stopped in July, 1916, for further investigation of the blue ore, which does not give high recovery. Average gold extraction is 75.55%.

Ore reserves: estimated by management June, 1916, at 2,000,000 tons. Production for 1915 amounted to 57,770 tons, yielding 16,428 oz. gold and 20,196 oz. silver; and in 1916, \$311,242 from 52,204 tons.

HIDDEN TREASURE MINING CO.

SOUTH DAKOTA

Trojan, Lawrence Co., S. D.

Officers: S. T. Cochran, pres.; J. N. Andrews, v. p.-sec.; Banks Stewart, treas. and gen. mgr.; above, with J. T. Bickle, Harry Thurston and Wm. Hill, directors at last accounts.

Property: near Deadwood.

Ore: carries copper-gold values. Has recently resumed shaft sinking after having crosscut E. and W. 100' on the 200' level.

Produced some ore, 1916.

HILL CITY MINING & DEVELOPMENT CO.

SOUTH DAKOTA

Hill City, Pennington Co., S. Dak.

Officers: John Wise, pres. and mgr.; with J. W. Stoner, and Albert Booth, directors; E. A. Schilliman, sec.-treas.

Inc. 1911, in S. D. **Cap.**, \$500,000; shares \$1 par; 300,000 shares issued. Annual meeting, March 9.

Property: 11 claims, 6 patented, 220 acres in Burnt Fork gulch, 3 miles north of Hill City.

Ore: gold, in fissure vein, in schist; strike N. S., dip 80°. Said to have an average width of 16'.

Development: by shafts, deepest 200'.

Equipment: includes double-drum hoist, Leyner compressor and a 10-stamp mill. Company plans to sink to 400' depth and later to build a cyanide plant.

HILL CITY TUNGSTEN PRODUCERS CO. SOUTH DAKOTA

Office: Hill City, S. D.

Inc. in May, 1916. Bought the old Harney Peak tin mill, installed new equipment and started treating tungsten and tin ores.

Property: mine was formerly owned and developed by the Harney Peak Tin Co. Vein said to average 30' in width and the tin ore is low grade, average assays being 1.6% metallic tin. Ore is cassiterite in quartz with coarse crystallization and occurs mainly in narrow seams of mica in the quartz.

Development: by 300' shaft with some drifting. Treats 150 tons daily. Employs about 80 men.

HOMELODE MINING & MILLING CO. SOUTH DAKOTA

Silver City, Pennington Co., So. Dak. L. A. Richards, gen. mgr.; L. L. Farnam, supt.

Property: shows several quartz veins, 1' to 2' wide, containing gold, silver, antimony, lead and zinc ore. Two veins have been opened up; one by a 200' adit connecting with a shaft, sunk on the vein, at the 100' level; a 50' winze shows the ore to be continuous to that depth. In these workings vein varies from 12" to 18" and is 150' in length; values are mainly in gold and antimony. The second vein parallels the first, is ¼ mile E., said to be 24" wide and to contain more zinc than No. 1. Two shafts, 370' apart, 66' and 103' deep, respectively, have been sunk on the vein.

At camp No. 2, there is reported to be a 4 to 6' quartz vein carrying gold-silver values. Developed by 300' shaft with 500' of drifting.

Equipment: includes three 100 h. p. boilers and an amalgamating mill, equipped with Dodge crusher, slow-speed Lane mill, tables and classifiers. Concentrate shipped reported to carry 2-4 oz. gold, and 6-10 oz. silver, principally as arsenopyrite. Cyanide plant to be added in 1917. Company employs 40 men.

HOMESTAKE MINING CO. SOUTH DAKOTA

Main office: 354 Pine St., San Francisco, Calif. **Eastern office:** 15 Broad St., New York. **Mine office:** Lead, So. Dakota.

Officers: Edward H. Clark, pres.; Frank G. Drum, v. p.; Fred Clark, sec.; Louis P. Haggin, treas.; preceding, with Harry L. Tevis, Thos. Turner and Richard A. Clark, directors; Richard Blackstone, supt; C. W. Merrill and Allen J. Clark, cons. metallurgists.

Inc. Nov. 5, 1877, in Calif. Cap., \$21,840,000; increased March 25, 1913, to \$25,116,000 by payment of 15% stock dividend; shares \$100 par. Columbia Trust Co., New York, transfer agent; Union Trust Co., New York, registrar. Annual meeting, third Tuesday in March, in San Francisco. Listed on New York Stock Exchange since 1879.

Balance sheet for year ending Jan. 1, 1917, shows, assets: mines, plants, etc., \$25,116,000; balance in bank, \$1,298,898; balance with supt., \$33,108; bullion in transit, \$325,569; gen. supplies, \$383,634; total, \$27,157,210.

Liabilities: cap. stock, \$25,116,000; outstanding drafts, \$522,352; unclaimed dividends, \$5,126; accounts payable, \$198; reserve for deprec., \$563,600; profit and loss account, \$949,934.

Operating deficit for 1916 was \$386,681.

Summary of Income Statements

Dr.	Receipts		Other Income,		Balance		Total
	Mng. Oper.		Shops, etc.		Brought Forward		
1916	\$6,531,003		\$586,505		\$1,032,933		\$8,150,442
1915	6,448,024		77,758		897,596		7,423,378
1914	6,160,160		148,562		1,428,248		7,736,970
1913	6,186,852		132,716		1,455,958		7,775,326
Oper.							
Cr.	Expenses(a)		Dividends		Balance Dec. 31		Total
1916	\$4,990,300		\$2,210,208		\$949,934		\$8,150,442
1915	4,180,238		2,210,208		1,032,932		7,423,378
1914	4,629,166		2,210,208		897,596		7,736,970
1913	4,200,853		2,146,225		1,428,248		7,775,326

(a) Including salaries, legal, general, etc.; bills payable; taxes; property purchased; interest.

Taxes are high; in 1914, amounting to 16c per ton of ore milled, in 1915, 15c; and in 1916, 16c.

Dividends: have been paid monthly almost continuously since Jan. 1879; were suspended in May, 1907, as result of a fire in the mines, and resumed Jan. 25, 1908; continued to Dec., 1909, inclusive, when they were suspended owing to labor troubles at the mines; resumed in March, 1910. Present rate is 65c per share per month. Dividends paid to Jan. 1, 1918, total \$40,000,000.

The first claims acquired by the company were the Grant and Old Abe, located by J. B. Pearson, Dec. 11, 1875. In the Fall of 1876, representatives of Haggin and Hearst bought these claims, and the Homestake Mining Co. was incorporated. In July, 1878, the first and only assessment was levied. \$1 per share; it furnished the \$200,000 required to build the 80-stamp Homestake mill. In 1899, company acquired the Highland Mining Co., an adjoining property of about 73 acres; also the Black Hills Canal & Water Co., owning 40 miles of ditches, flumes and pipe lines, with reservoirs, improvements and water rights covering the water supply of Deadwood and Lead districts.

Property: 468 claims, about 3,723 acres in the White Wood mining district, Lawrence Co. The towns of Lead and Deadwood and the settlements of Blacktail, Terraville and Central City have grown up around the mines and mills.

Ore: gold bearing, lies in a mineralized zone of nearly vertical Algonkian slates and crystalline schists, having a general strike, N. 35° W., and dipping slightly toward the east, into which enormous masses of rhyolite have been intruded. The ore bearing zone is approximately ½ mile wide and several miles long. Only the northern end of the zone has been extensively developed; such work lying mostly between the gulches, Gold Run, Deadwood and Blacktail. The deposits are not fissure veins, but impregnations that appear to have taken place along two converging lines of crushing; they follow roughly the direction of schistosity and show a general pitch southward; where several unite, the aggregate thickness is over 500' and many stopes are carried across that width of ore. The larger lenses are on the west side of the zone and are flanked on the east by a series of smaller parallel lenses, some of which join the larger at depth. Near the surface the orebodies follow the rhyolite porphyries, but at depth diverge from them and become in part associated with phonolite. The ore varies considerably in composition in different portions of the deposit, but that of the deeper levels, the unoxidized ore, usually contains either chlorite

or ferruginous hornblende (cummingtonite), with quartz, carbonates of lime, magnesia, iron, arsenopyrite, pyrite and pyrrhotite. Ferrous minerals predominated and this has been an important factor in determining the metallurgical treatment. In the upper oxidized parts of the deposits the ore is dark red, but deeper, in the sulphide zone, is greenish blue to blue black. The sulphides vary in amount from 3 to 5%, and even as high as 10% or more of the ore. In the sulphide zone the distribution of gold is uniform and averages \$4 to \$4.50 per ton. Over 60% of the ore is free milling. Secondary enrichment has not resulted in the formation of any particularly rich zones.

Development: 6 shafts; 4 in the footwall, one in the hanging, and one in the lode; depths Jan. 1, 1916:

Ellison	B. & M.	Golden Prospect	Golden Star	Old Brig	Golden Gate
2,000'	1,700'	1,100'	1,400'	800'	800'

The 1,850' and 2,000' levels of the Ellison shaft will eventually be connected with the B. & M. shaft, through which outlet the bulk of the ore will be hoisted to surface. The B. & M. shaft will be equipped with skips, which will dump into No. 8 Gates crushers, and their product carried by a belt conveyor system to smaller gyratories. Total cost of sinking at the Ellison shaft is said to have averaged \$60.64 per ft. There are in all about 130 miles of workings. Underground work in 1916 amounted to 21,982' of driving and 2,399' of raising. The measured ore reserves are large and sufficient to supply the reduction plants for many years.

The metallurgical equipment at the Homestake is one of the most modern and efficient in the country.

Mills: at the South Side—3 stamp mills (660 stamps) with 36,356 sq. ft. of amalgam plates; 1 regrinding plant, with independent cone system, and 340 sq. ft. of amalgam plates; 4 batteries of cones for classification; 3 clarifying tank houses; 1 sand plant. The mills are the Amicus, Golden Star, Homestake and Pocahontas. In 1915 the Pocahontas mill was completely rebuilt. The Amicus mill is being rebuilt.

At the North Side—2 stamp mills (360 stamps), the Monroe mill and Mineral Point mill; 2 tank houses; 2 cone houses; 1 sand plant. Ore supplied to these mills is usually drawn from the upper levels of the mine, and is at least partly oxidized.

A 5-stamp crushing and concentrating mill was built, 1916, for treating tungsten ores. Equipped with 1 Wilfley and 2 Deister tables. Net yield, in 1916, was \$229,916.

At Deadwood—1 slime plant, treating the combined slime from south and north sides. The stamps weigh 900 lbs., drop 10", making 88 drops per minute. Increased mill capacity is to be secured by a combination of heavier stamps and secondary crushing; the new stamps will weigh 1,000 lbs.; this, it is estimated, will give 10% additional stamp duty, while secondary crushing will allow another 8% increase in capacity. The Homestake order of drop is 1-3-5-2-4 or 1-4-2-5-3. A 25 h. p. back-gear motor drives each 10 stamps. Ratio of water to ore is large, at the Lead mills being 10 or 12 tons of water to one of ore. A minimum of about 50,000 tons of water per day is used, most of which comes from Spearfish Creek and its tributaries, being conveyed over 20 miles in ditches and vitrified clay pipe.

Inside amalgamation is practiced, quicksilver being fed to the mortar. Chuck-blocks are cleaned in rotation, at intervals of about 2 weeks; outside plates, except those of the fourth row, are cleaned and dressed daily.

Fourth row plates are dressed at 2-day intervals. Amalgam is restored three times each month. Oil-fired retorts are used, the resulting bullion being melted in coke-fired furnaces. Loss of quicksilver in retorting is almost nil.

Cost of stamp milling per ton of ore: stamping, 29.2c; amalgamating, normal charges, 2.6c. Supplies and labor rose considerably in 1916.

Regrinding is done in tube mills. In cyaniding the usual methods are closely conformed to. Slime plant costs in 1916 were 8.1c per ton of slime ore. Consumption per ton of slime treated in 1914; sodium cyanide, 0.16 lb.; zinc dust, 0.12 lb.; lime, 3.84 lbs.; hydrochloric acid, 0.39 lb.; costing 0.93c per ton treated; power, 1.15 kw.-hr. A recovery is made of about 94% of the values in the ore: 72% by amalgamation and 22% by cyanidation.

Power and equipment: company has hydro-electric plants at Spearfish and Englewood. New power equipment in 1915 includes a steam-driven electric generating station at Lead, maximum capacity, 4,000 k.v.a.; this, in conjunction with the hydro-electric plants, will furnish sufficient power for all purposes except the hoists, which will continue to be operated by steam. A completely equipped central boiler plant of six 600 h. p. boilers was completed in 1915. The B. & M. shaft was equipped in 1915 with a compound condensing hoist, designed to handle two 6-ton skips from a maximum depth of 4,000'. The company operates its own machine shops, carpenter shops and foundry.

The Homestake Mining Co. has long been known for the fine way in which it has looked after the welfare of its 2,350 employees. In 1914, it completed a recreation building, containing a theatre with seating capacity of 1,000, library, swimming pool, gymnasium, bowling alleys, billiard and amusement rooms.

Production: to Jan. 1, 1917, \$147,141,385. Recent production has been:

	Tons Milled	Recovered per Ton	Total Cost per Ton
1916.....	1,600,220	\$4.0813	\$3.11
1915.....	1,573,822	4.0848	2.6561
1914.....	1,587,774	3.8797	2.9155
1913.....	1,540,961	4.0148	2.7258

In 1916 Homestake produced tungsten ore from the Golden Summit claim, which netted \$229,916.

IMPERIAL COPPER CO.

SOUTH DAKOTA

Idle. Durbin Groupe, pres.; John O'Brien, supt., at last accounts. Property in Custer Peak district, developed by 175' shaft, reaching permanent water level. Crosscutting will be done to open up the 30" ledge.

Equipment: steam hoist, pump and mill of several hundred tons capacity. Mine reported to show good values in copper in upper workings.

MALONEY-BLUE LEAD COPPER MG. & SM. CO. SOUTH DAKOTA

Sheridan, Pennington Co., So. Dakota. Company out of funds, and property idle. Claims show copper ore in limited amount, but property is without merit as a copper producer, despite extensive workings. See Vol. XI. Copper Handbook. Letters neither answered nor returned.

MOGUL MINING CO.

SOUTH DAKOTA

Address: Terry, So. Dakota. Company treats ore from its own mine. from lessees and other companies. Treated 38,671 tons in 1916.

MONTEZUMA & THE WHIZZERS MINE

SOUTH DAKOTA

Address: J. T. Milliken, Deadwood, So. Dakota.

Property: 150 acres, on the divide between Deadwood and Whitewood Cañon, and on Deadwood Creek and West Gold Run, near Lead City, So. Dakota. Property shows Algonkian schists, slates and quartzite, and

carries a strong gossan, of 45' estimated average width, traceable 3,000'. Principal claims are the Spiegel No. 1, formerly known as the Whizzers, and Brownie No. 5, carrying 2 parallel quartzite reefs, about 300' apart. The first named has chalcopyrite in a gangue of hornblende schist, surface ores carrying 0.5 to 1.5% copper, up to 1 oz. silver and \$1-\$2 gold per ton.

Brownie No. 5 claim has 2 tunnels, one 650' long, and has produced about 50,000 tons of low-grade fluxing ore, sent to smelters at Deadwood and Rapid City, until the latter was closed down. A 22' winze, below the water-level, gave picked samples, assaying \$16.80 gold per ton.

The Montezuma claim, near West Gold Run, has 2 short tunnels, showing ore assaying up to 1 oz. silver and \$53.70 gold per ton. Though low in average grade, the property is considered promising, because of the enormous tonnage assured, but needs big capital to develop. Examined and reported favorably on by Geo. Huston, of Mullan, Idaho, and Nicholas Treweek, of Salt Lake City.

Property acquired in 1917 by J. T. Milliken of St. Louis, Mo., who is developing the Oro Hondo nearby. Mine was unwatered and diamond drilling underway in July, 1917.

NEW GOLDEN WEST MINES CO.

SOUTH DAKOTA

Mine near Rochford, Pennington Co., So. Dakota.

Officers: Otto E. Freund, pres.; Geo. H. Williams, v. p. and gen. mgr.; Geo. M. Lee, sec.; Sam T. White, treas.

Inc. Oct., 1915, in So. Dakota, as a reorganization of the Golden West Mining Co. Cap., \$2,000,000, in \$1,000,000 7% preferred and \$1,000,000 common stock.

Property: in Black Hills district, near Rochford, was equipped during 1916 and development commenced.

NEW PURITAN MINING CO.

SOUTH DAKOTA

Galena, So. Dakota.

Officers: Wm. J. McGoffin, pres. and mgr.; Dr. Fred M. Ganty, v. p.; Judge John R. Russell, sec.; Chas. J. Searle, treas., with J. R. Richardson, directors.

Inc. 1915, as a reorganization of the Puritan Mining Co. Cap., \$1,500,000 shares; \$1 par; non-assessable; 200,000 shares issued. Annual meeting in June.

Property: 60 patented acres, in White Wood mining district, Lawrence Co., So. Dakota, shows an orebody, 28' thick in quartzite with gold-silver-lead values, said to assay \$3.60 per ton.

Developed by several shafts to depth of 190'.

Equipment: includes steam hoist, 6-drill compressor, No. 5 Cameron pump and a 250-ton concentrating mill with cyanide unit. Property was idle for 8 years, owing to litigation, but development is now under way.

NEW RELIANCE GOLD MINING CO.

SOUTH DAKOTA

Office: 206 South 4th St., Minneapolis, Minn. Mine office: Trojan, Lawrence Co., So. Dakota. F. C. Bowman, gen. mgr.

Property: the Reliance mine, at Trojan, shows gold ore in quartzite formation. Orebody said to have an average width of 8' over a distance of 1,000' and to assay \$4 per ton.

Equipment: includes a 30-stamp mill, treating slime by the continuous decantation, counter current system, drills and air compressor. During 1916, mill treated 13,524 tons of ore, yielding \$49,893.

Work was suspended in Nov., 1916, due to low value of ore. Work has been confined to the upper Cambrian, but future operations will be in development of the lower quartzite, which drilling disclosed at 700'.

NORTH HOMESTAKE MINING CO.**SOUTH DAKOTA**

Address: A. Maitland, Negaunee, Michigan, pres and controlling owner; A. F. Maitland, v. p.; T. C. Jates, sec.; Jos Fountain, supt.
Inc. in So. Dakota. **Cap.**, \$6,000,000; shares \$5 par; 1,000,370 shares outstanding.

Property: 77 patented claims, 1,100 acres at Maitland, Lawrence Co., So. Dakota, shows veins of quartz and sulphide ore, carrying gold and silver values.

Development: by 750' vertical shaft and 600' drift on the 600' level with crosscuts E. and W. for 200' and 100', respectively.

Equipment: includes 125-ton cyanide mill, electric power, 4 electric pumps, 2 compressors and hoist. Mine is credited with a production of \$1,500,000 under former management. Development work carried on intermittently during past 5 years has so far failed to disclose new orebodies of commercial grade.

Work suspended in Sept., 1916, but mine being kept dry.

ORO HONDO MINE**SOUTH DAKOTA**

J. T. Milliken, owner and mgr., 121 Chamber of Commerce, St. Louis, Mo.; E. W. Talbot, supt., Deadwood, So. Dakota.

Property: at Deadwood, So. Dakota, is said to show replacement deposits in schist.

Development: by 2,200' vertical shaft. Did about 2 miles of diamond drilling, 1916, presumably in search of southerly extension of the Homestake orebodies.

Management does not furnish or publish details of its operations.

PURITAN MINING CO.**SOUTH DAKOTA**

Address: Deadwood, So. Dakota.

Directors: Wm. J. McGoffin, F. M. Gantz, J. R. Russell and Jas. R. Richardson.

Inc. Oct., 1915, in So. Dakota. **Cap.**, \$1,500,000; 500,000 shares in treasury.

Property: formerly owned by the Alta Mining Co. and the Puritan Mining Co., on Strawberry gulch, near Deadwood, said to show sulphide ore, carrying gold, silver and lead values.

Equipment: includes cyanide mill and hoist.

Work was resumed early in 1917 after several years' idleness.

RATTLESNAKE JACK MINING & MILLING CO.**SOUTH DAKOTA**

Galena, Lawrence Co., So. Dakota. Owned by C. B. Harris of Galena, and Wm. Sansome of New York.

Property: several claims, including the Rattlesnake Jack mine near Galena, said to show gold ore assaying \$15 to \$20 per ton.

Development: 200' shaft and tunnels. A 10-stamp mill and cyanide plant, completed in Aug., 1915, ran for several months, when a shutdown was made to build a tailing dam; resumed operations in Jan., 1916, only to close down in April, due to a disagreement between the owners.

Reported that 1,670 tons of ore treated in 1916, yielded \$14,270. Daily tonnage treated averaged 60 tons when the mill was running.

TROJAN MINING CO.**SOUTH DAKOTA**

Office: Deadwood, So. Dakota.

Officers: H. W. Seamon, pres.; G. M. Curtis, v. p.; F. M. Clark, sec.; H. S. Vincent, mgr.; above are the directors.

Inc. 1911, in So. Dakota. **Cap.**, 3,000,000 shares; par \$1; non-assessable; outstanding, \$1,000,000. Annual meeting, June.

The company publishes no financial reports.

Property: 157 patented claims, 1,000 acres, at Trojan, Lawrence Co.,

So. Dakota. Deposit is a flat blanket body between sandstones and slates and yields gold and silver.

Development: by tunnels, the Portland being main outlet.

Equipment: 100 h. p. electric hoists, capacity 5,000'; 600 cu. ft. compressor and 2 gasoline locomotives. Mill equipment is for cyaniding. Capacity 400 tons daily. Crushing is by Chilian and tube mills, filtration by Oliver machines.

Production: 420,000 tons dry ore to Dec. 31, 1916, of which 407,000 tons were treated by company's mill, and remainder sent to smelter. In 1916, output was 107,789 tons worth \$353,554; a gain of 27,886 tons and \$77,366 compared with 1915. Also treats custom ore. One hundred men are employed.

Is the second largest gold producer in So. Dakota. In August, 1917, company acquired a lease on the Republic mine.

WASP NO. 2 MINING CO.

SOUTH DAKOTA

Address: D. A. McPherson, pres., First National Bank, Deadwood, So. Dakota; E. Manion, mgr., Lead, So. Dakota; R. Craig, mill supt. A close corporation, most of the stock still held by original 14 stockholders.

Inc. November, 1901, in So. Dakota. **Cap.**, 500,000 shares; \$1 par; all issued. Original purchase of land paid for from sales of ore. Voluntary assessment of \$50,000 paid in 1911 to replace mill destroyed by fire. To October, 1914, dividends paid, totaled \$451,966. In 1916, 20%, or \$100,000, was distributed. This was over double that paid in 1915.

Property: includes the Alma Fraction and Wasp claims at Flatiron, long famous for low cost mining and milling of low-grade ore, which occurs in the Cambrian formation above the quartzite. Wolframite occurs along fissures in flat Cambrian quartzite.

Development: by open cuts, steam shovels stripping 20' of waste which overlies an ore bed 20' thick. The total mining cost was \$1.661 per ton. In 1916-1917 a decided change was apparent in the ore extracted from underground, and the mill has been dismantled. The ore now requires fine grinding and if development warrants it, a new plant will be erected.

Equipment: included a 500-ton plant, in which the ore was crushed coarsely and cyanided direct at cost of 59.1c per ton. In 1916 a 25-ton plant was erected for concentrating low-grade tungsten ore. It crushes to ½" by rolls, recrushes by smaller rolls, grinds by ball mill and treats coarse in jigs, sand on Wilfleys and slime on canvas tables. Three grades of concentrates are produced, 65%, 45% and 35% tungstic acid

Production: in 1914, 176,140 tons ore, average value \$2.015 gold and 28.7c silver per ton, returned \$1,533, at a cost of \$1.287 per ton. In 1915, costs increased and operations were curtailed until shipping and milling of tungsten ores added new profits.

From May, 1915, to March, 1916, company shipped 184 tons ore, averaging 45% tungstic acid. In 1916, 50,035 tons of gold ore averaged \$1.79 per ton; and 36 tons of tungsten concentrate were sold for \$97,869. Total value in 1916 was therefore \$187,775.

TENNESSEE

AMERICAN BALLAST CO.

TENNESSEE

A subsidiary of the Amer. Z. L. & Sm. Co., and described under that title.

AMERICAN ZINC CO. OF TENNESSEE

TENNESSEE

A subsidiary of the Amer. Z. L. & Sm. Co., and described under that title.

CHATTANOOGA COPPER CO.

TENNESSEE

Bought by the Ocoee Copper Co., which see.

DUCKTOWN SULPHUR, COPPER & IRON CO., LTD. TENNESSEE

Office: 1 Gresham House, Old Broad St., London, E. C., Eng. Mine office: Isabella, Polk Co., Tenn.

Officers: J. G. Gordon, chairman and managing director; L. G. Mortimer, managing director; preceding, with Col. J. Le G. Daniell, H. G. Palmer, Edward Dexter and Col. H. B. Mortimer, directors; J. W. Felstead,



sec.; William Young Westervelt, 17 Madison Ave., New York, cons. engr. Executives at the mine: C. W. Renwick, gen. mgr.; W. F. Lamoreaux, asst. gen. mgr.

Inc. in Great Britain, Feb. 16, 1891. Cap., £75,000; shares £1 par, in £74,800 ordinary shares and 200 founders' shares. Increased 1907, to £200,000 shares, increase subscribed to by the old stockholders at par, except £48,799 ordinary shares sold to the public at 25s. Stock is fully issued and fully paid. Profits are divisible on the basis of 7%, plus, one-half of the net remaining profits, to ordinary shares, balance of profits going to founders' shares. £109,300 first mortgage, 6½%, debentures outstanding, against which a general reserve fund of £55,000 has been accumulated.

Recent Dividends:

	Shares Ordinary	Shares Founder's £ s d		Shares Ordinary	Shares Founder's £ s d
1907.....	82½%	249 3	1912.....	10%	29 19 5
1908.....	55%	108 18	1913.....	12½%	54 18 11
1909.....	10%	16 0 8	1914.....	12½%	54 18 11
1910.....	10%	21 17	1915.....	13¾%	9 9 10
1911.....	10%	28 4 5	1916.....	20%	129 17 3

Total dividends including 1916, paid to all classes of shares, £558,063. Of this, £363,547, amounting to 375 5/6% on shares outstanding at the times of payment, was paid to the ordinary shares, and £194,506, amounting to 97,253% was paid to the founders' shares, the latter constituting the world's record for profitable copper-mining investment. On the 74,800 ordinary shares, from 1895 to 1907, inclusive, 293%, or £229,636, was paid.

Property: nearly 7,000 acres, bought for £68,057, includes the Mary, East Tennessee and Isabella mines, which are active, and the Calloway and Cherokee mines which are idle. Country rocks consist largely of very tough highly metamorphosed, silicified mica schists, of ancient origin. The ores are exclusively sulphide, averaging about 2½% copper and containing minute quantities of gold and silver, sufficient however to be appreciable to the matte.

The **Mary** mine, which is the principal producer, has heretofore yielded largely through the 3-compartment 350' Baxter shaft, and from the 2-compartment 375' No. 2 shaft. The new Gordon, 3-compartment 1,180' shaft is however, the principal producer. The richest ore in the mine is on the lower levels. Ore actually blocked out in the Spring of 1917 is in excess of 1,000,000 tons, averaging over 2% copper and 17% sulphur.

The **East Tennessee** mine, idle since early days, did not commence to produce until 1910. The Thomas, or operating shaft, is 700' deep, has 2 compartments and yields about 30 tons per diem of ore containing nearly 3% copper and 15% sulphur. Reserves of some 15,000 tons of ore containing about 2½% copper and 8% sulphur, had been proven in the spring of 1917.

The **Isabella** mine has thus far yielded but a few thousand tons of ore a year. The ore, averaging about 0.8% copper and 29% sulphur, has as yet been used for little else than experimental purposes. 5,600' of systematic diamond drilling, however, has already revealed over 2,500,000 tons of average ore with excellent prospects beyond, so that doubtless the property will, eventually, be worked on a considerable scale for acid and iron manufacture.

Equipment: the power plant at the smelter was enlarged in 1910 and changed from direct to 440-volt, 60-cycle, 3-phase, alternating current, two 500 k. w. Westinghouse-Parsons turbine generator units being installed, including air compressor for acid plant, etc., totaling about 1,500 h. p. The smelter, which is located at Isabella on the company's private, standard-gauge railway, about 2½ miles from the Mary mine, consists primarily of two 500-ton, sectional water-jacket blast furnaces. These furnaces are operated by induction motor Connersville blowers of 300 cu. ft. per revolution aggregate capacity, charged with Freeland patent electrical charges and served with electrical traveling crane for the mattes and belt bucket elevators for the granulated slag. Since 1902, when heap-roasting was abandoned, semi-pyritic smelting, introduced into this country from Tasmania by this company, has been employed. The first fusion gives a matte containing from 12-15% copper and disposes of the bulk of the non-valuable material of the ore in a slag containing from 0.2 to 0.3% copper. This coarse matte is then raised to 45% copper content by a second fusion in the same furnace, usually undertaken once a week. A small percentage of coke, with cold blast of from 20 to 30 oz. pressure is used in both fusions. The 45% matte is sold to the American Metal Co., of New York, and treated for them at the Laurel Hill, L. I., or the Carteret, N. J., smelters.

In 1905, investigations were undertaken to determine the possibility of making sulphuric acid from the smelter fumes. In 1906, an experimental contact plant was erected but proved unsuccessful, and in 1908, work on the present chamber acid plant was commenced. This plant, which cost over \$600,000, was put into operation in less than a year from the time of breaking the ground for its erection and has since been producing at the rate of from 40 to 50 thousand tons per annum of 60° Beaume sulphuric acid. It was the first acid plant to successfully convert sulphuric gases from pyritic smelting into concentrated acid. In 1915 a 300-ton acid concentrating plant was installed.

In 1916 the electrolytic zinc plant was completed and is now recovering zinc from the acid plant sludge at the rate of one ton a day.

The credit for the successful development of the company is due primarily to the chairman and managing director, Mr. Gordon, himself a technical man, to the consulting mining engineer, Mr. Westervelt, who developed the mines, to the former manager, Mr. W. H. Freeland, assisted by the present manager, Mr. Renwick, who developed the pyritic smelting process employed, and to Mr. N. L. Heinz, chemical engineer, who designed and erected the present acid plant.

Production:

Year	Pounds Copper	Tons 60° B. Sulphuric Acid
1916.....	5,129,000	*41,000
1915.....	5,500,000	41,000
1914.....	5,862,000	48,900
1913.....	5,811,000	48,800
1912.....	5,213,000	48,100
1911.....	5,040,000	45,600
1910.....	4,409,000	46,800

* 11,000 tons contained 95% to 97% acid.

Company is managed with commendable financial probity, technical ability of a high order, and is heartily endorsed as worthy of confidence and investment.

EAST TENNESSEE ZINC CO.

TENNESSEE

Inc. in N. J., and registered in Tennessee. All stock owned by M. C. Hinn. M. Casewell Heine, atty., 1 Liberty St., New York.

Property: 173 acres, 2 miles from Newmarket, on the Southern railway, reported to show zinc blende ore occurring in Knox dolomite in joint planes and fractures in limestone beds.

Development: by drilling claimed to have proven about 6,722,000 tons of ore. Work on the property includes an open quarry pit 75' deep with 5 tunnels running from it.

Equipment: includes 100-ton concentrator, 540' Lidgerwood cable tram and 25 h. p. hoist.

OCOEE COPPER CO.

TENNESSEE

Address: J. I. Carter, Chattanooga, Tenn.

Officers: J. I. Carter, pres.; John Stagmaier, 1st v. p.; G. H. Miller, 2nd v. p.; S. E. Whitaker, sec.; P. B. Carter, treas., with R. B. Davenport, W. S. Palmer, J. C. Vance and W. H. Weatherford, directors.

Inc. 1917, in Tennessee. **Cap.**, \$1,250,000; shares \$10 par; 70,000 shares in treasury to be sold to secure capital for development; 55,000 shares paid to Chattanooga Copper Co. for its holdings. Practically a reorganization of this company, the officers and directors remaining the same.

Property: 120 acres in northern part of Ducktown copper district, Polk Co., surrounded on 3 sides by the holdings of the Tennessee Copper Co., and the Ducktown Copper, Sulphur & Iron Co., adjoins the East Tennessee mine on the east, owned by the last named company. Several diamond drill holes prove that the ore deposits of that mine extend downward on their dip beneath the land of the Chattanooga Copper Co., and that the ore is identical in character, mineral association and occurrence with that of the East Tennessee mine. Ore was found in the drill holes at depths of 685 to 1,050'. Ownership of surface carries ownership of all beneath the surface, as Tennessee does not have an apex law. Diamond drill records would in-

dicating an orebody 290' long, 415' in depth and 30' thick, equal to about 241,000 tons, allowing $\frac{1}{3}$ for waste. Development might add to this figure.

The property is an attractive one, especially when the low operating costs of the Ducktown district are considered.

SOUTHERN ZINC & MINING CO., INC. TENNESSEE-VIRGINIA
Office: 115 Broadway, New York.

Officers: E. L. Patton, pres.; Geo. F. Reynolds, v. p.; J. E. Kingsland, sec.-treas., with John H. Banks, S. V. Fulkerson, Horace D. Fry, Kirby Thomas and H. G. Peters, directors; John H. Banks, cons. engr. and metallurgist.

Inc. in Del. Cap., \$1,600,000, in \$600,000 7% cum. pfd., and \$1,000,000 common stock; shares \$10 par; full paid; non-assessable.

Property: owns mineral rights of Fall Branch and Arcadia mines, 1,125 acres; the Fall Branch property, 225 acres, is in the S. W. corner of Sullivan Co., Tenn., 7 miles S. W. of Fordtown; the Arcadia property is in Sullivan Co., Tenn., and Scott Co., Va., about 12 miles N. of the Fall Branch property.

Ore: carries zinc in Knox dolomitic limestone; said to be in the same ore-bearing zone as the Mascot and Bertha mines. Prospecting to date has shown 4 parallel veins. Development has been confined to the centrally located vein. No. 1 vein is opened by a system of open cuts and a 127' incline shaft that has exposed the ore for 300' along the strike. The greater part of this work was done under lease by the East Tennessee Min. & Dev. Co., which built a mill prematurely and exhausted its funds. Reported in July, 1915, "Not enough work has been done to block out any material quantity of ore. Therefore, it is too early to properly estimate ore in sight." A rough estimate of ore in No. 1 vein gives 188,000 tons of 4% zinc ore above the 100' level. Veins 4, 5 and 6 parallel No. 1, but have had no systematic development.

Mill: 100-ton capacity, is now equipped with "Clifford" dry process system. Company plans to remodel mill and build a 100-ton wet mill on the Scott county land. J. H. Banks states in his report: "I consider this a very promising zinc property and can unhesitatingly recommend its further development."

TENNESSEE COPPER & CHEMICAL CORPORATION

TENNESSEE

(See Tennessee Copper Co.)

General office: 61 Broadway, New York. **Corporate office:** Millbrook, New York.

Officers: Adolph Lewisohn, pres.; Sam A. Lewisohn, v. p.; E. H. Westlake, v. p.; F. M. Loper, sec.; E. H. Westlake, treas.

Directors: Jules S. Bache, J. Parke Channing, Wm. B. Joyce, H. M. Kilborn, Adolph Lewisohn, Sam A. Lewisohn, S. S. Rosenstamm, J. H. Susmann, Richard Sutro, Martin Vogel and E. H. Westlake. Annual meeting, fourth Thursday in April.

Inc. Oct. 11, 1916, in New York, to refinance and take over control of Tennessee Copper Co. through stock ownership. Stockholders of latter company were given privilege of converting stock share for share, into stock of the new company, and of subscribing for an equal additional amount of the new stock at \$16 per share. Old stock may still be converted at option of new company, but the right to subscribe to additional stock has now expired.

Capital stock: authorized 400,000 shares, no par value; outstanding, May 3, 1917, 391,498. Columbia Trust Co., New York, transfer agents; Empire Trust Co., New York, registrars. Listed on New York Stock Exchange.

Initial balance sheet, Jan. 3, 1917, shows cash, \$2,779,891; Tenn. C. Co., share a/c (189,215 shares of not less value than \$1,000), \$1,000; State organization tax, \$20,109; paid bankers for underwriting sale of stock, \$400,000. Liabilities include stated capital, \$2,000,000; capital surplus (balance from issue of 200,000 shares at \$16, and 189,215 shares of Tennessee Copper Co. of not less value than \$1,000), \$1,201,000.

TENNESSEE COPPER CO.**TENNESSEE**

Subsidiary of Tenn. Copper & Chemical Corp. Same directorate.

Office: 61 Broadway, N Y. Mine at Copperhill, Polk Co., Tenn.

Inc. April 24, 1899, in New Jersey. **Cap.**, \$6,875,000; shares \$25 par; \$5,000,000 issued. State Street Trust Co., Boston, and Equitable Trust Co., New York, registrars; Old Colony Trust Co., Boston and National City Bank of New York, transfer agents. Annual meeting, fourth Thursday in April.

Authorized bond issue, 1915, \$3,000,000; 1st mortgage 6% 10-year convertible sinking fund gold bonds; \$1,855,000 outstanding. This issue enabled the company to retire the \$800,000 outstanding bonds of the first issue, Dec. 1, 1915.

	Profit	Dividend		Profit	Dividend
1903.....	\$417,565	\$218,750	1910.....	\$445,387	.....
1904.....	186,966	218,750	1911.....	.....	\$300,000
1905.....	452,106	218,750	1912.....	1,095,875	500,000
1906.....	824,231	250,000	1913.....	1,087,503	750,000
1907.....	800,634	650,000	1914.....	751,892	450,000
1908.....	324,768	500,000	1915.....	1,242,693	600,000
1909.....	339,406	250,000	1916.....	387,657	300,000

Net surplus, Dec. 31, 1916, was \$1,717,883.

Property: 12,640 acres of mineral and timber lands, in the Ducktown district. Ore was discovered and mining first begun in 1850, and the mines were operated regularly by a New York company previous to the Civil War, and during the earlier part of the war, under compulsion by the Confederate Government to supply copper for munitions of war. Company owns the Burra Burra, London, and the Eureka mines. Company also holds under lease 270 acres, including the Polk County mine. The Eureka was formerly operated under lease for iron ore by the Virginia Iron, Coal & Coke Co.

Geology: property shows pre-Cambrian metamorphosed mica-schist, carrying several lines of mineralization with lenticular orebodies. Four deposits, under development, show extensive gossans, originally having a little rich sooty glance ore under the gossan, which was mined out many years ago. The lenses range 30 to 150' in width, 500 to 2,000' in length, and are of unknown depth. The ore consists of a massive mixture of pyrite and pyrrhotite, with a little chalcopyrite, in a gangue of various metamorphic minerals and quartz, ore ranging from 1.2 to 3% copper, 40% iron, 27% sulphur and 15% silica, with minute quantities of gold and silver. The ore is excellently adapted to smelting, giving very clean slags.

Development: the mines are extensively developed; new work in 1916 totaled 4,090' of diamond-drill holes, and 2,990' of exploration work.

Ore reserves: Jan. 1, 1917, estimated at 3,372,305 tons of copper ore and 2,500,000 tons sulphur ore, not including ore indicated by diamond drilling.

The **Burra Burra mine**, which is the principal property, is operated through a 1,000' main central shaft, sunk at 75° in the footwall, having its first level 170' below the collar, with succeeding levels at 100' intervals, the mine ending 1916 with 8 producing levels, the 9th and 10th levels under

development. The entire output in 1916 came from back stopes in the mine and over 300,000 tons of broken ore was in the stopes Jan. 1, 1917.

The main orebody of the Burra Burra is 1,200' long and averages 60' wide on the 3rd level. There also is the north, or McPherson orebody, developed by a drift from the 3rd level of the main shaft, connecting with the McPherson shaft, now down to the 8th level. This shaft is 2,200' N. E. of the main shaft and facilitates working the McPherson orebody, which is about 900' long with an average width of 25'. The Hiwassee shaft, 900' S. W. of the main Burra Burra shaft, is sunk to the 8th level, showing a comparatively small orebody, of about 200' length and 12' average width. During 1916 a total of 1,820' of underground development work was done. Burra Burra produced 271,770 tons of ore in 1916.

The London mine has a 750' shaft, sunk at an incline of 75°, with 6 levels opened, developing an orebody of 25 to 75' width and about 600' length, ranging 2 to 4% in copper tenor. A total of 392' of underground work was done in 1916, consisting mainly of raises and drifts. The London produced 85,552 tons of ore in 1916.

The Polk County mine has a 485' vertical shaft, with 5 levels opened, developing an orebody of very irregular shape, up to 120' maximum width, of about 2% average copper tenor. The Polk mine is held under lease. To Jan. 1, 1917, about 778' of drifting had been done. Production of the Polk County mine was 55,438 tons of ore in 1916.

The Eureka mine, idle since 1912, has a shaft 165' deep, at which point the first level will be opened. Diamond-drill borings have shown an orebody of 20 to 165' width, about 1,000' length, and it is estimated that this mine has 2,500,000 tons of ore developed that average 44% iron, 30% sulphur and about 1% copper. This ore is to be treated for its iron and sulphur, as experiments indicate that it will make a good non-phosphorous iron ore. An initial unit to try out the process is planned.

Underground work during 1916 cost \$1.26 per ton.

Equipment: at McPherson shaft includes a Nordberg electric hoist, 3 Ragler type electrically driven 2,500-cu. ft. compressors, a combination shaft house and crusher building. Crushing plant includes 18x36" Blake crusher, feeding to a 36"x33' Robins belt conveyor, used as a picking belt, which discharges into storage bins of about 2,500 tons capacity; as far as possible all barren rock is removed from the crushed ore by hand picking, plant having a daily crushing and assorting capacity of 1,500 tons, ore being reduced to 4" size. There are similar shaft rock houses at the London and Polk County mines.

The new power and compressor plant at the McPherson shaft has supplied air for the Burra and London mines. During 1917 a new steel head frame and crusher house was erected at the Burra shaft and the old steam plant has been shut down, electricity being substituted.

The company's private railway connects the mines with the works and has connection at Copperhill with the Louisville & Nashville railway. The track is of standard gauge, with 7½ miles of main line and 8 miles of sidings and spurs. Equipment includes four 105,000-lb Schenectady locomotives, eighty-five 65-ton steel tank cars, 74 standard gauge gondolas and 13 flat cars, and 57 hopper bottom ore cars. The company has a repair shop for locomotives and cars, equipped for making all repairs and capable of completely rebuilding when necessary.

The smelter: at Copperhill, 1 to 5 miles from the mines of the company, was designed and built by J. Parke Channing. On the upper level are the ore bins, having storage capacity for 10,000 tons of ore, 800 tons of coke, and necessary fluxes and furnace products requiring retreatment.

Charges are drawn from the bins into cars of 44 cu. ft. capacity, hauled by electric locomotives over 4 tracks that run under the bins and circle around the furnaces, so that a train loaded on any track may go to any furnace and return to the bins.

The furnace building of steel has space for 7 blast furnaces, but only 5 are in use, each having an oval settler lined with firebrick. Slags skim into pots of 105 cu. ft. capacity, which are hauled by the electric locomotives, considerable slag being used for railway ballast.

The converter department has two 40-ton electric traveling cranes taking matte from the settlers to the converters: Two 12' basic lined converters of the Great Falls type were installed in 1916 to replace the old ones.

Hot converter slag is poured into the blast furnace settlers, by reason of which the only converter slags requiring remelting are the skulls forming in the ladles. Converter bars average about 99.4% in copper tenor. Copper is cast in 210-lb pigs and sent to the Baltimore Copper Smelting & Rolling Co. for electrolytic refining, which affects the saving of the very small gold and silver values contained. The finished electrolytic copper is marketed through the American Smelting & Refining Co.

The smelter power house includes two 250 k. w. 500-volt d. c. Westinghouse generators, direct-connected to 2 Nordberg tandem-compound Corliss engines, and one 400-k. w. 500-volt d. c. Crocker-Wheeler generator, driven by a Bates tandem-compound Corliss engine, all 3 engines running non-condensing, with exhaust steam going to a feedwater heater. Furnace blast is supplied by 3 Nordberg piston blowing engines, each of 20,000 cu. ft. capacity per minute, and 3 Nordberg duplex cross-compound piston blowing engines, each of 30,000 cu. ft. capacity per minute, supplying blast at 50 oz. pressure to a common blast-main, above the charge floor. Converter blast is furnished by 2 Nordberg duplex cross-compound air compressors, supplying 10,000 cu. ft. per minute each, at 12 lbs. initial pressure. An Ingersoll-Rand air compressor furnishes air at 100 lbs. pressure for operating the charging doors and sundry pneumatic tools. The electric plant includes a 110-k. w. 250-volt Keystone generator, direct-connected to a Ball tandem-compound engine furnishing current for electric light, and there is a motor-generator set for transforming a 500-volt current to 220-volt current for electric lighting outside of the power plant.

The smelter boiler house has four 512-h. p. Altman & Taylor water-tube boilers, with Murphy automatic stokers and Foster superheaters, delivering steam at 175 lbs. pressure, with 150° superheat. Coal and ashes are handled mechanically by a bucket and chain conveyor, an 800-ton steel coal bunker being located to feed automatically to the boilers. A brick transformer house was added to the plant in 1915.

The smelter treated 424,197 tons of company ore in 1910; 436,285 tons in 1911; 444,289 tons in 1912; 470,135 tons in 1913; 485,051 tons in 1914; 475,301 tons in 1915; 385,188 tons in 1916. Smelting costs last year were \$1.18 per ton of ore smelted.

Water is pumped from the Ocoee river by three 10" 2-stage Worthington pumps, belt-driven by motors, each with capacity of 2,800 gals. per minute, to large storage tanks above the smelter. A 4,000,000-gal reservoir at about the level of the furnace floor receives the flow from the water-jackets.

The company operates a quartz quarry at Austral, Tenn., 35 miles N. of Copperhill, on the Louisville & Nashville railway. Equipment of the quarry consists of a boiler, air compressor, rock drills and a Bucyrus steam shovel.

The mines, smelter, and acid plants employ a total of 1,650 men.

The smoke damage situation is complicated by the location of the

works, which are in the extreme S. E. corner of Tennessee, winds carrying the bulk of the fumes into the State of Georgia, by reason of which the State authorities of Georgia brought suit against the Tennessee Copper Co. and the Ducktown Sulphur Copper & Iron Co. in the Federal courts, and the latter decided that the smelters must cease operations or stop the fumes by using them for a sulphuric acid plant. This undertaking proved much more difficult than was anticipated by reason of the intermittent and varying nature of the gas supply from the blast furnace tops.

The No. 1 acid plant cost about \$1,600,000 and was put into full operation early in 1908, with a rated capacity of 120,000 tons yearly of 60° Beaumé chamber acid. With the completion of the No. 2 acid plant in July, 1916, the company had 2 large lead chamber plants for the manufacture of 60% acid, with an estimated capacity of 300,000 tons per year. No. 1 was overhauled by July, 1917. There are also plants for concentration of sulphuric acid to 66° and 97½%, and for manufacture of nitric acid.

As the furnace gases contain sulphur dioxide, sulphur trioxide, carbon dioxide, oxygen and nitrogen in considerably varying percentages, new methods of control were found necessary to maintain the volume of sulphurous gases suitable for making sulphuric acid by the chamber process. After some experimentation the problem was solved by equipping 1 of the smaller and 3 of the larger blast furnaces with tight tops, above the charge floor, to exclude atmospheric air, these being connected with a dust chamber, where most of the solid matter is precipitated from the gas, the dust chamber being so constructed as to conserve the heat of the gases sufficiently to concentrate the acid in the Glover towers. There are 2 octagonal Glover towers of 30' diameter and 50' height with suitable nitre plants at the foot of each. After passing through the towers the gases are conducted through very large lead flues of 200 sq. ft. sectional area, which deliver the fumes to the chamber system containing 4,600,000 cu. ft. of chamber space. In a general way the chamber plant is of conventional design, yet the enormous quantities of fumes received and acid produced have brought about developments that are quite new to the industry, among the most notable being the size of gas connections, acid lines, acid coolers and fans, which are all on a scale never before known. The discharge from the chamber plant is conducted into 11 Gay-Lussac towers, which are of a gigantic size, the 3 latest and largest being octagonal of 36' diameter and 65' height. The company has contracted for the sale of its entire production of sulphuric acid to the International Agricultural Corporation, at a price understood to be \$4.81 per ton, the contract expiring on Dec. 31, 1920. This acid plant is the largest and most complete in existence.

Recent Production:

	Tons Ore Smelt.	Lbs. Cu. per Ton Ore	Oper. Cost per Ton	Production			
				Acid Tons	Copper Lbs.	Cost per Lb.	Rec. per Lb.
1916	385,188	24.41	\$3.51	181,637	9,404,295	14.36c	.....
1915	475,301	26.83	2.82	210,666	12,750,418	10.53c	16.274c
1914	485,051	26.54	3.14	210,163	12,871,113	11.84c	13.706c
1913	470,135	28.70	3.25	197,713	13,493,140	11.34c	15.748c
1912	444,289	29.80	3.27	192,084	13,252,634	11.00c	.....
1911	436,285	31.65	3.44	.....	13,808,940	10.88c	.....

Silver produced in 1916 amounted to 55,790 oz.; gold, 219 oz.

Low-grade copper ores are treated profitably at other points, but in nearly all other cases there are considerable gold and silver values, which

are lacking in the case of the Tennessee. This company has shown both courage and ability in changing the old method of semi-pyritic smelting, and has shown equal ability and greater courage in the installation of its acid plant, by virtue of which a very serious handicap has been turned into a permanent source of large revenue.

This progressiveness received a setback in March, 1916, when the trinitrotoluol plant, built with \$1,500,000 advanced by the Russian Government, was burned down and suit for recovery of the money begun by lender. The quarterly dividend was omitted on this account.

Events in 1916 were briefly as follows: There was a cave at the principal mine, strikes started, and there were other labor difficulties. These reduced copper and acid production. Then serious defects developed at No. 1 acid plant, which had to be practically rebuilt. The T. N. T. plant destroyed by fire has not been reconstructed. The claim of the Russian Government is disputed by Tennessee Copper Co. and the action is pending. Most of the other claims and suits against the company have been satisfactorily settled, that with the International Agricultural Corporation (which see) reported as settled for between \$400,000 and \$500,000 cash. By 1918 Tennessee Copper should be through with all its troubles, and making much larger profits.

TEXAS

During 1917, increased mining activity has prevailed in the State. In West Texas, in the sulphur fields of the Pecos valley, two companies, the West Texas Sulphur and the Michigan Sulphur & Oil Co., have entered the field. The total output of the latter company now is about 35 tons of sulphur per day. The West Texas Sulphur Company is the owner of three sulphur properties and is occupied in perfecting plants to extract the sulphur.

There is considerable mining activity in the eastern part of El Paso county. The Hazel mine, 10 miles north of Allamore, is shipping considerable quantities of high-grade copper-silver ore. Two miles north of this mine are several prospects which are showing up good, regular shipments of copper ore being made to the El Paso smelter. The Little Lightning mine, located in the Quitman mountain district, a few miles west of Sierra Blanca, Texas, is doing well, sending high-grade copper sulphide to the smelter at El Paso.

Several quicksilver companies in the Big Bend region of Brewster county are producing large quantities of quicksilver. Many old openings have been renewed, resulting in increased output. The Colquitt-Tiger Quicksilver Company is one of the heaviest producers. In the Terlingua district of Texas the most successful and heaviest producing companies are the Texas-Almaden Mining Company; Study-Butte Mining Company; the Chisos Mining Company, and the Mariposa Mining Company.

The mining companies of the State are arranged alphabetically.

AMERICAN SULPHUR CO.

TEXAS

Controls Freeport Sulphur Co. mines at Freeport, Brazoria Co., Tex., at mouth of Brazos river on Gulf of Mexico. Deposit covers 500 acres.

Sulphur occurs in pockets and veins, in porous gypsum deposit beneath limestone cap and many hundred feet below surface of ground. Recovery is by superheated water, compressed air raising the melted sulphur to surface. This is the well-known Frasch process.

Equipment: includes 4 plants aggregating 23,800 h. p., one 3,000 h. p. plant built in 1912, and a 4,000 h. p. plant in 1914.

CHISOS MINING CO. (Quicksilver).**TEXAS**

Howard E. Perry, pres.-gen. mgr., Terlingua, Brewster Co., Tex. Property is at Terlingua, 108 miles S. E. of Marfa on the S. P. R. R. Cinnabar ore occurs as replacement deposits in limestone and shale. In the lower limestones the ores are generally in nearly vertical calcite veins, or in lodges of friction breccia. For geology see Texas Bull. 405, 1909.

Development: by shafts. The mine, which is the only operator in the district, had a record-breaking year in 1915. **Production:** 1,200 flasks of mercury in Nov. and Dec., 1915, yearly output not available.

Equipment: includes an 18-ton shaft furnace. Employs 150 men.

COLQUITT-TIGNER QUICKSILVER MINE.**TEXAS**

Marlow Wells, mgr., Terlingua, Texas. Reopened June, 1916, and 40-ton furnace started.

CONSOLIDATED KANSAS CITY SM. & REF. CO.**TEXAS**

Owns the El Paso smelter at El Paso, Tex. Company owned by American Smelting & Refining Co., and property described under that title.

EL PASO SMELTER**TEXAS**

Address: Kuno Doerr, gen. mgr.; J. Heggie, supt., El Paso, Tex.

Is a subsidiary of the American Smelting & Refining Co.

The smelter proper occupies 43 acres out of a 1,100-acre tract of land which is traversed by the Santa Fe, El Paso & Southwestern and the Southern Pacific railways.

The monthly average of cars of ore that is brought to the smelter from the surrounding mines has never been less than 1,600. Often it has run as high as 2,300 cars per month and in a few instances even larger amounts of ore have been handled in a month. The business has yearly increased and the facilities for handling ore are also yearly increasing.

Three Godfrey lead roasters and eight mechanical roasters average from 1,200 to 1,500 tons daily. There are three reverberatory copper smelting furnaces, that in practice actually smelt 1,200 tons of copper ore in a working day.

The constant increase in the tonnage of copper smelted at the El Paso smelter has made it necessary to replace the two 10' diameter, 30' long Pierce-Smith converters which have been in use by 2 new converters of the same type, each of which is 30' in length and 13' in diameter.

A 12' Great Falls type converter converts in connection with the others 200 tons of blister copper per day and is not the least important item in the equipment. From 1,500 to 2,000 tons of lead are smelted each month.

An interesting mechanical feature is the 90' craneway span over which two 60-ton cranes are operated. The new converter stack is 300' in height, is 16' in diameter and was built of concrete. The smoke and escaping gases reach this stack through a steel "Balloon type" flue 4,400' long.

Ore worth \$1,500,000 a month and over \$18,040,000 a year are smelted in the plant, which covers 43 acres of ground.

The El Paso smelter is a city within itself, with stores, fire station, church, an electric light plant that could light a city of 50,000; parks, water works and office buildings. A portion of the grounds were used during 1916 and 1917 by United States troops as a military post. The hospital has a number of ever-ready beds and a resident physician. The smelter owns and operates a complete railway system, and more than 7,000 people who live in El Paso look to it for support.

The smelter treats ores from Old Mexico; from the Chino Copper Company in Hurley, N. M.; from the Santa Rita Mining district and from the Globe, Twin Butte, Sahuarita, Patagonia and Dragoon districts of Arizona from the Magdalena, Oro Grande and the Silver City districts in New Mexico.

EMPIRE SMELTING & REFINING CO. **TEXAS**
 Inc. 1917, in Chicago, Ill. Cap., \$100,000. Offices in San Antonio and El Paso.

FREEPORT SULPHUR CO. **TEXAS**
Address: Bryan Heights, near Freeport, Texas.
Property: extensive area near the mouth of Brazos river, Brazoria county, Texas.

Geology: sulphur occurs in pockets, cavities, and as streaks impregnating gypsum, or a formation in which gypsum predominates. The bed is about 1,000' from the surface.

Development: by wells drilled to the sulphur bearing formation.
Process: the sulphur is extracted from the rock by the well-known Frasch process. Steam is made in boilers and used in water-heaters, each capable of heating 1,000 gals. of water a minute from 60° to 336° F. under a pressure of 100 lbs. This superheated water is forced down the wells to the formation, the sulphur melts, and rises to surface where it cools. Sulphur is pure and is mostly used in the paper pulp industry, the remainder being used for sulphuric acid manufacture.

Equipment: complete with oil storage, 4½-mile oil pipe line, canal from river, pumping plant, water purification plant, compressors, and large battery of boilers.

HAZEL MINING & MILLING CO. **TEXAS**
Officers: John V. Hughes, Dallas, Tex., pres.; G. G. Wright, v. p.; C. F. Freeman, Dallas, Tex., sec.; R. B. Stichter, treas. **Directors:** J. V. Hughes, T. J. Oliver, G. H. Cox, C. A. Culter, C. F. Freeman, Milton Parks and G. G. Wright.

Property: the Hazel Silver mine, in Diablo mountains, 15 miles N. E. of Van Horn, Culberson Co., Tex., shows a fissure vein that yields chalcocite ore with barite gangue. Shipping ore said to average 10% copper and 50 oz. silver per ton.

Development: includes 700' shaft and extensive workings at various levels. Mine was worked for 10 years by H. G. Clifford of El Paso and A. C. Schriver of San Antonio, producing \$500,000, but was shut down in 1895. A dry concentrator was erected to treat the old dumps, said to contain about 100,000 tons of \$15 copper-silver ore, but was unsatisfactory and has been converted into a wet concentrator.

Reported that the Sutton Steel & Steel Co. of Dallas has taken over the mine and will install cyanide mill, 1917. O. W. Steel, mgr.

MINERAL MILLING CO. **TEXAS**
Office: Van Horn, Tex.

Officers: H. M. Sutton, pres.; W. L. Steele, v. p. and gen. mgr.; E. G. Steele, sec.; O. W. Steele, asst. mgr.; F. W. Schneider, supt.

PECOS MINING CO. **TEXAS**
 J. Y. Canon and James Dougherty, of Van Horn, Tex, principal shareholders.

Property: the Pecos mine, 3 miles N. E. of the Hazel silver mine in El Paso county, 19 miles from Van Horn, shows a N. E.-S. W. vein in brown igneous tuffs, traceable 2 miles across the mountains to the Red Maverick mine.

Development: by a 105' shaft with a level at 90', showing seams a few inches thick of copper-silver ore, said to assay 70% copper; the seams in places aggregate 2' in thickness. The mine was first operated in 1888, abandoned after working and relocated 1903, by Geo. Briggs and T. R. Owen, forfeited by technicality of Land Commission and located by J. Y. Canon. Presumably idle.

PRESIDIO MINING AND MILLING CO.**TEXAS**

Office: 255 California St., San Francisco, Cal. Mine office: Shafter Tex.

Officers: W. S. Noyes, v. p. and gen. mgr.; E. M. Gleim, supt.

Cap., \$150,000; shares \$1 par; all issued.

Property: the Shafter or Presidio mine, at Shafter, Presidio Co., has a production record of \$6,700,000 since 1883. Ore: carries silver mainly as chloride.

Development: by about 20 miles of workings.

Equipment: includes 1 mile aerial tram, a 15-stamp 100-ton mill and a cyanide plant. The mill is equipped with 2 tube mills, Oliver filter, Pachuca tanks, Dorr thickener and 250-h. p. de La Vergne oil engines.

Production: in 1916 amounted to about \$390,000. The State of Texas produces about 600,000 oz. of silver annually, practically all from this mine, which has an interesting history. The mine, originally called the Bullis, has been productive for nearly 40 years. Litigation started in 1915 by certain shareholders against W. S. Noyes resulted in his being honorably cleared in Aug., 1917.

SHAFTER SILVER MINE**TEXAS**

Owned by the Presidio Mining & Smelting Co., which see.

SHERIDAN MINING CO.**TEXAS**

Llano, Texas.

Operates a copper molybdenite property in the Llano district, Burnet County, Texas.

TAMA SILVER MINING CO.**TEXAS**

Address: Sierra Blanca, Texas.

Is a new company developing a group of claims in the Quitman district, El Paso County. The ore is silver lead and is found in replacement deposits in limestone.

Adjacent properties include the Thunderbolt group on the lead and zinc bearing Bonanza lode, owned by Geo. H. Stokes, which is developed by two tunnels. Love Bros, are also working similar silver lead deposits at the head of Quitman canyon, 9 miles S. E. of Sierra Blanca.

UTAH**SALT LAKE CITY**

Salt Lake City is a mining center from which the Alta, American Fork, Big and Little Cottonwood, Bingham, Mercury, Tintic and Santaquin districts are reached, and most of the operating companies have offices there. The following list of companies operate at or near the city; others are listed under the district name or county name.

GARFIELD CHEMICAL MANUFACTURING CORP'N**UTAH**

Subsidiary of the American Smelting & Refining Co.

Officers: C. W. Whitley, pres.; C. M. McNeil, v. p.; R. G. Gemmill, v. p.; J. M. Bidwell, sec.-treas.; and E. L. Newhouse, mgr.; above with J. M. Hays, directors.

Treats at Garfield concentrate from the Utah Copper Co. and custom ores from scattered points in Utah. To supply sulphuric acid for leaching copper ore and other purposes, a 150-ton acid plant costing nearly \$500,000 was erected late in 1916. Fumes from the smelter supply the sulphur.

Equipment: two 20' Herreshoff roasting furnaces of 50-ton capacity each, brick-lined steel flue, pyrite burners, Glover tower, lead-lined acid chambers, and two Gay-Lussac towers. Both 66° and 98° B. acid ore

made. Leaching and flotation plants nearby will consume most of the acid.

GARFIELD SMELTING CO.**UTAH**

Office: 165 Broadway, New York. Operating office: 714 McCornick Blk., Salt Lake City, Utah. Works office: Garfield, Salt Lake Co., Utah. Is the Utah Copper Co. smelter, owned by American Smelters Securities Co., and itself owns the Garfield Water Co. and the Garfield Improvement Co. The smelter has cost, complete, about \$6,000,000. Fully described Vol. X.

Capacity has been almost trebled by additions and metallurgical improvements since 1911.

HANAUER SMELTING WORKS**UTAH**

At Salt Lake City, Utah. Controlled through stock ownership by American Smelting & Refining Co.

KING COPPER MINING CO.**UTAH**

Office: Salt Lake City, Utah. Located on the divide between Emigration and Red Butte canyon, 12 miles E. of Salt Lake City, Utah. Controlled by the Baileys of Salt Lake.

Property: shows 6' ledge of copper carbonates on contact between quartzite and blue limestone. Is developed by 300' tunnel, principally in sandstone. Ore said to carry \$14 in gold, copper and silver.

ROB ROY MINING CO.**UTAH**

Address: P. T. Farnsworth, 164 E. S. Temple St., Salt Lake City.

Mine near Beaver City, Utah, at mouth of Indian Creek Canyon. T. P. Farnsworth, Salt Lake City, owner. Developed to depth of 300'. Reported about to resume operations, 1916. Mine has produced very rich gold ore, but was closed down several years ago when the vein was cut off by faulting. Tunnel was to be driven south in hopes of finding ore-body.

ST. PATRICK MINING & MILLING CO.**UTAH**

Idle. Office: 855 Sherman Ave., Salt Lake City, Utah. Mine office: Hughes Canyon, Salt Lake Co., Utah.

Officers: D. A. Buck, pres.; H. H. Paterson, v. p.; B. A. M. Froiseth, sec.-treas.

Inc. March 17, 1906, in Utah. Cap., \$50,000; shares 20c par; non-assessable; issued, 180,000 shares.

Property: 6 claims, unpatented, 7 miles from railroad, opened by shaft and tunnel, with about 650' of workings, showing gold and silver-copper ore. Annual assessment work only being done.

UTAH ORE SAMPLING CO.**UTAH**

Office: Salt Lake City, Utah.

Officers: Jesse Knight, pres.; E. P. Ellison, v. p.; W. L. Mangum, sec.; with J. W. Knight and R. E. Allen, directors. F. M. Manson, gen. mgr.; E. G. Jensen, asst. gen. mgr.; Frank Burgner, gen. supt. at Murray; Geo. Green, supt. at Silver City.

Cap., \$300,000.

Company owns and operates ore-sampling mills at Murray and Silver City, with combined capacity of 500,000 tons of ore annually.

WEST JORDAN SMELTER**UTAH**

Owned by U. S. Smelting Co., at West Jordan, Utah.

*EMERY, GRAND, IRON, MORGAN, SAN JUAN, UINTAH,
WASATCH AND WEBER COUNTIES.*

BIG INDIAN COPPER CO.**UTAH**

Office: Provo, Utah. Col. C. E. Loose, pres.-gen. mgr.; J. T. Farrer,

v. p.; P. G. Peterson, sec.-treas. and supt.; Niels C. Christensen, metallurgist. Col. Loose and Senator Smoot are the principal owners.

Inc. in Utah. Cap., \$1,000,000; shares 1c par; 185,000 taken by insiders, 700,000 issued for property; 100,000 shares offered the public in 1917 at \$1.

Property: 21 claims, 11 patented, about 350 acres, 38 miles S. E. of Moab and 60 miles from the D. & R. G. railway at Crescent, San Juan Co., Utah. Claims are said to show copper ore occurring disseminated through sandstone with sulphides appearing at 100' depth.

Company started operating a 300-ton leaching plant to use the sulphur dioxide process to treat a large tonnage of 3% ore, in November, 1917. Water is piped from La Sal ranch 7 miles distant.

CALUMET MINING CO.

UTAH

Address: Lund, Iron Co., Utah.

Property: 19 claims, 30 miles N. W. of Lund, developed during 1917. Management estimates 2,000 tons of 30% lead and 2 oz. silver ore available above 75' level. Shipments in Aug., 1917, yielded \$3,000. Production to Sept., 1917, was about 700 tons.

ELDORADO GOLD MINING & MILLING CO.

UTAH

Don Maguire, mgr. and principal owner, Ogden, Utah.

Property: 900 acres, said to show silver-lead-zinc ore in limestone-quartzite contact. Copper ores occur in granite. Shipments in 1912 ran 37.5% lead, 10 oz. silver and \$2 gold. Mine is said to show 40,000 tons of 15% zinc ore and 100,000 tons of silver-lead ore.

Development: includes 1,400' tunnel. In 1917 operations consisted of road work, repairs, etc. Plans mine development and installation of a new tramway.

GREEN MOUNTAIN MINING & MILLING CO.

UTAH

Probably idle. No 1917 returns secured.

Officers: Dr. R. S. Millbee, Marshfield, Wis., pres.; Dr. H. H. Millbee, v. p.; A. E. Goodell, sec.; S. Amberson, treas.; with B. S. Rich, directors. Inc. 1915, in Utah. Cap., 1,500,000 shares; 100,000 issued.

Property: Green Mountain group in Miners Basin, Grand Co., Utah, 35 miles S. E. of Cisco, on the Denver & Rio Grande R. R., formerly owned by the Green Mtn. G. & C. Mng. Co. and fully described in Vol. XI, Copper Handbook.

Ore: gold, silver and copper, low-grade ore said to average about \$8 per ton; also said to show some high-grade ore. Developed by Dewey crosscut tunnel.

Equipment: 30 h. p. gasoline engine, 2 sets of power drills, compressor and pumps.

JEANETTE COPPER MINING & MILLING CO.

UTAH

Address: via Vernal, Utah.

Officers: J. T. Fitch, pres.; F. B. Hammond, v. p.; C. R. Jones, sec.-treas., with G. A. Storrs and W. H. Griffin, Jr., directors.

Cap., \$200,000; shares 20c par.

Property: 34 unpatented claims in the Uintah basin, Utah, 55 miles S. of Rock Springs, Wyo.

Development: by 1,000' of tunnels and shafts, costing \$10,000. Ore contains up to 20% copper and good gold and silver contents. Shipments were made in 1916.

The long haul prevents shipping ore at a profit, and a plant was planned at last accounts.

MORGAN ARGENTINE MINING CO.

UTAH

Office: 431 First Ave., Salt Lake City, Utah. Mine near Peterson, Morgan Co., Utah.

Officers: Herbert Pembroke, pres.-gen. mgr.; A. B. Pembroke, sec.-treas.

Inc. 1900, in Utah. **Cap.**, \$500,000; shares 1c par.

Property: 15 claims, 9 patented, 280 acres, in Argenta district, shows fissure veins in limestone carrying silver-lead and copper-gold ore.

Company reported May, 1917, that it was starting extensive development work and had purchased machinery.

MORGAN-GALENA MINING CO.

UTAH

Address: 417 Kearns Bldg., Salt Lake City, Utah.

Officers: J. W. Rozzelle, pres.-treas.; A. H. Levine, v. p.; J. H. Ritchie, sec., with F. H. Ashihira and Frank Troxler, directors.

Inc. Oct., 1916, in Utah. **Cap.**, \$100,000; shares 10c par; non-assessable; 500,000 issued.

Property: 6 claims in Morgan county, Utah, said to contain fissure veins in porphyry carrying 37% lead ore with some gold-silver values. Development by shafts and tunnels. Is considered a good prospect.

NATIONAL RADIUM MINES CO.

UTAH

Henry Schwartz, Denver, Colo., pres. **Inc.** in Colorado. **Cap.**, \$400,000.

Property: in Green River district, Emery Co., Utah, shows uranium and vanadium ore in a 5' vein, said to run as high as 20% uranium. Developing in 1916.

SILVER PEAK MINING CO.

UTAH

J. R. Richards, mgr., Cedar City, Utah. **R. B. Shepard**, pres., 408 State St., Salt Lake City. **T. F. Jennings**, sec.-treas., Garfield, Utah.

Inc. July, 1915, in Utah. **Cap.**, \$10,000; shares 1c par; 600,000 issued.

Property: the Blair mine, 6 claims, 120 acres, unpatented, near Pinto, in Pinto Iron mining district, Iron Co., Utah, shows a contact deposit 8'-10' wide carrying copper-lead ores with gold-silver values.

Development: 200' shaft and 2 others. Dumps show 100 tons of \$8 to \$300 ore. Company doing assessment work only.

SOUTHERN PACIFIC GOLD & COPPER M. & M. CO.

UTAH

Office: 39 North Capitol Ave., Salt Lake City, Utah. Mine near Ogden, Weber Co., Utah.

Officers: T. S. Freney, pres.; Wm. Pough, v. p.; J. W. Burnham, sec. and gen. mgr., at last accounts.

Inc. July 20, 1903, in Utah. **Cap.**, \$1,000,000; shares \$1 par; assessable; issued 798,910. Shares are listed on the Salt Lake Stock Exchange.

Property: 12 claims, unpatented, 240 acres, 3 miles from a railway and about 8 miles north of Ogden, in the Sierra Madre district, reported to carry 25 orebodies, mainly contact deposits between quartzite and gneiss. The main vein of about 50' width, shows some oxidized ores, but mainly auriferous sulphides, including covellite, bornite and chalcopyrite, with some molybdenite, in a 6' vein.

Development: by 65' incline shaft on the Wizard claim, and 8 tunnels, with about 1,000' of workings, said to show ore assaying up to 6% copper, 37 oz. silver and \$1.60 gold per ton.

UTAH PLACER MINING CO.

UTAH

Address: Cisco, Grand Co., Utah.

Officers: Eli Punshon, pres.; L. Charrington, v. p.; Harry Snyder, sec.-treas., with E. Helmerich, T. Peterson, M. Murphy and J. H. Butcher, directors.

Property: 1,320 acres of placer ground on the Grand river, Utah. Gravel is said to carry from 40c to \$3 gold per yard, also some platinum. One channel is 9 to 20' deep. To treat this material a **W. F. Mitchell**

mill of 420 tons daily capacity is being tested in connection with a drag-line scraper and concentrating tables.

If company has so much gravel it would be better to use a dredge of standard design, if enough water is available. Few dry or wet gravel concentrators are a success.

WASATCH BONANZA MINING CO.

UTAH

Officers: Burdell Davis, pres., Provo, Utah; Wm. Davis, v. p.; Brigham Johnson, sec.-treas.; J. M. Buckner, Geo. A. Storrs, directors.

Inc. May, 1916, in Utah. **Cap.**, \$10,000; 1c par.

Property: 4 claims, the Mayflower group in Decker Canyon, near Charleston, Wasatch Co., Utah.

WOLF MOUNTAIN COPPER CO.

UTAH

Office: C. A. Harker, 506 Eccles Bldg., Ogden, Utah.

Officers: C. A. Harker, pres.; P. M. Parry, v. p.; S. A. Holmes, sec.-treas., with J. R. Cole and J. S. Lewis, directors.

Inc. Jan. 31, 1914, in Utah. **Cap.**, \$100,000; shares 10c par; assessable; all issued.

Income 1916 was \$7,796, \$693 coming from ore sales. Expenses were \$7,826.

Property: 37 claims, 33 patented, 720 acres, in Paradise or La Plata district, 5 miles S. of Hyrum, Cache Co., Utah, said to show a fissure vein in quartzite, 45' wide, dipping 37°, with N.-S. course. Ore carries 4½% copper, 2 oz. silver, and 30c gold per ton. Examined by W. F. Mitchell, Don Maguire and J. G. Lind.

Development: by 70 and 350' tunnels. Openings total 820'. Ore blocked out is said to be 10,000 tons and 20,000 tons probable. A 3,000' tunnel is proposed.

Production: 80 tons in 1915 and 1916, the latter averaging \$19.65 per ton. Shipments in 1917 started in July.

For the work done ore reserves seem out of proportion.

ALTA COTTONWOOD DISTRICT

Includes Big Cottonwood and Little Cottonwood

ALBION MINING CO.

UTAH

Office: 703 McIntyre Bldg., Salt Lake City, Utah. **Mine office:** Alta, Utah.

Officers: Wm. Hatfield, pres.; C. E. Loose, v. p.; H. T. Hatfield, sec.-treas., with P. G. Peterson and W. M. Bradley, directors; Col. Geo. H. Watson, gen. mgr.; Sol Snyder, supt.

Inc. 1903, in Utah. **Cap.**, \$1,000,000; shares 10c par; 735,000 shares outstanding. Assessment No. 15 of 1c per share levied October, 1917. Stock listed on Salt Lake Exchange and New York Curb.

Property: 11 patented claims, 250 acres, in the Alta Cottonwood district adjoining the South Hecla ground on the south, includes the Wellington mine of the Albion Group, formerly owned by the Wellington Mining Co. and credited with a \$1,000,000 production from shallow workings. Company advertised March 29, 1910, as delinquent in payment of Utah corporation tax, but refinanced in May, 1915, and operations reported resumed in June, after an enforced shutdown since the panic of 1907.

Further development is expected to cut the Greeley fissure through the 3,800' Quincy tunnel of the South Hecla at a depth of 1,300'; a raise driven up 110' to explore the Hays fissure discovered the Connor vein, carrying bunches of copper-silver-gold ore, said to assay 37 ozs. silver per ton.

Equipment includes machine drills, water power and a 30-ton mill, with jigs, putting about 4 into 1, giving concentrates with small and variable assays in copper, 35 to 40% lead, 40 to 45 oz. silver and 0.15 oz. gold per ton.

The Albion Group, being developed under lease by R. S. Witcher, covers about 2,000' of the Cardiff lode, intersected by the Greeley, Kate Hayes, Garfield fissures; on the first two a high-grade shoot of black sulphides 4' wide has been opened up on a porphyry and limestone contact; this ore is said to assay 1.7% copper, 22% lead, \$1 gold and 26 ozs. silver



PROPERTIES IN ALTA-COTTONWOOD DISTRICT, UTAH

per ton. Shipments begun in October, 1915, reported to average \$50 per ton and netting about \$30 to the leasers.

No recent returns.

ALTA CONSOLIDATED MINING CO.

UTAH

Office: 201 Judge Bldg., Salt Lake City, Utah. Mine office: Alta, Salt Lake Co., Utah. R. S. Lewis, pres.; R. P. Morris, v. p.; W. E. Weyher, sec.-treas., with John Dorius, directors. R. A. Brown, cons. engr.; J. D. Lewis, mgr.

Inc. Aug., 1911. Cap., \$300,000; shares \$1 par, the promoters taking 100,000 shares, and 200,000 shares being placed in the treasury, of which amount 100,000 shares were sold at 20c per share; capitalization was increased Oct. 10, 1913, to \$500,000, to provide stock for treasury purposes, practically all issued Jan., 1916. Stock listed on Salt Lake Exchange.

Property: 17 claims in the heart of Alta's mineralized zone between the Emma and the Michigan Utah properties, include several old mines. Ores are lead and copper sulphides, highly argentiferous. Ores occur as bedded tabular replacement deposits adjacent to crosscutting fissures and are parallel to the bedding and fissure intersections. The Braine fissure, the most important ore-bearing channel of the camp, known for 2 miles and explored on Alta Consolidated ground for 800'. The existence of cross-cut fissures and a porphyry dike are favorable geologic features.

Development: 5,000' of tunnels exposing a deposit of copper ore 20' wide, carrying 2% copper, 80c in gold and silver and excess iron, and worth about \$6.00 at the Garfield smelter, 24 miles away. With cheaper freight (present teaming and freight is \$3.65) it could be worked. Ore occurs at contact between flat dipping quartzite and limestone. The main working, or Silver King tunnel is 300' below the Brooklyn tunnel and an equal distance above the new Alfred tunnel. All recent development is from the main tunnel which follows in a general way the Braine fissure. Drifts east and west from this tunnel have raises to reach the ore. Shipments were made during 1915 from Hoboken lease and from small orebodies encountered in the company workings. In Nov., 1917, it was reported that a drift from the copper Prince tunnel had cut good gold-silver ore.

Past representations of mine management have been misleading and unduly optimistic. While the property has merit the company has no stock in reserve, but was reported out of debt, Nov., 1916, with \$10,000 in the treasury for development purposes.

ALTA COTTONWOOD MINING CO.

UTAH

Address: Salt Lake City, Utah. A. O. Jacobson, pres.; Franklin Webb, v. p.; Val. S. Snow, sec.-treas.; preceding officers, J. C. Wood and R. S. Lewis, directors.

Inc. 1915. Cap., \$250,000; shares 25c par.

Property: 28 claims, 18 patented, known as the Argenta group, located in the Big Cottonwood district, 7 miles southwest of Park City. Claims adjoin the Maxfield mine on the south and the Cardiff on the north. In 1917 the company was planning to start work on a long drainage and exploration tunnel that had already been driven 1,300'.

ALTA DIVIDE GOLD MINING CO.

UTAH

Officers: A. F. Ellgren, pres.; L. H. Hardy, treas.; A. Y. Hardy, sec.; with C. W. Knudsen, and E. M. Tyson, directors.

Inc. April 22, 1916, in Utah. Cap., \$100,000; shares 10c par; 600,000 shares in treasury.

Property: 34 unpatented claims, in Big and Little Cottonwood districts, near Alta, Salt Lake Co., Utah, shows gold values in a vein up to 30' wide in a shale quartzite contact.

Development: commenced in Spring of 1916.

ALTA-GERMANIA MINES CO.

UTAH

Office: 161 So. Main St., Salt Lake City, Utah. **Mine office:** Alta, Utah.

Officers: Geo. H. Watson, pres.-mgr.; Herman Bamberger, v. p.; Robt. F. Marvin, sec.-treas., with H. C. Edwards and D. W. Harcrow, directors.

Inc. in Utah. Cap., \$100,000; shares 10c; assessable; 78,714 outstanding. First assessment of 1c per share levied October, 1917. Stock listed

on Salt Lake Exchange. Financial statement to Jan. 1, 1917, shows resources as follows: mines and plant, \$47,200; mine development, \$6,439; cash in bank, \$1,314; discounts on sale of treasury stock, \$24,356; treasury stock, \$21,286; with accounts payable, \$597.

Property: 67 acres in Little Cottonwood district, adjoining the South Hecla, said to show silver-lead-copper-gold ore. At present development is being done through Dominic tunnel, but will eventually be done through the Quincy tunnel level of the South Hecla mine.

ALTA-MICHIGAN MINES CO.

UTAH

Office: 161 So. Main St., Salt Lake City, Utah. **Mine office:** Alta., Utah.

Officers: same as South Hecla Mining Co.

Inc. in Utah. Cap., \$100,000; shares 10c par; assessable; outstanding, 25,713. First assessment of 1c per share levied October, 1917. Listed on Salt Lake Exchange. Financial statement to Jan. 1, 1917, shows total resources, \$101,000, which includes: mines and plant, \$16,250; treasury stock, \$74,287; and cash, \$1,864; accounts payable, \$1,000.

Property: 17 acres, in Little Cottonwood district, said to show silver-lead-copper-gold ore. Development work is being carried on through the Quincy tunnel level of the South Hecla mine. A prospect.

ALTA MINING & DEVELOPMENT CO.

UTAH

Address: 102 Mercantile Annex, Salt Lake City, Utah.

Officers: Chas. A. Walker, pres.-mgr.; J. R. Walker, v. p.; H. M. Chamberlain, sec.-treas., with Walter C. Lewis and John M. Moore, directors.

Inc. June 29, 1906, in Utah. Cap., \$600,000; shares \$1¹/₂ par; 326,500 held in treasury. Annual meeting 1st Monday in January. Columbia Trust Co., Salt Lake City, Utah, transfer agent.

Property: about 160 acres, is in the Alta Cottonwood district and located at the head of Little Cottonwood canyon. Lands include the townsite at Alta. Adjoining on the west are the Wasatch mines, and on the north, east and south the South Hecla. The management planned to continue a 330' tunnel that had been started in 1907 at a distance of 3,600' from the townsite down Little Cottonwood Creek. The object in driving the tunnel was to explore the ground under the townsite at a depth of 500'. Several contacts and well-defined fissures are said to cross the property. Idle, 1917.

ALTA PRINCE MINING CO.

UTAH

J. S. Johnson, pres.; C. W. Frees, sec.-treas., 739 E. 21st St., South, Salt Lake City, Utah.

Cap., 1,000,000 shares, par 25c; 300,000 shares in treasury.

Property: 2 claims, patented, at Alta, Salt Lake Co., between the Michigan-Utah and the Prince of Wales Mining Co.'s property. Development tunnel 1.065' at 500'-depth.

ALTA SUPERIOR M. & M. CO.

UTAH

Office: Provo, Juab Co., Utah.

Officers: J. I. Bullock, pres.; F. E. Brown, sec.; W. H. Horner, supt.

Inc. March, 1909, in Utah. Cap., \$50,000; shares 5c par; assessable. Previously known as Mineral Flat Extension M. & M. Co.

Property: 2 miles S. of Alta, Little Cottonwood district, Utah.

Development: by tunnel and shaft. Ores contain copper, silver and lead.

ALTA TIGER MNG. CO.

UTAH

Address: 420 Boston Bldg., Salt Lake City. **Mine office:** Alta, Utah. J. E. Phillips, pres.; Daniel Phillips, v. p.; A. T. Sanford, sec.-treas.

Inc. 1915. Cap., \$7,000; divided into 700,000 shares; assessable; with

20,000 remaining in the treasury. Report of 1917 gives bills payable \$200.

Property: the Tiger patented claim, 6 acres and an interest in the Highland Chief claim, in the Alta-Cottonwood district, north of the town of Alta. The management intended to work the Tiger claim ground through the Highland Chief claim tunnel. The tunnel was cleaned out in the summer of 1915 when it was found that the Tiger ground had been mined to a considerable extent in early days. The work since has been devoted to the unexplored ground. One shipment made in 1916, claimed to have assayed 18% lead and 16.8 oz. silver per ton.

ALTA TUNNEL & TRANSPORTATION CO. UTAH

Office: 618 Newhouse Bld., Salt Lake City, Utah.

Officers: John C. D. Clark, pres.; M. P. Braffet, v. p.; John Cain, sec.; F. V. Bodfish, gen. mgr.; preceding officers, V. E. Lollin and Geo. N. Wagner, directors.

Inc. Sept., 1911, in Utah. Cap., \$1,000,000; shares \$1 par; 800,000 issued; assessable; last assessment, 1c per share, called May 12, 1917.

Property: 250 acres, includes the Lucky Dutchman group of 16 claims and the old Alta tunnel ground. Ore occurs in fissure veins in limestone with stringers of ore said to assay 9.7% copper, 21% lead and 13½ ozs. silver per ton.

Development: by drifts and raises which have opened up several rich veins. Company is driving a mile-long drainage and transportation tunnel (2,900' long in Oct., 1917) to open its own and adjoining properties, with portal 3,500' from Silver Fork on the Big Cottonwood, and 8,500' above sea level. Tunnel will be 600' lower than any mine workings of the district and will cut all the great veins of the section.

Equipment. 50-h. p. motor and compressor, drills, a 10' fan for ventilating purposes, a 2-mile power line, boarding house and other buildings. No report from company.

ALTA-UTAH MINES CO. UTAH

Address: G. H. Watson, gen. mgr., Alta, Utah.

Property: an old property in the Cottonwood district, near the South Hecla. In Oct., 1917, one tunnel was in 400'. and another 200'. The latter shows high grade ore. No. 3 tunnel yielded a carload of 3% copper and 15 oz. silver ore. Company was organized late in 1917.

AMERICAN CONSOLIDATED COPPER CO. UTAH

Office: Judge Bldg., Salt Lake City, Utah.

Officers: John C. Barnard, pres.; L. L. Smith, v. p. and mgr.; D. C. Dart, sec.-treas.; with J. W. McKinney and L. R. Wardrop, directors; G. Malmberg, supt.

Inc. 1907, in Utah. Cap., \$600,000; shares \$1 par; non-assessable; changed to 1,000,000 shares; 10c par, October, 1917. Stock listed on Salt Lake Stock Exchange.

Property: 19 claims, 1 patented, in Big Cottonwood district, adjoin the Cardiff and Howell on the west.

Development: several tunnels, longest 2,200', driven to cut the Silver King & Garfield fissures, showing heavy mineralization. Samples said to assay 48% zinc, with lead, gold and silver values.

Equipment: includes compressor, drills and mine buildings. Operations resumed Dec., 1914, after an idleness of several years. Management reports working on 1' of \$110 ore 1,700' from portal of tunnel, 600' under surface and expected to make shipments in 1917.

AMERICAN COPPER MINING & MILLING CO. UTAH

Office: Lehi City, Utah. J. N. Butt, pres.; Charles Anderson, v. p.; A. O. Slade, treas.; preceding officers, Howard Murdock and Chas. Herron, directors; William Asher, sec.

Inc. Aug., 1912. **Cap.**, \$100,000; shares 10c par. An assessment of 1 mill called March, 1914. Property is in Tooele county, but as officers do not reply to letters, no details of the company's holdings are available.
AMERICAN MINING CO. **UTAH**

Office: 27 Latimer Blk., Salt Lake City, Utah. **Mine office:** Brighton, Salt Lake Co., Utah.

Officers: I. A. Benton, pres.; A. L. Headberg, 1st v. p. and gen. mgr.; Wm. Crome, sec.-treas.

Inc. 1896, in Utah. **Cap.**, \$50,000; shares 5c par; assessable; all issued; 26 assessments levied to end of 1910. Annual meeting 3rd Monday in May.

Property: 10 patented claims, on Scott Hill, in Big Cottonwood district, 5 miles from a railroad. Ore occurs as sulphides in lime. Orebody is from 2" to 2' wide and average assays run from 5-18% copper, 10 oz. silver and \$3.50 gold.

Development: About 2,000' of shafts and tunnels.

Property: reported under lease and bond, June, 1917, for \$200,000.

AMERICAN STAR MINING CO. **UTAH**

Office: 403 Dooly Bldg., Salt Lake City, Utah. **Mine office:** Eureka, Juab Co., Utah.

Officers: Imer Pett, pres. and gen. mgr.; Jas. P. Graves, v. p.; Fred R. Sands, sec.-treas.; preceding officers, Geo. E. Davis and Thos. P. Billings, directors.

Inc. 1909, in Utah. **Cap.**, \$1,000,000; shares \$1 par; issued 599,500 shares.

Property: 2 claims, 15 acres, between the Victoria and Chief Consolidated mines, and touching the Plutus on the east and Eagle & Blue Bell on the west. Mine has about 1,000' of workings, made from the 900' level and 1,000' from the 1,350' level of the Eagle & Blue Bell mine, and is developing through the Eagle & Blue Bell, in 1917. Workings show an ore channel of about 60' width. Property considered promising.

ANTELOPE & PRINCE OF WALES MINING CO. **UTAH**

Not incorporated. Controlled by Walker Bros., of Salt Lake City. **Cap.**, \$1,250,000; shares \$1 par; 400,000 shares held in treasury.

Property: 9 claims, patented, in the Alta-Cottonwood district, cover a mile of the Prince of Wales fissure, worked years ago to a depth of 900', said to have produced \$1,000,000 from one shoot alone, and was the "bone of contention" in a celebrated lawsuit in the seventies.

Development: 930' incline shaft and 600' "Annie" tunnel. In 1915 lessees continued the tunnel several hundred feet, cutting the vein 140' below bottom of shaft. Vein where cut is said to have shown good ore containing silver chloride and galena. Company plans to continue the work of the lessees.

BANKERS MINES CO. **UTAH**

Office: J. A. Maxfield, Maxfield Apts., Salt Lake City, Utah.

Officers: Noble Warrum, pres.; J. A. Maxfield, v. p.-sec.; A. D. Williams, treas.; preceding with M. B. Connell, B. Y. Golding and Aquilla Nebeker, directors.

Inc. November, 1916. **Cap.**, 1,000,000 shares; 10c par; 500,000 shares in treasury.

Property: 39 claims, about 780 acres, adjoins the Logger Mine in Big Cottonwood Canyon, and is near the old Maxfield mine.

Development: by a tunnel which is expected to cut the Logger vein at 900' in. At 60' in, (Jan. 1917) tunnel was reported to show specks of galena.

BIG COTTONWOOD CONSOLIDATED MINING CO. **UTAH**

Office: Boston Bldg., Salt Lake City, Utah. **Mine office:** Brighton, Salt Lake Co., Utah.

Officers: J. F. Dunn, pres.; J. E. Johnson, v. p. and gen. mgr.; J. P. Waite, sec.-treas.; preceding officers, Judge Chas. C. Dey, F. J. Fabian, and P. F. Keyser, directors.

Inc. Sept., 1909, in Utah. Cap., \$250,000; shares 25c par; assessable; 900,000 shares issued; listed Salt Lake Exchange. Annual meeting, 1st Monday in October.

Statement for year ended Oct. 1, 1917, shows total expenditures of \$60,672 to date, including \$13,306 for the Victor tunnel in 1916-17. Cash on hand amounted to \$5,058.

Property: 11 claims in South Fork, Big Cottonwood district, Salt Lake Co., carry auriferous and argentiferous lead and copper ore on which work is being done. Driving the Victor crosscut tunnel, now in 1,400', to cut fissure veins in lime and quartzite. No ore reserves developed as yet. Property is a prospect.

BIG COTTONWOOD COPPER & GOLD MINING CO. UTAH

Mine office: Brighton, Salt Lake Co., Utah.

Officers: Col. Nicholas Treweek, pres. and gen. mgr.; W. Mont Ferry, v. p.; J. Leonard Burch, sec.-treas.; preceding officers, J. E. Galligher and John S. Bransford, directors, at last accounts.

Inc. in Utah. Cap., \$1,500,000, increased 1906, to \$3,750,000; shares \$5 par; non-assessable. Is operated as a close corporation.

Property: 140 acres, adjoining the Mountain Lake Consolidated Mining Co., on the southeast, and carrying same ore zone, near the head of Big Cottonwood canyon, and also in the Snake Creek district.

Development: by a shaft, showing ore assaying up to 8% copper, with small gold and silver values, and a long tunnel with about 2,000' of workings. Mine apparently has considerable bodies of sulphide ore, averaging about 5% copper and \$2 per ton in combined gold and silver values.

BIG KING MINING CO. UTAH

Office: 519 Newhouse Bldg., Salt Lake City, Utah.

Officers: S. A. Parry, pres.; H. B. Cole, v. p.; H. H. Harris, sec.-treas., with B. P. Critchlow and G. R. Halstead, directors.

Inc. June, 1916, in Utah. Cap., 600,000 shares; 25c par; 240,000 shares in treasury, August, 1917. Stock listed on Salt Lake Exchange, but trading suspended, February, 1917, by the listing committee.

Property: 24 claims, 480 acres, in Big Cottonwood Canyon, reported to show 3 well-defined fissure veins, carrying copper, silver and iron manganese ore. A prospect.

BOSTON DEVELOPMENT CO. UTAH

Office: 911 Boston Bldg., Salt Lake City, Utah.

Officers: F. H. Vahrenkamp, pres. and gen. mgr.; Thos. Austin, v. p.; Richard Winder, treas.; preceding officers, S. S. Stillman and B. F. Fitzgerald, directors; R. B. Garff, sec.; A. Boulais, supt.

Cap., \$500,000; shares \$1 par; assessable; 3 assessments levied; last one of 3c due Feb., 1917.

Property: the old Maxfield mine on the north side of Cottonwood Canyon, in the Big Cottonwood district, 3 miles north of the Cardiff mine, and 2 hours by auto from Salt Lake City, was taken over on a \$250,000 bond and lease, 1914. The Maxfield mine, discovered in 1872, is one of Utah's well-known early day mines; it is credited with a production of over a million dollars in gold, silver, copper and lead. The present management is said to have spent \$70,000 in 1915, in unwatering and equipping the mine.

Ore: above the water level is silver-lead, carbonate; below, it is galena, containing gold, silver and copper. Orebodies vary in width from 6" to 24".

Development: mainly by tunnels. The mine is about worked out above the main tunnel which was driven north and west, a total of 4,000'. New management plans systematic development work including the sinking of the 1,900' incline shaft.

In Jan., 1917, a new strike was made at 1,900'. The ore was followed for 20' and 700 tons were shipped, averaging \$65 per ton. In Sept., 1917, a narrow vein of rich lead-silver ore was cut at a distance of 1,100' in the tunnel. The ore will average \$165 per ton, it is said.

Equipment: includes 2 air compressors, pumps and electric power.

Production: shipped steadily in 1916. Ore from 1,800' level averaged \$50 a ton.

BRANBORG MINING CO.

UTAH

Office: Judge Bldg., Salt Lake City, Utah. J. C. Barnard, pres.; D. C. Dart, v. p.; L. R. Waldrop, sec.; J. W. McKinney, F. W. Price, directors. Inc. April, 1915. **Cap.**, 500,000 shares; 10c par.

Property: 11 claims, 220 acres, located at Big Cottonwood. A prospect.

CANTON MINING CO.

UTAH

Owens the Canton group of claims in Alta-Big Cottonwood district.

Incorporators: W. W. Armstrong, pres. of Natl. Copper Bank, Salt Lake City; James Farrell and Duncan MacVichie, a consulting engineer, 507 Newhouse Bldg., Salt Lake City.

Property: 500 acres adjoining the Cardiff, Wasatch, Crown Prince and Frederick Mines.

Development: tunnel work aggregates about 3,000'. Reported to have produced considerable tonnage of ore running from 100 to 250 oz. of silver.

CARBONATE CONSOLIDATED MINES

UTAH

Address: Woolley Brothers, brokers, Newhouse Bldg., Salt Lake City.

Officers: Leo Neilsen, pres.; D. A. West, sec.-treas.

Inc. in Utah. Cap., \$1,000,000; shares \$1 par; 600,000 issued.

Property: 19 claims in Big Cottonwood district. Surface workings said to have yielded \$1,250,000 years ago. Recent litigation has been settled, and prospecting started.

CARDIFF MINING & MILLING CO.

UTAH

Office: 1218 So. Main St., Salt Lake City.

Mine office: Alta, Salt Lake Co., Utah.

Officers: Ezra Thompson, pres.-gen. mgr.; Fred N. Price, v. p.; J. D. Murdock, sec.-treas., with L. H. Thompson and T. A. Reamer, directors. Con O'Neil, supt.

Inc. 1906, in Utah. **Cap.**, \$500,000; shares \$1 par; assessable; all issued. Last assessment of 1c per share delinquent June 1, 1914.

Dividends: initial dividend of 25c, Oct. 15, 1915; 25c June 1, 1916, Sept. 1, and Dec. 1, 1916; 25c Aug. 1, 1917; total, \$1.25 per share, or \$625,000.

Returns to the State Board of Equalization are given as: net proceeds, \$372,000; gross returns, \$645,772; expenditures; transportation, \$104,124; labor, \$114,173; supplies, \$44,295; improvements, \$10,978.

Stock listed on Salt Lake Exchange.

Property: 14 claims, partly patented, 25 miles from a railway, in the Alta Cottonwood district, 26 miles from Salt Lake City, includes the Mountain Chief group, N. W. of the Columbus Consolidated.

The Cardiff is now one of the richest silver-lead mines of Utah. Idle for years, a prospecting tunnel started in 1914, cut a limestone-quartzite contact, where intersected by an ore fissure several hundred feet below old and slightly productive workings. This tunnel cut a bedded orebody, averaging 10' thick, that had been opened for 235' long, 795' on its dip (22°) and which contains about 250,000 tons of \$30 ore.

A second and new orebody on a new fissure was cut in August, 1917.

Development: by tunnel, and 1,180' inclined shaft 500' below the tunnel and following the ore down along bedding plane, also a new 235' shaft in quartzite hanging wall. A new orebody or possibly an offshoot of the others is cut on the 235' level.

Ore reserves: estimated Jan., 1917, at 200,000 tons of \$30 ore blocked out.

Equipment: includes compressor, drills, electric power, dwellings, machine and blacksmith shop.

Production: was begun in 1910 and to 1913 amounted to 3,339 tons, valued at \$100,549. Recent production was made from the stopes above the 850' level. Shipments in 1916 to the Salt Lake smelter averaged 100 tons daily, returning 38.2% lead, 13.4 oz. silver, 3% copper. Employs 85 men. Ore is now being hauled by tractors and shipments will be materially increased.

Production amounts to 125 tons of \$45 to \$50 ore daily during the summer months, but only half this amount when the winter snows cover the ground. Owing to the low price of lead in October, shipments were suspended for a time.

CITY ROCKS MINING CO.

UTAH

Office: Leopold Bldg., Houghton, Mich.

Officers: N. W. Haire, pres.; John Edwards, v. p.; Jas. P. Edwards, sec.-treas.; W. S. Zehring and Jos. Bosch, directors.

Inc. 1906, in Utah. **Cap.**, \$1,000,000; shares \$5 par. Has an issue of convertible bonds. Property consists of shareholdings in the Michigan-Utah Mining Co., received for lands sold in 1912.

COLUMBUS EXTENSION MINING CO.

UTAH

Consolidated with Rexall Silver & Copper Co. to form the Columbus-Rexall Con. Mines Co., which see.

Described Vol. XII.

COLUMBUS-REXALL CONS. MINES CO.

UTAH

Office: 125 Main St., Salt Lake City, Utah.

Mine office: Alta, Utah.

Officers: L. Greene, pres.; M. R. Evans, v. p.-mgr.; F. B. Cook, sec.; S. A. Whitney, treas., with H. W. Lane, Fred A. Price and John Gallacher, directors. J. D. Houston, supt. R. A. Brown, cons. engr. Columbia Trust Co., N. Y., registrar and transfer agts. Annual meeting, 1st Monday in June.

Inc. July 15, 1916, in Utah. **Cap.**, \$600,000; \$1 par; 586,234 issued; assessable. Is a consolidation of the Columbus Extension and Rexall Silver and Copper Mng. Co., described in Mines Handbook, Vol. XII.

Shares jumped from 13c in July to \$2 in September, 1917. Profits for July, August, and September totaled \$30,000.

Property: owns an interest in 18 claims, 15 patented, about 200 acres, in the Alta Cottonwood district, Utah. Ore is copper with some galena.

Development: by 5,000' tunnel. In July, 1917, at 500' in from the portal of tunnel and at depth of 1,350' in Rexall ground, rich ore was opened in limestone, not far from the quartzite contact. Up to October 27th, the yield was 1,900 tons of smelting ore. Some of this assayed 13.96% copper, 3.8% zinc, 0.37 oz. gold, and 32.9 oz. silver per ton. Early in November a drift from the main tunnel cut ore at 75', and passed through 16' of ore.

Shipments are made to the smelter at Murray and averaged 40 tons per day in October, 1917.

Equipment: includes tramway and motors.

COTTONWOOD ATLANTIS MINING CO.

UTAH

Office: 521 Vermont Bldg., Salt Lake City, Utah.

Mine office: Alta, Utah.

Officers: Samuel Neff, pres.; R. O. Dobbs, v. p.-gen. mgr.; J. H. Moss, sec.-treas.; with Sol Snider and R. C. Middlewood, directors.

Transfer office: 521 Vermont Bldg., Salt Lake City. Annual meeting in May.

Inc. July, 1915, in Utah. **Cap.**, 1,000,000 shares; 10c par value; 750,000 issued, non-assessable.

Property: 12 claims, 115 acres, of which 6 are patented in the Little Cottonwood district. Ore which carries lead, silver, gold and copper occurs in shoots at the intersection of two orebearing fissures with a thrust fault contact having a limestone foot wall and a quartzite hanging wall. This contact courses South 15° East and dips 25°.

Development: by tunnels that are 175' to 450' in length, having 1,500' of underground workings with a depth of 400'. During 1916, 191' of crosscutting was done.

It is the plan of the company to crosscut to the thrust contact as has been done at the Cardiff mine two miles north.

COTTONWOOD KING MINING CO.

UTAH

Office: 519 Newhouse Bldg., Salt Lake City, Utah.

Mine: Big Cottonwood Canyon.

Officers: S. A. Parry, pres.; A. Anderson, v. p.; H. H. Harris, sec.-treas.; preceding, with H. P. Hucy, G. H. Webb, C. R. Halstead and J. W. McLaughlin, directors. A. B. Gattrell, mgr.

Inc. July 2, 1915. **Cap.**, \$150,000; shares 10c par; 150,000 shares in treasury. Late in 1916 company levied an assessment of ½c per share which should net \$4,419. Listed on Salt Lake Exchange.

Property: 28 claims, 560 acres, and a bond and lease on the Giles property of 31 claims, located beteen Big Cottonwood and Park City, Utah. Bond calls for \$600,000, with no payments due for 2 years.

All the property of the Big King Mining Co., bought, 1917, by exchange of stock share for share, property 52 claims, 1,040 acres, adjacent to Cottonwood King ground; also a bond and lease on Giles property, 31 claims.

Development: 2,100' of tunnels and 187' shaft with 500' of workings. Management states that on account of faults, 600' of development done in 1916-17 proved disappointing. In October, 1917, company was sinking a winze. Property is still in a prospective state. It adjoins the Daly Judge and Silver King Coalition of Park City.

COTTONWOOD METAL MINING CO.

UTAH

Office: 508 Utah Savings and Trust Co. Bldg., Salt Lake City.

Mine office: Alta, Cottonwood Mining District.

Officers: W. M. Ferry, pres.; S. J. Truman, sec.-treas., preceding with E. E. Watrous, E. P. Watrous, and H. R. Watrous, directors.

Inc. in Utah. **Cap.**, \$1,000,000; shares 10c par. Outstanding 440,000 shares paid for property and organization expenses. The balance is to provide funds for development work.

Property: 38 full claims, 760 acres, known as the Watrous group, in the Big Cottonwood district. Property is said to be crossed by six large fissures which cut the series of sandstone, shale, quartzite and limestone. These fissures run N. 35°-40° E., dip 60° to the N. W., and are cut by E. and W. fissures. Orebodies are found at these intersections especially in the soluble white lime. The deposits of the district are bedded deposits by replacement.

Development: by 380' tunnel that has cut first fissure. It is the plan of the company to continue the tunnel to cut all the fissures.

Equipment: 4 drill compressor, blacksmith shop, and houses.

Management frankly states that property is a prospect and that they will spend the money in honest development. Prof. J. H. Webber of Salt Lake says that there is much first-class territory to prospect.

DAYS FORK MINING CO.

UTAH

Office: 608 Boston Bldg., Salt Lake City, Utah.**Officers:** Henry Harker, pres.; M. T. Ellison, v. p.-mgr.; E. O. Lee, sec.-treas., with H. E. Booth and B. H. Cannon, directors.**Inc.** April, 1911, in Utah. **Cap.**, \$60,000; shares 10 cts. par, assessable. 475,000 shares outstanding.**Property:** 5 claims, 85 acres, in Big Cottonwood mining district. Management reports \$2,500 expended in prospect work during 1916.**EAST HECLA MINING CO.**

UTAH

Office: 1119 Boston Bldg., Salt Lake City, Utah.**Mine office:** Alta, Utah.**Officers:** J. B. Taylor, pres.-gen. mgr.; E. J. Broberg, v. p.; W. Hansen, Jr., sec.-treas.; D. J. Cook, supt.**Inc.** in 1916, in Utah. **Cap.**, 1,000,000 shares; 10c par.**Property:** A group of claims at Alta, Utah, adjoining the South Hecla mine, said to show a prominent outcropping vein and about 3' of ore in a shaft sunk on it. Ore carries copper, lead, silver and gold values.**Development:** a new tunnel 250' long is being driven to cut the downward extension of the vein beneath a 75' shaft, that shows copper ore.

Management doing legitimate exploration work.

EMMA CONSOLIDATED MINING CO.

UTAH

Office: 27 William St., New York City. **Mine address:** Alta, Salt Lake Co., Utah.**Officers:** G. G. Rice, pres.; Wm. Barret Ridgely, v. p.-treas.; Judge H. D. Rummel, 2d v. p.; R. W. Gnekow, sec.; J. J. Beeson, gen. mgr.**Inc.** 1917, in Delaware. **Cap.**, \$3,000,000; shares \$1 par, non-assessable; 2,668,693 issued. Is the holding company, owning more than 98% of the outstanding capitalization of Emma Copper Co. and over 80% of Old Emma Mines Co. Also bought the lease on Old Emma Mines Co. ground from the Old Emma Leasing Co. (now dissolved), which ran until Sept., 1917.**Emma Copper Co.**

Controlled through ownership of over 98% of outstanding capitalization by the Emma Cons. Mng. Co.

Property: includes 11 claims in Little Cottonwood district and the adjoining Vallejo and Joab Lawrence groups, bought 1915 in exchange for 352,000 shares of stock. The company has a lease on the Emma mine owned by the Old Emma Mines Co., which see.**History:** the Old Emma mine was a famous early-day producer, having shipped over \$6,000,000 worth of lead-silver ore in the 60's and 70's, from above the 300' level. It was sold to the Emma Silver Mng. Co., for \$5,000,000 and soon afterwards the orebodies appeared worked out, or cut off by a fault. After vain attempts to find the orebodies below the fault, the mine lay idle until 1915.

Chas. S. Herzig made a geological study of the property with the deduction that it contained a faulted portion of the Old Emma bonanza orebody, whereupon diamond drilling was started. Under direction of J. J. Beeson, geologist, the Emma vein was located, 1916, at about 250' below where it had been cut off by the fault, and the displaced segment of the orebody opened up.

Development: by 1,700' tunnel, 400' shaft and drifts on several levels.

Management is diamond drilling in 1917 in the hopes of locating the downward extensions of 4 other orebodies, all presumably cut off by the Montezuma fault. In November a mineralized zone 50' wide was passed through, assaying a few ounces of silver.

Production: from Jan. to Nov., 1917, 8,400 tons were shipped with average net returns of \$30 a ton. Shipping between 80-100 tons daily to Midvale smelter, Sept., 1917.

FREE COINAGE MINING & MILLING CO.**UTAH**

Office: 69 Commercial Bldg., Salt Lake City, Utah. Mine near Alta, Salt Lake Co., Utah. L. A. Evans, pres.; D. H. Wenger, sec.-treas.

Inc. 1896, in Utah. Cap., \$125,000; shares 25 cts. par, assessable, with 2 assessments levied.

Property: 4 claims, 3 patented, in Little Cottonwood canyon, 2 miles from a railroad, developed by shaft and tunnels, showing lead and copper ores. Letters neither answered nor returned. Probably idle, or moribund.

GLENWOOD MINING CO.**UTAH**

Office: 1102 West Seventh South St., Salt Lake City, Utah.

Officers: E. P. Mowers, pres. and gen. mgr.; N. W. Sonnedecker, v. p.; M. L. Grovenor, sec.-treas.

Inc. Feb. 21, 1901, in Utah.

Cap., \$30,000, shares 10 cts. par, assessable; increased 1912, to \$125,000, shares 25 cts. par.

Property: 8 claims, patented, in Big Cottonwood district, 6 miles from a railroad, opened by shafts and tunnels, with about 1,600' of workings.

GREAT COPPER KING MINING CO.**UTAH**

Inc. Aug., 1904, in Utah. Cap., \$50,000; shares 10 cts. par; issued, \$47,500, assessable; last assessment 1/10 ct. delinquent March 7, 1914.

Property: 10 claims, unpatented, including 4 claims, 1 fractional, held under bond and lease, near the mouth of Little Cottonwood canyon, 7 miles from Alta, Salt Lake Co., Utah. Mine has shallow shafts and a 330' tunnel, with about 800' of workings, showing auriferous and argentiferous copper and lead ores. Ore occurs in fissure veins as contact deposit in granite and quartzite.

Samples taken from main tunnel on 300' level said to assay from 19-33% copper. J. E. Smith, a director, was developing property under contract in 1916.

GREAT WESTERN GOLD & COPPER CO.**UTAH**

Merged 1916 with Mountain Lake Mining Co. and Thor Mining Co. under title of Great Western Mines Co., which see.

GREAT WESTERN MINES CO.**UTAH**

Office: Knight Bldg., Provo, Utah.

Officers: Jesse Knight, pres.; J. W. Knight, v. p.; W. L. Mangum, sec.-treas., with Jas. H. Moyle, W. I. Snyder, R. A. Brighton and K. S. Jordan, directors.

Inc. 1916, in Utah. Cap., \$150,000; shares 10c par; outstanding in May, 1916, 1,270,000 shares. Listed on Salt Lake City Exchange. Debts reported, \$6,036. Company is a merger of the Great Western Gold & Silver Co., Mountain Lake Mining Co., and the Thor Mining Co., all described in Vol. XI, Copper Handbook.

Property: 98 claims, in the Big Cottonwood and Snake Creek districts, in Salt Lake and Wasatch counties.

Ore: gold, silver, copper, and lead, mainly in contact deposits; no estimate of ore in sight.

Development: 500' of shafts, 8,500' of tunnels, 350' winzes and raises, and 2,000' of crosscuts. Ten cars of copper ore said to have been shipped from the property. No special equipment. Company has a transportation agreement with the Snake Creek Mining & Tunnel Co., a subsidiary of the Judge Mining & Smelting Co., for use of the 14,000' tunnel. Early in 1917 a start was made to explore ground cut by the tunnel.

HOWELL MINING CO.**UTAH**

Office: 218 So. Main St., Salt Lake City, Utah.

Officers: Ezra Thompson, pres.; J. C. Lynch, v. p.; Lynn H. Thompson, sec.-treas.; with J. M. Howell and David Neff, directors.

Inc. in 1910. Cap., \$600,000; shares \$1 par; 500,000 shares outstanding. Listed on Salt Lake Exchange.

Property: an old mine, formerly known as the Baby McKee, 8 claims, 4 patented, 140 acres, in the Alta-Cottonwood district, Salt Lake Co., about 25 miles S. E. of Salt Lake City, adjoins the Cardiff property on the east. Reported that it will eventually be merged with Cardiff. Claims cover strike of Howell vein, said to be traceable on property for over a mile, with strike N. E.-S. W. and 4' width. Country rock is quartzite and limestone.

Ore: silver, copper, lead, zinc and antimony, said to average \$20 to \$50 per ton.

Development: 150' of shafts, 1,790' of tunnels, 90' of raises, 40' of crosscuts. Shipments were made prior to 1910, but amount not known. Management is continuing upper tunnel to the contact in 600', October, 1916, and driving the lower tunnel farther along the Howell fissure.

IOWA COPPER MINING CO.

UTAH

Address: Park City, Utah.

Officers: L. R. Perry, pres.; D. G. Scott, v. p.; R. T. Kimball, sec.-treas.; with J. Carson and D. E. King, directors.

Cap., \$1,000,000; shares 10c par; increased from \$500,000 in June, 1917; 750,000 issued. Earnings from ore sold 1916, \$3,000; operating expenses, \$5,000.

Property: 9 patented claims, 180 acres, in Big Cottonwood district, 1,000' N. W. of Silver King Coalition

Development: by tunnel, with 200' incline in ore and 100' crosscut from incline with 50' shaft on quartzite lime contact, showing 2' of copper ore.

In 1917 a compressor and other mining machinery was installed. Several shipments were made, yielding as high as \$900 per carload. Recent developments reported as good. Work under way at 400' depth. Eighteen men are employed.

KENNEBEC CONSOLIDATED MINING CO.

UTAH

Address: 239 Atlas Bldg., Salt Lake City, Utah.

Officers: Ezra Thompson, pres.; S. M. Levy, v. p.; Shand Smith, sec., with W. J. Wolstenholme, A. T. Sanford, H. S. Barnhardt, J. Patrick and P. S. Keogh, directors.

Inc. in 1901. **Cap.,** \$400,000; shares \$1 par; 130,000 shares in treasury.

On the basis of 3c per share on their holdings, shareholders subscribed to a loan bearing 8% during June, 1917.

Property: 30 patented claims, about 400 acres, in the South Fork of the Big Cottonwood district, Salt Lake Co., Utah, adjoins the Cardiff on the east and west and the Wasatch Mines and Columbus Extension on the north.

Development: by a 700' incline shaft, a 3,000' lower tunnel and an upper tunnel.

Property is an old-time silver-lead producer and has been under development by present management for many years.

Work was resumed in July, 1917. The Cardiff Company, adjoining, which is interested in the Kennebec, is supplying air for power.

KENNEBEC MINING CO.

UTAH

Company reorganized in Oct., 1917, under name of Kennebec Consolidated, which see.

LAST CHANCE MINING CO.

UTAH

Owens 1 patented claim adjoining the American Copper Co., in the Big Cottonwood district, near Alta, Salt Lake Co., Utah. Shaft, at depth of 70', is said to show a 6" lead of silver-lead ore. Operations resumed in 1915 by F. O. Horne and Jas. Hauerbach.

No recent returns.

LOGGER MINING CO.

UTAH

Officers: J. A. Maxfield, pres.-mgr.; R. D. Maxfield, v. p.; D. J. Bloem, sec.; C. S. Tingey, treas., with J. W. McKinney and Mrs. K. F. Scott, directors.

Inc. July, 1915. Cap., 1,00,000 shares; 1c each. Stock listed on Salt Lake Exchange.

Property: the Logger mine in Big Cottonwood canyon, adjoining the Maxfield mine, shows a 1' fissure vein, developed by a 350' adit and a winze now being sunk on the vein from the 200' point. Assays said to return \$16.47 gold, 13.4 oz. silver and 11% copper.

A lower tunnel was started 100' below upper tunnel, 1916, and is reported to have cut the vein seen above with several other small veins of ore, assaying from \$50-\$240 per ton in copper, gold, and silver.

Developing energetically, 1917, and expecting to start production.

MAXFIELD MINE

UTAH

Operated by Boston Development Co.

MICHIGAN-UTAH CONSOLIDATED MINES CO.

UTAH

Office: 411 Felt Bldg., Salt Lake City, Utah. **Mine office:** Alta, Salt Lake Co.

Officers: Norman W. Haire, pres. and gen. mgr.; H. R. MacMillan, v. p.; N. A. Robertson, sec.; L. H. Farnsworth, treas.; with Frank B. Cook, C. A. Gillette, and R. J. Evans, directors. R. A. Brown, cons. eng.; Ed. Cook, foreman.

Inc. April 26, 1915, in Utah, as a reorganization of the bankrupt Michigan-Utah Mining Co. Cap., 1,500,000 shares; 25c par; assessable; 1,354,608 shares issued. Listed on Salt Lake Exchange. Columbia Trust Co., registrar. Annual meeting, 2nd Monday in February.

Gross earnings in 1916 were \$125,985, all from ore sales.

Property: 72 claims, 42 patented, 1,200 acres, including a millsite, in the Big and Little Cottonwood mining districts. Claims show Paleozoic sediments cut by granite, the ore occurring in fissure veins in limestone, and as contact metamorphic deposits between limestone and granite, having a general strike of N. 65° E., and a dip of 32°. There are 5 distinct and parallel veins showing average widths of 2½' and traceable 5,000', reported to carry copper, lead, zinc, silver and gold values, averaging \$25 per ton. Ores are carbonates at and near surface, succeeded below by sulphides.

Development: principally by tunnels, all workings being in the oxide and carbonate zones, but sulphides are proven to occur in depth by workings of the Columbus Consolidated Mining Co., near by. Total underground openings aggregate over 50,000', about one-half being represented by tunnels, drifts and crosscuts that are all in ore, raises and winzes aggregating 10,500' additional. Ore is transported by aerial tramway to Tanners flat, 5 miles from the mine, thence by narrow-gauge railway to Wasatch, where connection is made with the Salt Lake & Alta standard gauge road which runs to the Midvale smelter. The tram has a maximum capacity of 200 tons daily.

The Copper Prince tunnel has been driven under property about 1,700', exposing several large orebodies that are soon to be mined, the Lavinia fissure showing well in Oct., 1917.

Equipment: includes two 90-h. p. hoists, and everything necessary for mining 150 tons daily. Air is supplied by the Wasatch Power Co. from Little Cottonwood creek.

Buildings include machine shop, carpenter shop, several dwellings and a smithy, located underground as a measure of protection from snowslides, which are of frequent occurrence in this region.

Production: in 1916: 154 oz. gold, 90,816 oz. silver, 364,685 lbs. copper, 916,851 lbs. lead, worth \$225,832 gross. Shipping 150 tons, daily, 1917.

As much ore was shipped in first half of 1917 as in all of 1916, 2,500 tons being moved in October. Considerable copper ore is also ready for extraction.

Part of the property is operated under lease by the Triangle Mining Co., a close corporation, which see. Property considered promising.

MINERAL FLAT EXTENSION MINING & MILLING CO. UTAH

Name changed to Alta Superior Mining & Milling Co., which see.

Office: Provo, Juab Co., Utah.

Property: 2 miles south of Alta, in Little Cottonwood district, White Pine canyon, shows a 3' vein of copper ore, giving assays up to 50% copper, also silver-lead ores. Developed by tunnel and shaft, with drifting on vein. Company has kept up assessment work on its unpatented claims. Tunnel in 300' early in 1916.

No recent information available.

MINERAL FLAT MINING CO. UTAH

Address: Hugh Trenholm, supt., American Fork, Utah.

Property: in the American Fork district. A tunnel is being driven to explore several fissures known to exist, and was in 3,000' late in Oct., 1917. Three fissures have been cut, showing good ore in bunches. Assessments are levied to keep the work going.

MONETAIRE MINING CO. UTAH

Office: 405 Newhouse Bldg., Salt Lake City, Utah.

Officers: D. J. Williams, pres.; N. V. Jones, v. p.; B. F. Cummings, sec-treas.; with W. H. King and D. W. Cummings, directors.

Inc. Sept. 19, 1912, in Utah. Cap., \$250,000; shares 25 cts. par; assessable; 885,000 shares outstanding. Annual meeting third Tuesday in January. Listed in Salt Lake City.

Property: 2 patented claims, 6 acres, in Little Cottonwood mining district, said to show lead-zinc ore, with some molybdenum, in fissure veins in limestone and quartzite. Veins strike E. W. and dip almost vertical. Ore shipped said to have returned \$17 per ton. No recent shipments reported.

Development: 127' vertical shaft and tunnels, with about 1,000' of workings. Claim to have 20,000 tons of ore blocked out.

Equipment: includes an electric hoist. Mine is a prospect, idle at present.

NEVA MINING CO. UTAH

Office: 400 Boyd Park Bldg., Salt Lake City, Utah. Mine office: Brighton, Utah.

Officers: A. H. Rock, pres.; C. E. Cole, v. p.; Walter Steadman, sec.

Inc. 1906, in Utah. Cap., \$75,000; shares 15c par. Last assessment 1/5c levied Sept., 1917. Stock is listed on Salt Lake Exchange.

Property: 5 unpatented claims, adjoining the Cardiff on the W., show silver-lead-gold ore in a fissure vein, running E. W. along a quartz-lime contact and said to give assays of 45% lead, 30 oz. silver and 0.1 oz. gold. Developed by incline shaft and tunnel. Operations were resumed in 1915 and shaft is being sunk to intercept the Cardiff contact lode.

Property in dispute with the Cardiff Mining Co. was won by the Neva, and is considered valuable. Operations are carried on by small assessments.

OLD EVERGREEN M. & T. CO. UTAH

H. G. McMillan, gen. mgr., 649 E. South Temple St., Salt Lake City, Utah.

Cap., \$300,000; shares \$1 par; all outstanding.

Property: 12 patented claims, 8 miles N. E. of Alta, in the Big Cottonwood district, Salt Lake Co., was an old-time producer of gold-copper ore. Developed by 2,700' drainage and transportation tunnel. Idle.

ONTARIO SILVER MINING CO. UTAH

Offices: 163 So. Main St., Salt Lake City, and Room 1208, 32 Broadway, New York.

Mine office: Park City, Utah.

Officers: J. E. Bamberger, pres.; Ernest Bamberger, v. p.-treas.-gen. mgr.

with N. A. Dunyon, John S. Critchlow, Wm. C. Osborne, H. G. McMillan and Walter Linforth, directors. Herbert Cohen, sec.; J. L. Tilton, New York, asst. sec. Newton A. Dunyon, supt.

Inc. 1887, in Calif. **Cap.**, \$15,000,000; shares \$100 par; all issued. Stock is listed on New York Exchange. Union Trust Co., New York, registrar. Annual meeting, third Monday in January. Was at one time the largest silver producer in Utah with a total production of about \$35,000,000 gross and a dividend record of \$14,932,500.

The annual report, Dec. 31, 1916, showed receipts from ore sales and royalties, \$289,691; disbursements, \$290,645; cash and bullion on hand, bonds and other liquid assets, \$311,620.

Property: the Ontario mine, 800 acres, patented, across the divide from the Emma Copper Co., at the head of Little Cottonwood canyon; also owns an interest in the Weber Coal Co., 811 acres coal land and the New Quincy and Naildriver Mining Companies.

The Ontario is an old and very famous silver-lead mine in which the ore occurs in a great pipe and chamber deposit in limestone. Ore shows an increase in zinc content at depth. In December, 1915, the manager decided to reopen the Ontario mine below the 1,500', or Drain tunnel No. 2 level. The old workings were unwatered to the 1,700' level and work was done on the 500, 1,000, 1,500 and 1,700' levels in 1916, on company account.

Development: about 60 miles of old workings, includes two tunnels and a shaft 2,000' deep. From the 900' level to surface, mine is worked by lessees.

Shaft caved badly in November and the lower levels were flooded, but by May, 1917, retimbering and unwatering had been accomplished.

On the 1,600' level a vein was encountered showing 25' of milling ore.

Equipment: includes 3½ miles power line, 2 electric pumps, hoist, compressor and 100-ton mill.

Stock believed to have a speculative value in addition to its liquidation value of about \$8 per share. Although the high-grade ore is mined out there is much low-grade ore left in the property which will yield a fair profit with silver at 80c or better.

PRICE MINING CO.

UTAH

Office: 410 Utah Savings & Trust Co. Bldg., Salt Lake City, Utah.

Officers: F. W. Price, pres.-treas.; M. R. Evans, v. p.; W. M. McCrea, sec.

Inc. April, 1915. **Cap.**, \$250,000; shares 25 cts. par; assessable; 650,000 issued. Stock is listed on the Salt Lake Exchange.

Operating expenses in 1916 were \$8,000.

Property: 17 claims, 300 acres, in South Fork canyon, Alta-Cottonwood mining district, Salt Lake Co., Utah, considered to carry the Cardiff contact, which is intersected at right angles by several fissure veins. Samples taken at depth of 15' on the Nettie claims, reported to have assayed 64.2% lead, 50 oz. silver and \$12 gold per ton.

Development: by 400' and 150' tunnels. Plans adding electric power, compressor and drills. A prospect.

PRINCE OF WALES MINING CO.

UTAH

Address: Walker Bros., Salt Lake City, Utah.

Property: at Alta, 60 acres, was closed down, 1914, when a snowslide destroyed its equipment. Mine has 950' incline shaft from which \$2,000,000 worth of ore was mined, 1870-1875, until the influx of water stopped operation. Alta T. & T. Co. tunnel will entirely drain the ground.

In July, 1917, 19 tons of \$100 ore was shipped.

RED BELL MINING CO.

UTAH

Office: 519 Newhouse Bldg., Salt Lake City, Utah.

Officers: S. A. Parry, pres.; M. E. Price, v. p.; H. H. Harris, sec.-treas.

Inc. Nov., 1916. Cap., 800,000 shares, 10 cts. par; 340,000 shares in treasury.

Property: 16 claims in Big Cottonwood canyon, Salt Lake Co., about 1 mile E. of the Old Maxfield mine, reported to have produced rich silver-lead ore.

Development: by tunnel, in 150', Sept., 1917, and said to have penetrated a 12' porphyry dike carrying lead, iron, and copper. Lack of power prevented ore extraction for 2 months, but this work was resumed in November.

RED CLOUD MINING CO.

UTAH

F. N. Leonard, mgr. Property at American Fork includes the Eudora, First Chance, and Red Cloud claims and 2 millsites.

Development: by 675' tunnel in quartzite, said to show 5' of silver-lead ore. The tunnel is being driven to reach the contact, 1917.

REED'S PEAK MINING CO.

UTAH

Office: 1 Mining Exchange Bldg., Salt Lake City, Utah.

Officers: Frank Andrews, pres.; W. J. Bardsley, v. p.; F. A. Stiefel, sec.-treas.; with Robt. Kimball, E. W. Hulse, T. L. Mitchell, and L. G. Schwalenberg, directors.

Financial statement for fiscal year ended Sept. 30, 1916, showed: receipts, \$18,191; expenditures, \$9,799, cash balance, \$8,391.

Inc. Feb. 14, 1907, in Utah. Cap., \$50,000; shares 10c par; outstanding April, 1917, 489,000 shares; assessable. Listed on Salt Lake Exchange.

Property: 21 unpatented claims, 420 acres, 12 miles from a railroad, located on South Fork in Big Cottonwood mining district, Salt Lake Co. Claims said to show fissure veins in limestone carry lead-silver ore.

Development: by tunnels, upper 450' long, lower 1,450' long. Objective of lower tunnel is the intersection of the Birthday No. 1 fissure with a N.-S. fissure at a depth of 800' from surface; this intersection is expected to be reached within a short distance; Birthday fissures Nos. 1 and 2, said to have been productive of shipping ore on upper levels.

Equipment: includes a compressor, machine drills and electric power.

A few tons of ore have been shipped from development work; property is a prospect.

REXALL SILVER & COPPER MINING CO.

UTAH

Consolidated, 1916, with Columbus Extension Mng. Co., and now known as Columbus-Rexall Cons. Mines Co., which see. Described Vol. XII.

SECRET MINING & MILLING CO.

UTAH

Offices: 618 Newhouse Bldg., Salt Lake City and Alta, Utah. Reported "dead" in Copper Handbook, Vol. X. Reorganized and rejuvenated in 1915.

Officers: R. W. Clough, pres.; W. M. Minor, v. p. and treas.; H. S. Harper, sec.; with E. R. Phelps and W. H. Clough, directors.

Inc. about April, 1906, in Utah. Cap., \$300,000; increased in 1915 to \$600,000; shares \$1 par. The additional 300,000 shares were to provide funds for development.

Property: 15 claims, 300 acres, 100 patented, at Alta, Little Cottonwood mining district, adjoining the Albion on the S. E., said to show lead-silver ore. Country rock is quartzite.

Development: by tunnels; reported in April, 1916, that an 80' tunnel would be extended to cut the surface showings at a depth of 800'. The company is also reported as having obtained the right from the Albion to drive a crosscut into Secret ground from a point 2,500' in from the portal of the Albion tunnel. An upper tunnel is in 500'. Workings total 700'. No orebodies large enough for production have been found. In Sept., 1917, the lower tunnel was being extended 200'. Property is in the speculative class.

SELLS MINING CO.

UTAH

Address: Judge Bldg., Salt Lake City and A. O. Jacobson, supt., Alta.

Officers: Ezra Thompson, pres.; L. R. Eccles, v. p.; Jas. Murdoch, sec.; John Pingree, treas., with A. O. Jacobson, J. C. Lynch, and Lynn Thompson, directors.

Inc. 1914, in Utah. **Cap.**, 600,000 shares; 25c par; 400,000 issued. In May, 1916, there was \$3,994 in the treasury; debts amounted to \$13,500 on the property and \$24,446 on the 6 patented claims, latter amount was due Sept. 1, 1916. Listed on Salt Lake City Exchange. Company has remained courteously non-communicative to requests for information.

Property: 16 claims, 6 patented, in the Alta-Cottonwood mining district, Salt Lake Co., 8 miles from a railroad, said to cover 1,800' to 3,000' along the mineralized zone passing through the South Hecla property which adjoins on the west.

Ore: carries silver-lead-zinc-copper, in fissure veins in limestone and in contact deposits between limestone and granite; veins strike N. E.-S. W.

Development: mainly through the Dwyer tunnel of the South Hecla company, consists of a 200' shaft, 2,200' of tunnels and 600' of raises. Reported in May, 1916, 200' of ore proven on the strike, with ore in a 100' raise; average width of ore 6'. Shipments of about 125 tons were made early in 1916, returning \$2,768 net. Initial shipment is said to have assayed 77 oz. silver, .8% lead, 1.6% copper, 1.6% zinc and 19% iron per ton. Is a speculative mining venture, that has promising ground.

In June, 1917, workings were connected with the old Lexington tunnel, giving another opening to the Sells and improving ventilation. In September 7' of silver-lead ore was cut by a raise 125' above this tunnel. Shipments are about 2 cars per week.

An aerial tram 2,000' long, costing \$10,000, to carry 10 tons per hour, was being erected in November, 1917. This will allow of transport during the winter.

SILVER MOON MINING CO.

UTAH

Office: 27 Latimer Block, Salt Lake City, Utah.

Officers: A. L. Headbug, pres.; Wm. Crome, sec.-treas.

Inc. Jan. 29, 1912. **Cap.**, \$10,000; shares 2c par, assessable. In treasury, May, 1916, 200,000 shares and \$780 in cash; no debts. Listed in Salt Lake City.

Property: 7 unpatented claims in the Big Cottonwood district.

Ore: carries silver, gold, lead. Little development has been done. Four men employed. Property is a prospect.

SOUTH CARDIFF MINING CO.

UTAH

Address: George N. Lawrence, pres.; 420 Boston Bldg., Salt Lake City; W. H. King, v. p.; Allen Sanford, sec.-treas.; and George A. Steiner, directors. **Inc.** April 9, 1916, in Utah. **Cap.**, 1,000,000 shares; 450,000 in treasury.

Property: 10 claims, 160 acres in Cottonwood district, adjoining the Cardiff, Howell & Monte Cristo, and the Canton Mining Co. holdings, is supposed to carry extension of Cardiff fissure.

SOUTH HECLA EXTENSION MINING CO.

UTAH

Office: 161 So. Main St., Salt Lake City, Utah.

Officers: the same as South Hecla Mng. Co.

Inc. in Utah. **Cap.**, \$100,000; shares 10c par; assessable; outstanding \$53,879. Listed in Salt Lake City.

Property: 37 acres in the Little Cottonwood district, adjoining South Hecla Mining Co., said to show silver-lead-copper-gold ore. Development is being done through the Quincy tunnel level of the South Hecla mine. Is in the prospect class.

Assets at Jan. 1, 1917, totaled \$101,747, including \$32,085 for property and plant, \$19,422 for development and \$46,122 for treasury stock. Current assets were \$4,118, against current liabilities of \$1,747.

SOUTH HECLA MINING CO.**UTAH**

Office: 161 So. Main St., Salt Lake City, Utah. **Main office:** Alta, Salt Lake City, Utah.

Officers: Geo. H. Watson, pres.-gen. mgr.; Herman Bamberger, v. p.; R. F. Marvin, sec.-treas.; preceding with H. C. Edwards, Thos. Coughlin, V. M. Burman and D. W. Harcrow, directors. Matt Aho, mine superintendent.

Inc. Sept. 14, 1910, in Utah. **Cap.,** \$500,000; shares \$1 par; assessable; issued \$262,920. Company was organized as a merger of the South Columbus Consolidated Mining Co., and Alta-Hecla Mining Co., and holds properties formerly held by the Bingham-Centennial, Alta-Quincy, Columbus Wedge, Ivanhoe and Lilburn mining companies. Company exchanged stock on the basis of 1 share of South Hecla for 5 shares of South Columbus, and 1 share of South Hecla for 5 shares of Alta-Hecla. Shares are listed on the Salt Lake Stock Exchange. Annual meeting, second Wednesday in September.

Assets at end of 1916 totaled \$600,271, including \$208,534 for property, \$237,080 for treasury stock, and \$51,577 discounts.

Gross earnings in 1916 amounted to \$166,916, all from ore sales; operating expenses were \$127,541, leaving a credit balance of \$39,375. Initial dividend, 15 cts. per share, paid Aug. 10, 1916.

Property: 41 claims, partly patented, 550 acres, in the Little Cottonwood district. Claims carry 8 well defined ore bearing fissures in granodiorite and limestone, running N. 70° E., dipping 70° N. and contact deposits between limestone and granite. The 3 orebodies under development, one in the Kate Hayes, the others in the Wedge fissure, are reported by the management to average 20' in width, and to carry malachite, azurite and tetrahedrite in the surface zone, succeeded by chalcopyrite, galena and sphalerite, estimated by the management to average 1% copper, 15% lead, .05 oz. gold and 35 oz. silver per ton. No. 1 shoot of the Kate Hayes is 940' long; No. 2 proven for 300' long.

Development: is by two main working tunnels, the Quincy and Dwyer: the Dwyer 2,000', Alta-Quincy 1,800', South Columbus 1,400', Rustler 1,200', Scott 1,700', Neversweat 150' and the White of 700'. The mine as a whole has about 7 miles of workings, lighted by electricity. Main development during 1915 was on the 250' level of the Wedge vein; 11 incline raises and 14 crosscuts were driven, all in ore.

In 1916, work on the Wedge vein was continued from the 100, 250, and 400' levels. This opened the orebody 300' W. and to a vertical depth of 430' from the surface. Milling ore was opened on other levels, but company wishes to extract smelting ore. Five blocks of ground were leased. Three feet of copper-silver ore was opened in November, 1917.

Equipment: includes a 60-h. p. electric plant, with a 10-h. p. hoist good for 200', and a 2-stage Chicago P. Co. compressor. Buildings include a shop building, housing smithy, machine and carpenter shops, with a 3-story boarding house and 5 dwellings.

Production: company in 1916 shipped 7,962 tons of ore containing 267 oz. gold, 164,619 oz. silver, 1,236,357 lbs. lead, 55,366 lbs. copper, 733,473 lbs. zinc and 782,050 lbs. iron. Lessees marketed 1,097 tons of ore containing 34 oz. gold, 16,493 oz. silver, 218,015 lbs. lead, 5,361 lbs. copper, 157,854 lbs. zinc, and 47,089 lbs. iron. In Sept., 1917, shipments by company were 4 carloads per week, only transportation hindering double this quantity.

Absorption of the Albion property, owning 12 claims at Alta, was reported Aug., 1916. With improved transportation facilities, company should become a dividend payer. Company employs 60 men.

TAR BABY MINING CO.**UTAH**

Office: Sugar House, Salt Lake City, Utah. **Mine office:** Alta, Salt Lake Co., Utah.

Officers: C. R. Greene, pres. and gen. mgr.; J. M. Matsen, v. p.; C. F. Greene, sec.-treas.; R. B. Rankin, and J. W. Brewer, directors; H. D. Greene, supt.

Inc. 1911, in Utah. **Cap.**, 500,000 shares, increased June, 1916, from 400,000; 20c par; outstanding, 483,000 shares. Listed on Salt Lake City Exchange. Fourteen assessments levied to Oct., 1917, three of 1c each, 1917.

Property: 6 claims, in the Alta-Cottonwood district, on the south fork of Big Cottonwood. The purpose of the enterprise is to cut the Cardiff lime-quartzite contact by working through the Victor company's tunnel, whereby an additional depth of 500' will be gained. The ore horizon should be cut late in 1917.

THOR MINING CO.

UTAH

Merged 1916 with Great Western Gold & Copper Co. and Mountain Lake Mining Co., with title of Great Western Mines Co., which see.

TRIANGLE MINING CO.

UTAH

Address: 521 Felt Bldg., Salt Lake City. **Mine address:** Alta, Utah.

Officers: Howard C. Fields, pres.; Wm. C. Stewart, v. p.; Irma R. Fields, sec.-treas.; Howard H. Fields, mgr., with Harry A. Marsh and Wm. C. Lidvall, directors.

Inc. July 15, 1917. **Cap.**, \$25,000; shares \$1 par; 6,201 outstanding, Operated as a close corporation. Annual meeting 1st Saturday in September.

Company operates a lease on part of the property of the Michigan Utah Consolidated Mines Co., Little Cottonwood district, Salt Lake Co., Utah, and mine is described thereunder.

Production: in 1915 was 2,000 tons; in 1916, 5,000 tons, averaging \$25 per ton.

WASATCH MINES CO.

UTAH

Office: 713 Judge Bldg., Salt Lake City, Utah. **Mine office:** T. W. Blake, supt., Alta, Salt Lake Co., Utah.

Officers: A. H. Cowie, pres.; A. C. Ellis, Jr., v. p.; W. O. Williams, sec.-treas.; with H. G. Williams, C. H. Gibbs, W. S. Cooper and B. F. Kay.

Inc. Feb. 8, 1913, as a merger of the Columbus Consolidated Mining Co., Flagstaff Copper Co., and Superior-Alta Mining Co. **Cap.**, \$1,000,000; shares \$1 par; issued 357,971 shares. The consolidation of these properties was effected on the basis of 160,000 shares for Columbus Consolidated Co., 100,000 shares for Flagstaff Co., and 40,000 shares for Superior-Alta. Stock is listed on the Salt Lake Stock Exchange. McCornick & Co., Salt Lake City, registrar. Annual meeting second Thursday in June.

Annual report as of Nov. 1, 1915, showed cash on hand, \$3,643; accounts receivable, \$10,428; current liabilities, \$2,996.

Property: 78 claims, 62 patented, about 900 acres, and mill sites at Tanner's Flat and at the mouth of Little Cottonwood canyon, on the E. flank of the Wasatch mountains.

Geology: Claims show a number of fissure veins cutting limestone, shale and quartzite, also numerous bedded and contact deposits between limestone and quartzite. The bedded deposits contain the principal prebodies. Occasional highly mineralized shoots are found ranging from 30 to 100' in width, several hundred feet long, and carrying up to 11% copper, 18% lead, 15% zinc, 66 oz. silver and \$4 gold per ton, but ore is generally pockety and mainly below payable tenor. Ores are carbonates at and near surface, succeeded by sulphides at depth.

The Flagstaff group carries several ore deposits, one of which is said to range up to 300' in width and to be traceable 2,000'. Developed by the 5,000' Tom Moore tunnel. This tunnel also cuts 6 smaller veins and has a 450' crosscut to the N. E., with about 13,000' of workings. Other workings include the 500' Burgess tunnel, 1,200' Burnswood tunnel, 1,200' Flagstaff tunnel, and

the 700' Flagstaff shaft. The mine was a considerable producer of silver-lead carbonates in early days.

The Columbus Consolidated group shows a vein, known as the Braine fissure, of about 12' average width, opened by 2 tunnels, 1,250' apart, on practically the same level. A strike of rich zinc ore was made on the Relief claim, above the Columbus tunnel in June, 1915; the vein was reported to show 3' of ore assaying from 35 to 40% zinc, 2½ oz. silver and 11% lead.

Development: by 5 shallow shafts and 4 tunnels, including a drainage tunnel, 4,000' down the canyon, planned to unwater the Columbus and adjoining properties, with about 3 miles of workings. The Holland and Columbus tunnels are connected on the Braine fissure, the first-named with electric traction. The output is divided into copper, silver-lead and concentrating ore. The mine is wet and has a 600-gal. pump.

Shipments in 1916 assayed from 34c to 70c gold; 8 to 51 oz. silver; 5 to 6% lead; 5 to 14% copper, 6 to 14% excess iron per ton, yielding from \$20 to \$60 per ton.

A Pelton water wheel works under a head of 494', taking water through a 20" and 22" steel pipe line of 4,500' length, developing 660 h. p., which is transformed into electricity by two 300-kw. dynamos and carried to the mine by a 4½-mile transmission line. At the mine there are four 25-h. p. hoists good for 600' each, 10-drill Nordberg and two 5-drill Ingersoll-Sergeant air compressors, a machine shop and a sawmill.

The 150-ton concentrator is equipped with a Gates gyratory crusher, 2 sets of Rogers rolls, six 3-compartment jigs and 7 Wilfley tables, the mill putting about 4 or 5 tons into 1. A cyanide unit was installed in 1915.

Development work above the tunnel level proved disappointing and the management has concentrated all energy on the deep drainage tunnel to be driven 5,000', about 500' below the present lowest workings and which will make economical and profitable mining at depths possible; also up to 1,500' below other properties in the district. Company drives sufficient funds to cover operating expenses from the sale of electric power and compressed air to most of the mines in the district.

By August, 1917, the tunnel was in 300', in addition to 900' of open cut, making 1,200'. Progress in the limestone was 9' daily with 2 shifts. Most of the drifting was in granite and conglomerate.

WASATCH UTAH MINING CO.

UTAH

Office: Kearns Bldg., Salt Lake City. **Mine office:** R. D. No. 4, Landy, Utah.

Officers: F. L. Palmquist, sec.-treas.; J. L. Kraft, L. Moody, A. W. Manz, J. Hyldahl, E. Tressing, Asa Bacon, J. W. Reihman, directors.

Inc. October, 1902, in Nevada. **Cap.,** \$1,000,000; shares par \$1; assessable; all issued.

Bonds: authorized, \$100,000; issued, \$35,000. Annual meeting, second Monday in June.

Property: 51 claims, 14 patented, known as the Consolidated Jefferson mine, 9 miles from railroad, near mouth of Little Cottonwood canyon; also 40 acres dumping ground. Mine has two systems of veins, a narrow E.-W. fissure in hornblende schist with high-grade gold, silver and copper ore, and a large N.S. quartz fissure about 8' wide containing ore running from \$2 to \$5 gold per ton, which is all milled.

Development: by adit at level of top of mill by glory-hole method through 500' stope.

Equipment: includes compressors, buildings, experimental 5-stamp mill with Wilfley and vanner, large mill with crusher, Chilean mill, plates and Pierce amalgamator. All machinery electrically driven; power furnished by Utah Light & Power Co.

WEST TOLEDO MINES CO.

UTAH

Office: 1 Mining Exchange Bldg., Salt Lake City.**Mine office:** Alta, Utah.**Officers:** E. W. Hulse, pres.; T. L. Mitchell, v. p.; F. C. Cohen, sec-treas.; with J. A. Foley and P. M. Magregor, directors. A. O. Jacobson, mgr.**Cap.,** \$500,000; shares 10c par; outstanding 398,000 shares. Listed on the Salt Lake Stock Exchange.**Property:** 11 claims in the Little Cottonwood district, Salt Lake County.**Development:** chiefly by the Superior and Frederick tunnels which are to be extended to cut several known mineralized veins. The Frederick tunnel is over 3,000' long. Grade of ore so far found is reported to be low. Actively developing in Sept., 1917, at several points to open both the E. and W. Cardiff contacts. Property is in a line with Cardiff and South Hecla in both of which the overthrust contacts have proven ore bearing.**WOODLAWN COPPER MINING CO.**

UTAH

Office: 305 Atlas Blk., Salt Lake City, Utah. Mine near Brighton, Salt Lake Co., Utah.**Officers:** H. W. Lawrence, pres.; A. C. Ellis, Jr., v. p.; George N. Lawrence, sec.-treas.; W. J. Lawrence, mgr.**Inc.** 1899, in Utah. **Cap.,** \$70,000; shares 10 cts. par, assessable.**Property:** 7 claims, patented in the Big Cottonwood district, 18 miles from a railroad, having 3 tunnels of 360', 980' and 100', with over 4,000' of workings, showing lead, zinc, silver and copper ore, whose value is mainly in lead.**Development:** work was resumed in 1915, after an idleness of several years, the main tunnel being driven 500' farther. By Aug., 1917, a 165' incline shaft had been sunk and drifting was underway for an ore shoot. On the 100' level this shoot yielded up to 70% lead and 190 oz. silver ore.*AMERICAN FORK DISTRICT***ALBERTA MINING CO.**

UTAH

Office: American Fork, Utah.**Officers:** Ammon Mercer, pres.; S. H. Roundy, v. p.; Jas. L. Mercer, sec., with M. F. Cowley, Nelson McCarty and David Davis, directors.**Inc.** May, 1917, in Utah. **Cap.,** \$30,000; shares 3 cts. par; 500,000 shares held in treasury.**Property:** 15 claims in Silver Lake mining district, said to carry good values in gold, silver, copper, lead and molybdenum. Developed by 135' tunnel. A prospect.**AMERICAN FORK EXPLORATION CO.**

UTAH

Formerly the Wild Dutchman Mining & Milling Co.

Address: American Fork, Utah.**Officers:** W. E. L. Dillaway, mg. dir. and treas.; J. E. Rothwell, W. B. Farmer, J. B. Hubbard and F. J. Justin, directors; Carl B. Ferlin, supt.**Inc.** in Utah. **Cap.,** \$150,000; shares \$1 par; all issued.**Property:** company owns lease on the Dutchman mine and all shares of the Fissures Exploration Co. (which see), and thereby owns by assignment and purchase the lease of the Pacific mine.**Development:** by upper and lower tunnel following the Pacific fissure and cross fissures. Estimated value of ore reserves is \$1,000,000. Ore is high in lead and silver; while copper ore carrying gold is being developed.**Equipment:** in Oct., 1917, a new 200-ton mill, costing \$100,000, started treating dump ore. Houses were erected for staff and employees, also necessary shops, 300-ton concentrate bins, assay-office, etc.**Production:** during the season of 1916 crude ore and concentrate were

Officers: Wm. Chipman, pres.; Hugo B. Anderson, v. p.; J. Tracey Wootton, sec.-treas.; J. H. Wootton, mgr., with John Hower, directors.

Inc. Feb., 1917, in Utah. Cap., \$50,000; shares 5 cts. par; assessable; 515,000 shares outstanding. Annual meeting, 2nd Tuesday in January.

Property: 7 claims, 140 acres, in American Fork canyon, Utah, claimed to carry a fissure vein of lead sulphide and iron carbonate, with a 4" shoot of lead ore, assaying about \$25. Developed by tunnel, 90' long, to be extended 200' during 1917. Company has no equipment.

BAY STATE MNG. & DEV. CO.

UTAH

Address: American Fork, Utah Co., Utah.

Officers: Geo. B. Tyler, pres. and mgr.; J. H. Wootton, v. p.; J. W. Storrs, sec.-treas., with A. Chipman and E. J. Bennett, directors.

Cap., \$1,000,000; shares 5 cts. par; assessable; last assessment, No. 5, of 1/2c called June 14, 1917. Stock listed on Salt Lake Exchange. Financial statement to April 20, 1917, shows receipts from stock sales of \$7,990 and loans \$1,000, with disbursements for preceding year of \$9,160 and current bills of \$1,333.

Property: at American Fork canyon, 22 claims, unpatented, 18 miles from the railroad. Company claims to have 1,000 tons of ore on the dump averaging 5 to 8% lead and 8 to 10 oz. silver, and 210 tons of ore averaging \$75 per ton.

Development: is by a tunnel over 320' long with about 1,065' of workings.

BELOROPHON MINING CO.

UTAH

Address: A. T. Sanford, Boston Bldg., Salt Lake City, Utah. John Cleg-horn, mgr.

Cap., \$100,000; shares 10 cts. par; 960,000 shares issued.

Property: 250 acres adjoining the Live Yankee group on the north in American Fork canyon, Utah. The Live Yankee and other veins are said to cross the claims.

Ore: occurs in fissures in quartzite and in contact between lime and quartzite, carrying gold, copper, silver, and lead.

Shipped 1 carload in September, 1914, running 1.38 oz. gold, 10 oz. silver, 5.8% lead, and 3.45% copper.

Development: work in progress, and in Oct., 1917, management contemplated erecting a mill next spring.

BOG MINING CO.

Address: Evans, Morris & Whitney Co., Exchange Bldg., Salt Lake City, Utah.

Cap., \$1,000,000; shares 100,000, offered at 15c each, up to November 24, 1917.

Property: 12 claims in American Fork canyon, said to be on the same formation as the Pacific mine. The Bog is shipping from a 3' vein and a deep tunnel is proposed.

BOLEY MINING CO.

UTAH

Office: Newhouse Bldg., Salt Lake City, Utah.

Officers: E. G. Jensen, pres.; J. A. Stallings, sec.-treas.; Chas. Read, J. H. Woodmansee and A. M. Cheny, directors.

Cap., 1,000,000 shares.

Property: 7 claims, in American Fork mining district, Utah, adjoining the Texan, Whirlwind and Miller Hill properties. Mine is to be developed at a depth of 1,000' by the Texan Mining Co.'s 1,300' tunnel. Is a prospect.

EARL & EAGLE MINING CO.

UTAH

Address: C. W. Earl, pres.-gen. mgr., George E. Hemphill, supt., American Fork, Utah Co., Utah. W. E. Evans, sec., Lehi, Utah.

Cap., \$10,000; shares 1c par; \$5,600 issued. Listed in Salt Lake City.

Property: 10 claims, about 200 acres, is a consolidation of the Clipper & Silver King and Steel groups, located in American Fork district, about 25 miles southeast of Salt Lake City.

Claims are reported to be traversed by several ore bearing fissures and dikes. Tunnel was 1,100' long, September, 1917, and is being driven to reach the fissure or Live Yankee vein, expected at 1,200'. Property is in the prospect class.

ETTA MAY MINING CO.

UTAH

Address: Frank Jardine, mgr., American Fork, Utah.

Property: in American Fork district. In Aug., 1917, a tunnel was in 80', showing lead-silver ore, with some copper.

FISSURES EXPLORATION CO.

UTAH

Entire stock issue owned by American Fork Exploration Co., which see.

Address: C. B. Ferlin, supt., McCornick Blk., Salt Lake City, Utah. Has a 10 years' lease on property of Pacific Gold M. & M. Co., at American Fork, Utah, Co., Utah, which see. Also leases other groups at head of Mary Ellen gulch.

Company is shipping copper-silver ore, eight teams being steadily employed, July to Oct., 1917.

Employs 35 men at Pacific mine where a 200-ton mill started work in Oct., 1917.

GOLD HILL MINES DEVELOPMENT CO.

UTAH

Main office: 425 Atlas Block, Salt Lake City, Utah. **Mine office:** American Fork, Utah.

Officers: Theo. Nicholes, pres. and gen. mgr.; A. J. Weber, v. p.; H. J. Fitzgerald, sec.-treas.

Inc. July, 1916. **Cap.**, \$1,000,000; par \$1; 300,000 in treasury; 290,000 sold. Increased 1916 from \$50,000; 10c par.

Property: 9 claims in American Fork district, Utah Co., Utah, on Miller Hill. Ledge said to show copper ore, with lead and gold-silver values.

Development: by 3 short tunnels, lowest being driven to open ore found in upper tunnel.

JULIAN MINING & MILLING CO.

UTAH

Idle. American Fork, Utah Co., Utah.

Officers: Jas. Chipman, Jr., pres.; Wm. Thornton, v. p.; J. E. Bennett, sec.-treas.

Inc. Aug., 1909, in Utah. **Cap.**, \$50,000; shares 5 cts. par. Apparently succeeded a company of same title organized in Nebraska, with an office at Geneva, Neb., which lost its charter 1909.

Lands: 5 claims, unpatented, showing gold, silver and copper ore.

MAJOR EVANS MINING CO.

UTAH

Office: 440 Boston Bldg., Salt Lake City, Utah. C. B. Felt, pres.; R. Leo Bird, sec.

Inc. 1915, in Utah. **Cap.**, \$100,000; shares 10c par; assessable; treasury, 440,000 shares. Listed in Salt Lake City.

Property: 42 claims in American Fork mining district, said to show copper-lead-silver ore. Is a prospect.

MARY ELLEN MINING & MILLING CO.

UTAH

Address: American Fork, Utah.

Officers: W. C. Boley, pres.; T. S. Friday, v. p.; J. W. Storrs, sec.-treas.; with R. C. Boley and T. M. Allman, directors.

Inc. 1909, in Utah. **Cap.**, \$100,000; shares 10c par; assessable; 650,000 issued.

Property: 7 claims, 125 acres, in American Fork district, Utah, said to show a vein in quartzite and limestone.

Ore: is partly sulphide, and contains lead, silver, and gold values.

Development: by tunnels totaling 700'. Idle for 3 years, but work resumed in 1917.

MILLER HILL MINING CO.**UTAH**

Office: Knight Block, care Knight Bros., Provo, Utah. **Mine office:** American Fork, Utah Co., Utah.

Officers: Jesse Knight, pres.; J. Wm. Knight, v. p.; W. Lester Mangum, sec.-treas.

Cap., \$100,000; shares 10c par. Shares are listed on the Salt Lake Stock Exchange. In Sept., 1917, 25,000 shares of stock were offered for sale at 50c a share.

Property: 33 claims, 30 patented, adjoining the Mineral Flat mine, are developed by 2,200' tunnel with about 2,400' of workings. Drift, 30' long, will be extended 500' to cut the Pacific fissures and work is provided for by assessments, 2c per share being called Nov. 12, 1917. Employs 15 men. Company purchased the adjoining Mountaindell property in 1916.

MILLER MINES DEVELOPMENT CO.**UTAH**

Office: 804 Newhouse Bldg., Salt Lake City, Utah.

Officers: J. H. Leavell, pres.; G. H. Ryan, v. p.; H. W. Ragland, sec.-treas.; with M. P. Kirk, and L. D. Foreman, directors. J. C. Fitzgerald, supt. Inc. in Utah. **Cap.,** \$1,000,000; shares 10c par; 543,500 issued; non-assessable.

Property: 11 claims, 10 patented, 70 acres, at Miller Hill, in American Fork district, Utah Co., Utah. Miller mine operated under 5 years' lease and bond.

Geology: replacement deposit in upper Cambrian limestone. Orebody said to be 600' long and of good width. Ore carries lead and zinc carbonates, and is reported to assay 0.73 oz. gold, 20.7 oz. silver, 43.95% lead, 17.2% iron, and 6.1% zinc.

Development: by tunnels 300 to 1,200' long to depth of 400' with total underground workings of about 15,000'. In 1918 company expects to prospect veins in quartzite.

Development: by tunnels 300 to 1,200' long to depth of 400' with total underground workings of about 15,000'. In 1918 company expects to prospect veins in quartzite.

MILLER MINING & SMELTING CO.**UTAH**

Office: 406 Dooley Block, Salt Lake City, Utah. W. A. Wilson, gen. mgr.

Property: 10 claims, patented, 56 acres, in American Fork canyon.

Ore: carries gold, silver, and lead. Management reports production of \$1,600,000 to end of 1912. Development resumed June, 1917, and mine under lease and bond.

MINERAL FLAT MINING CO.**UTAH**

Office: Provo, Utah. **Mine office:** American Fork, Utah Co., Utah. Jesse Knight, pres.; J. C. Jensen, mgr.

Inc. in Utah. Cap., \$100,000; shares 10 cts. par; assessable. Shares listed on Salt Lake Stock Exchange.

Property: 22 claims, partly patented, 25 miles from a railway, carries lead and copper ores. Developed by shaft and tunnels of about 2,000' aggregate length, upper levels showing occasional bunches of good ore, but without continuity of payable mineral. Extension of main tunnel underway, 1917.

Equipment: includes a hydro-electric plant, with a 9,000' pipe line and several buildings.

MONARCH MINES CO.**UTAH**

Title changed from Plentiful M. & M. Co., 1916.

Address: American Fork, Utah.

Officers: Chas. Ohran, pres.; F. W. Wright, v. p.; with W. A. McBride, E. J. Seastrand, and J. A. Kauffman, directors. J. Watt Storrs, sec.-treas.

Inc. June, 1915, in Utah. Cap., \$30,000, increased March, 1916, to \$40,000; shares 5c par; 600,000 issued.

Property: 9 claims, 186 acres, near American Fork, Tooele Co., in Lake-side mountains, shows galena and carbonate ore in fissure vein cutting blue and

gray limestone, with N.-S. strike and dip of 70° W. Pay ore reported to have been cut in 1916, at 140' depth in a 40' vein of lead carbonates. A 2½' streak is said to assay 78% lead and 10 oz. silver.

Development: by 3 incline shafts, deepest 193'.

Ore reserves: 100,000 tons estimated as blocked out.

Equipment: includes 2 motor trucks.

OLD EMMA LEASING CO.

UTAH

Office: 40 Exchange Place, New York City.

Dissolved April, 1917. Assets consisting of 416,667 shares of Emma Cons. Mines Co. stock being distributed to stockholders at ratio of 3 shares of O. E. L. for 1 share of Emma Cons.

OLD EMMA MINES CO.

UTAH

Emma Consolidated Mining Co. owns 80% of the outstanding capitalization.

Property was leased for 14 months from July, 1916, to Old Emma Leasing Co., which was dissolved in April, 1917. Lease sold to Emma Cons. Mining Co., which see.

OSBORN CONSOLIDATED MINING & MILLING CO.

UTAH

Address: American Fork, Utah.

Officers: at last accounts, S. Osborn, pres. and gen. mgr.; W. D. Lovell, v. p.; Alfred J. Osborn, sec.-treas.

Inc. July 17, 1907, in Utah. **Cap.**, \$125,000; shares 25 cts. par.

Property: 9 claims, in American Fork canyon, about 4 miles from Park City, shows veins of 5 to 8' width, carrying lead values near surface, developed by a number of shallow shafts and shaft tunnels. The 200' main shaft is sunk at an incline of 42°. Copper ores occur in depth in many of the adjacent mines and are expected here. Development meagre. Presumably idle.

PACIFIC GOLD MINING & MILLING CO.

UTAH

Office: American Fork, Utah.

Officers: J. L. Craig, pres.; Jas Chipman, Jr., v. p.-treas.; H. C. Johnson, sec.-mgr.; with A. B. Stevenson, A. K. Thornton, directors.

Inc. 1900, in Utah. **Cap.**, \$100,000; shares 10 cts par; assessable; 400,000 shares outstanding. Annual meeting, 1st Monday in Feb. Financial statement for year ending Feb. 3, 1917, showed balance in bank, \$7.26, after payment of dividends No. 1 and No. 2, amounting to \$8,000.

Property: Blue Rock group, 6 patented claims, 120 acres, in American Fork mining district, Utah Co., Utah, shows quartzite and limestone, carrying several fissure veins varying in width from 17" to 15'. Veins strike N. 30° E. and dip 50° N. W.

Ore: lead-silver sulphide, estimated by management to average 50% lead, 25 oz. silver, .02 oz. gold, 1.5% zinc, 15% iron, 0.1% copper, 22% sulphur.

Development: by 3 tunnels, 300', 700' and 1,000' long, with about 5,000' of workings, estimated to show 100,000 tons of ore blocked out for stoping, Dec., 1915. The main fissure was cut at depth of 500'. A drift was run on the vein 75' S. and another 500' N.; at the end of the latter a crosscut made to the hanging-wall was reported, Feb., 1917, to have disclosed 26' of ore, averaging \$55 per ton in copper, silver and gold. Carload shipments in 1916 amounted to 978 tons, netting \$49,999, the Pacific Co. receiving \$8,637 in royalties. Total production to date about \$32,000. Property operated under a 5-year lease, from 1914, by the Fissures Exploration Co., controlled through stock ownership by American Fork Exploration Co., on a royalty basis.

Equipment: includes a hydro-electric-generating plant, installed in Dec., 1916, at a cost of \$20,000. The mill treats about 70 tons per day concen-

trates netting \$37 per ton. A 200-ton mill constructed during 1917, was started in October by the American Fork Exploration Co., which see.

PATHE MINING CO.**UTAH**

Address: American Fork, Utah.

Officers: John E. Berg, pres.; L. A. Anderson, v. p.; Boise A. Wells, 2nd v. p.; S. L. Anderson, sec.; S. T. Shelley, treas., with W. F. Anderson and Abner Chipman, directors.

Inc. March, 1917, in Utah. Cap., \$10,000; shares 1c par.

Property: the Silver King Nos. 1 and 6 claims in American Fork district.

PITTSBURGH CONSOLIDATED MINING & MILLING CO. UTAH

Address: American Fork, Utah Co., Utah.

Officers: Mrs. E. Tarbet, pres.-mgr.; H. H. Green, v. p.; J. G. Doolittle, sec.-treas.; with B. Snyder and P. S. Keoch, directors; J. Benton Leggatt, cons. engr.

Inc. 1903. Cap., \$500,000; shares \$1 par; 300,000 shares issued.

Property: 9 claims, 6 patented in both Salt Lake and Utah counties, mainly on the American Fork side of the divide.

Ore: occurs in fissure veins.

Development: by 3 tunnels from American Fork canyon, is on the Pittsburgh fissure. A 500' upper tunnel is credited with a production of 11,000 tons under former management. The tunnels are in 500' and are connected by winzes and raises. Operations were resumed in 1914 after an examination of the property by J. Benton Leggatt. In No. 2 tunnel a 12' orebody of solid lead-zinc sulphide is said to have been exposed, assaying 25% lead, 34% zinc, 40c gold, 5 oz. silver, 26% sulphur and 5% iron per ton.

In 1915 the 3 tunnels were connected and drifts run along the several fissures. A fourth tunnel, started to top the Pittsburgh fissure 150' lower than No. 3, will be driven 1,200' and is to serve as a means of transportation. A wagon road was built to Alta in 1916.

Equipment: includes necessary mine buildings and dwellings.

SILVER FLAT MINING CO.**UTAH**

Property: the old Nebraska mine in Delta Creek, Silver Lake section, American Fork, Utah, shows silver-lead ore in fissures in limestone cut by porphyry dikes.

Ore: is high in zinc.

Development: by 1,200' of tunnels. Work resumed, June, 1916.

SILVER SIDE MINING CO.**UTAH**

Address: American Fork, Utah.

Officers: J. E. Beveridge, pres.; A. O. Jacobson, v. p.; W. Holmes, sec.-treas.; with H. P. Huey and M. M. Beaver, directors.

Inc. 1916, in Utah. Cap., \$50,000; shares 5c par.

Property: is 5 miles up American Fork canyon, Utah, and is said to show silver-lead ore in a lime-quartzite contact.

Development: by tunnels and shallow shaft.

SOUTH PARK MINING & DEVELOPMENT CO.**UTAH**

Office: 310 Kearns Bldg., Salt Lake City. O. A. Relf, pres.; J. Tracy Wootton, sec.-treas.

Inc. May 24, 1916. Cap., \$50,000; shares 5c par; assessable; \$3,000 issued. Listed in Salt Lake City.

Property: 17 claims, 14 patented, in American Fork mining district, said to show iron carbonate containing silver-lead values.

Development: in 1917, two tunnels were being extended to cut the vein. In October, the 250' tunnel cut ore assaying 2.99% copper, 57.8% lead, 303 oz. silver, and \$2.40 gold per ton.

TEXAN MINING CO.

UTAH

Office: 400 W. 7th South St., Salt Lake City, Utah.**Officers:** Chas. Tyng, pres.; Frank Nelson, sec.**Inc.** in Utah. **Cap.**, \$1,000,000; shares \$1 par; outstanding, \$825,000. Listed in Salt Lake City.**Property:** 200 acres in American Fork district, said to show silver-lead-copper-gold ore. A tunnel was driven over 1,000' in the Texan mine, while the Miller Hill tunnel is in 2,100'; both tunnels are in quartzite. No commercial orebodies have been found yet.**UTAH CENTENNIAL MINING CO.**

UTAH

Address: Pleasant Grove, Utah.**Officers:** J. E. Thorne, pres.; L. L. Nelson, v. p.; D. Noble, sec. and treas.; J. W. Thorne, J. E. Thorne, C. Thorne and L. L. Nelson, directors.**Inc.** 1907. **Cap.**, \$1,000,000; shares 5c par; outstanding, 250,000 shares; assessable. Annual meeting in April.**Property:** 10 claims in American Fork Canyon, American Fork district, Utah Co. Fissure vein carries gold, silver, lead, copper ore. Developed by a 450' tunnel. Property is a prospect undergoing development.**WHIRLWIND CONSOLIDATED MINING CO**

UTAH

Office: 400 W. 7th St., Salt Lake City, Utah; Harry Kreuse, supt, American Fork, Utah.**Officers:** Chas. Tyng, pres.-mgr.; Frank K. Nelson, sec.**Inc.** April 24, 1916, in Utah. **Cap.**, \$250,000; shares 25c par; 800,000 shares issued. Listed on Salt Lake Exchange. Cash on hand, \$6,250.**Property:** 7 claims, unpatented, 110 acres, in the American Fork mining district, adjoining the Miller Hill on the West, 20 miles from a railroad, said to show silver-lead ore.**Development:** by 2 tunnels; one started June, 1916, was 1,000' long in Oct., 1917, and was reported to have cut some lead carbonate ore at 760' in.

Installation of machinery and power was planned for 1916-17. Stock offered by W. H. Childs & Co., for 7c a share in May, 1916.

WIG MOUNTAIN MINING & MILLING CO.

UTAH

Officers: George A. Storrs, pres., American Fork, Utah; George A. Brown, v. p.; J. W. Storrs, sec.-treas., John Curzon, and Jos. Thurgood, directors; F. Jardine, supt.**Inc.** May, 1916. **Cap.**, \$1,000,000; shares 1c par.**Property:** the Jumbo group, 7 claims, on Wig mountain. Is a prospect which was being developed in Aug., 1917. Ore contains lead and silver.*BINGHAM DISTRICT (see p. 1354)**MILFORD, OR STAR DISTRICT***BEAVER COPPER CO.**

UTAH

Office: 222 D. F. Walker, Bldg., Salt Lake City, Utah. Mine at Milford, Beaver Co., Utah.**Officers:** A. D. Moffat, pres.; A. J. McMullen, v. p. and gen. mgr.; F. S. Walden, sec.-treas.; preceding officers, A. D. McMullen, Lewis Merriman, Chas. A. Weaver and Jas. H. Paterson, directors; D. P. Rohlfing, cons. engr.**Inc.** 1907, in Utah. **Cap.**, \$1,000,000; shares 10c par; assessable; all issued; 4 assessments levied to date. Annual meeting, third Monday in March. Listed on Salt Lake exchange.**Property:** 4 claims, 75 acres, in the Beaver Lake district, carrying an ore zone for about 6,000', with 2 veins, known as North and South, that are fissures in monzonite. Six veins about 4' wide, developed by 4 pits and a shaft, with 308' of workings, show oxidized and sulphide ores, the latter chalcopyrite, estimated by management to average 2% copper, 6 oz. silver and 80c gold per ton. Company has raised sufficient funds to install complete equipment.

and had sunk shaft to 200' level, Feb., 1917. Shipped 35 tons of ore carrying 3 to 4% copper early in 1917.

CAPITOL MINING CO.**UTAH**

Address: Charles Smith, supt., Milford, Utah.

Property: 2 claims, 3½ miles S. W. of Milford, Utah. Being developed by shaft, and machinery to be erected in Nov., 1917.

Ore: carrying silver, lead and gold occurs in limestone and porphyry.

COPPER RANCH CONS. MINING CO.**UTAH**

Office: 130 South, on West Temple St., Salt Lake City, Utah.

Officers: D. L. Evans, pres., Malad, Ida.; Jos. Pingree, sec.-treas., Salt Lake City; A. F. McCulley, v. p.; D. E. Kirk and E. V. Kessler, all of Malad, directors.

Inc. Sept., 1917, in Utah.

Property: the Copper Ranch mine, 10 claims, located next to Milford Copper Co. ground, 7½ miles west of Milford. Mine operated during 1916-17 by lessees who produced 100 cars of ore netting \$92,368 smelter returns. Orebodies in sight reported sufficient for regular shipments for several years. High-grade ore cut in Sept., 1917. Shipments, 1917, one hundred cars ore netting \$32,368.

Development: by 300' incline shaft with drifts and crosscuts on ore.

New company will furnish new equipment for mine, sink shaft and build a one-mile spur to connect with Frisco branch of Salt Lake Route.

COPPER RANCH MINING CO.**UTAH**

Mine near Milford, Beaver Co., Utah.

Officers: Moses Thatcher, former pres.; C. L. Rood, v. p.

Inc. in Utah. Cap., \$500,000; shares 50c par.

Property: sold Aug., 1917, for \$57,000 to D. L. Evans, of Malad City, Jos. Pingree and A. S. McCully, of Milford, Utah. This amounts to 13% a share of Copper Ranch stock. (See Copper Ranch Consolidated.)

CREOLE COPPER MINES CO.**UTAH**

Inc. 1917. Cap., \$250,000; shares 25c par. H. S. Wooley, sec. (See Creole Mining Co.)

CREOLE MINING CO.**UTAH**

Mortgage reported foreclosed in March, 1917. Said to be controlled by Creole Copper Mines Co. Ore shipments made up to Dec., 1916, and financial trouble arose.

Property: 10 claims, 6 patented, 75 acres in Lincoln mining district, Beaver Co., Utah, shows gold, silver, copper, lead ore in a contact deposit between granite and limestone. Deposit has an E. W. course and dips E. 38°. Average assays said to be 12% copper, 5% lead, 17 oz. silver and \$1 to \$5 gold per ton.

Development: 220' incline shaft and 200' tunnel, with total underground workings about 1,500'.

Considered of doubtful future value.

CROFF MINING CO.**UTAH**

Officers: R. R. Tanner, supt., Beaver, Utah; G. P. Norton, sec.

Cap., \$1,000,000; shares \$1 par; 295,000 shares and \$7,354 in treasury, Jan., 1916. Listed in Salt Lake City.

Property: 5 patented claims, in Lincoln mining district, 12 miles east of Milford, Beaver Co., Utah. Ore is found along the contact of lime shale hanging-wall and limestone foot-wall and varies in width from 6" to 3'. It is said to carry silver, lead, copper and gold.

Development: by 240' incline shaft, still sinking; also 665' of tunnels and drifts. Have proven ore shoot on 150' level.

Three carloads of ore shipped, 1917, assayed 13% lead, 6 oz. silver and \$2.80 gold per ton.

Equipment: includes a gasoline hoist and air-compressor.

GOLD CROWN MINING & MILLING CO.

UTAH

Address: Milford, Beaver Co., Utah.**Officers:** A. L. Cullimore, pres.; C. G. Johnson, v. p.; S. L. Swanson, sec.-treas.; James Kirk, mgr.; W. E. Yardley, asst. mgr.**Cap.,** \$10,000; shares \$1 par.**Property:** 7 claims and lease on another in Star district, Beaver Co., Utah. Some rich lead-silver ore opened.**GRANITE COPPER CO.**

UTAH

Beaver, Beaver Co., Utah.**Officers:** A. L. Fotheringham, pres. and mgr.; Jos. McEwen, v. p.; J. F. Tolton, sec.-treas.**Cap.,** \$1,000,000; shares \$1 par.**Property:** in the Mineral range between Milford and Beaver, Utah, has a 2' vein, carrying high-grade silver-lead ore with some copper.

Opened by a 250' shaft and 1,100' tunnel. About \$25,000 has been spent on mine, known as the King of the Hills. Under bond and lease, 1917-18.

KING OF THE HILLS MINE

UTAH

Address: Milford, Beaver Co., Utah. Mine in Granite district, 25 miles N. E. of Milford, reported to have 14 to 18' contact metamorphic vein of copper-lead ore in limestone, cut by porphyry.**Development:** by tunnels. Equipped with concentrating mill, making a product carrying 10% copper, 42% lead and 10 oz. silver. Developing at last accounts.**LEONORA MINING & MILLING CO.**

UTAH

Office: 18-20 E. 1st South St., Salt Lake City, Utah. **Mine office:** Milford, Beaver Co., Utah.**Officers:** John Matson, pres. and mgr.; J. W. Chase, v. p.; C. D. Brown, sec.-treas.; preceding, with L. H. Stohr and N. P. Hansen, directors; A. C. Nebeker, mine supt.**Inc.** Dec. 19, 1903, in Utah. **Cap.,** \$100,000; shares 10c par; assessable; issued, 950,000 shares.**Property:** 13 claims, in the North Star district near Milford, shows fissures in limestone carrying replacement deposits of gold, silver, zinc and lead ores.**Development:** by tunnels of 900', 500' and 300' and 7 shallow shafts of 25' to 100' depth.

Company did 1,500' of development work in 1916 and has cut some promising looking veins. Expects to be shipping soon.

Equipment: includes electric hoist and air compressor.**MAJESTIC COPPER MINING & SMELTING CO.**

UTAH

Office: 53 State St., Boston, Mass. John M. Dick, president. To all practical intents and purposes this company was succeeded, 1904, by Majestic Copper Co., which was succeeded, 1908, by Majestic Mines Co. Majestic Copper M. & S. Co., however, remains in existence, though practically the entire stock issue, and a large majority of the bonds, are owned by the Majestic Mines Co. Very fully described in Vol. IV, of the Copper Handbook.**MAJESTIC MINES CO.**

UTAH

Office: 342 Exchange Bldg., Boston, Mass. **Mine office:** Milford, Beaver Co., Utah.**Officers:** John M. Dick, pres.; H. M. Inman, v. p.; D. J. Flanders, sec.-treas.; J. A. Bailey, G. F. Kellogg, John Muller, R. H. Phillip, E. M. Southworth and John Freeland, directors; Alex. D. Moffat, mine mgr.**Inc.** May 18, 1908, in Maine, practically as successor of Majestic Copper Co. and Majestic Copper Mining & Smelting Co. **Cap.,** \$5,000,000; shares \$5 par; assessable; issued, 808,795 shares.

Stocks of both companies were exchanged share for share for stock of the Majestic Mines Co. on payment of 15c a share; bonds of the Majestic Copper Mining & Smelting Co. were exchanged for stock of the Majestic Mines Co., giving 900 shares of new stock for each \$1,000 bond.

The result of the reorganization has been as follows: all floating indebtedness of the operating company has been liquidated; \$868,500 of the \$1,000,000 outstanding bonds have been purchased and are now owned by the Majestic Mines Co.—practically 87%—which gives the Majestic Mines Co. control of the situation. Assessments of present company have been as follows: 15c in 1908; 5c in June, 1910; 10c in April, 1911. Shares listed on Salt Lake Stock Exchange, Boston and New York Curbs. Federal Trust Co., transfer agent; State Street Trust Co., registrar, Boston, Mass. Annual meeting, third Tuesday in March.

Property: 120 claims, 2,450 acres, in 8 groups, also an 80-acre smelter site, and 800 acres miscellaneous lands. The groups, located in 5 different districts of Beaver county are the O. K., Old Hickory, Harrington-Hickory, Vicksburg, Hoosier Boy, Southern States, Larkspur, Copperfield and Treasurer, said to have about 100 orebodies, carrying copper, gold, silver, platinum, lead, cobalt, bismuth, vanadium and uranium. The company has platted the town site of Lewisville, where the smelter was located, and the property is served by the Salt Lake Route.

Development: claims are under active development, 1917; there are 18 shafts, 100 to 600' deep, with a total of 6 miles of underground workings. The Old Hickory and O. K. mines yield copper ores, the others silver-lead ores.

The principal work of the present company is on the Old Hickory group of 9 claims, from which shipments are being made at the rate of about 33 tons ore daily. Smelter returns on this ore are given as 3.46% copper, 1.7 oz. silver and 39.7% iron.

The **O. K. mine**, 7 claims, formerly the principal producer, has a 500' three-compartment shaft, with a vein up to 20' in width, development being mainly on the 300' and 400' levels. This mine has over 500,000 tons of low-grade ore blocked out, in what apparently is a stockwerk, up to 250' in width, carrying stringers of high-grade ore. The O. K. mine, idle in 1915, is producing 8% copper ore, 1917.

The **Harrington-Hickory** group of 27 claims, partly fractional, shows numerous fissure veins, intersected by cross veins, both approximately vertical, and, in addition, has a series of bedded veins, presumably following bedding planes, dipping at 30 to 35°, giving 3 separate intersecting systems of orebodies. Development is by a 600' two-compartment vertical main working shaft, with drifts on the 500' level, where there is a body of high-grade ore, assays from which have given 1% copper, 37 to 55% lead, 18 to 22 oz. silver, and about \$1 gold per ton.

The **Vicksburg** group of 4 claims, a lead-silver mine, formerly worked for gold, has 3 practically vertical fissures, of 2 to 20' width, with mineralized cross-fissures, developed by a 200' 2-compartment working shaft, a 150' incline shaft and numerous shallow shafts and pits. It is said that high-grade ore has been encountered at a depth of 150' in this mine. Worked by lessee and 20% royalty paid to company on gross proceeds.

The **Hoosier Boy**, a silver-lead mine, about 3 miles from the Horn Silver mine, is now under development.

Producing about 600 tons per month, 1917. An 800' shaft has been sunk and considerable work done at 200', 400', 600' and 800' depth.

Equipment: includes 6 gasoline and 1 steam hoist. Electric power, for lighting and pumping, is taken from the Beaver River Power Co.

Production: in 1916 was about 6,500 tons of ore, yielding 350,065 lbs. copper, 294,678 lbs. lead, 257,476 lbs. zinc, and 18,680 oz. silver.

Mines closed down from Aug., 1914, to May, 1915, but operations now being pushed rapidly. Producing about 600 tons per month, 1917.

MASTER KEY MINING CO.**UTAH**

Address: 1014 Boston Bldg., Salt Lake City, Utah.

Officers: A. G. Guthell, pres.; C. W. Reese, v. p.; G. M. Sullivan, sec.-treas.; with A. J. Mooney and Henry Barney, directors.

Inc. Feb., 1915, in Utah. Cap., 1,000,000 shares of no par value; assessable; 500,000 held by Trustee.

Property: 7 claims, 5 being patented, 123 acres, 8 miles, W. of Milford, Star district, Beaver Co., Utah.

Geology: ore occurs in bedding planes and fissures in limestone dipping N. E., the Mowitza shale-contact carrying the large orebodies, which extend along the bedding into the Red Warrior limestone. Company expected to cut ore horizon at depth of 250'. Hoosier Boy fissure intersects it. Is a prospect.

MILFORD COPPER CO. OF UTAH**UTAH**

Office: Newhouse Bldg., Salt Lake City, Utah. **Mine office:** Milford, Utah.

Officers: F. E. Turner, pres.; C. W. Saacke, v. p.; H. A. Frank, sec.; F. B. Cook, treas.; with Alfred Frank, mgr.; J. W. Caswell, supt.; and H. C. Todd, directors.

Inc. Feb. 3, 1917, in Utah. Cap., \$500,000; shares \$1 par; all issued; non-assessable. Transfer office, 61 Broadway, New York. U. S. Corporation Co., New York, registrar. Annual meeting, January 15. Earnings at rate of \$100,000 per year.

Property: 18 patented claims, 300 acres, at Milford, Beaver Co., Utah, known as the Montreal mine, being one of the properties developed extensively by the Glasgow & Western Exploration Co., in liquidation. In Feb., 1916, mine was leased by Alfred Frank and others, who eventually organized the Milford company.

Geology: contact deposit in limestone and quartz-monzonite. Orebody 10 to 50' wide, dips 45°, and has an irregular course. Ore is partly sulphide and averages 2.5% copper, 0.75 oz. silver, 0.01 oz. gold, 15% silica and 37% iron.

Development: by tunnels and shafts to 400' depth, workings amount to 3,000'. Ore reserves estimated at 30,000 tons.

Equipment: 8x10" air-hoist and 10-drill Sullivan compressor. Railroad spur to be constructed to mine, to save \$1,000 per month.

Production: ships 100 tons daily to Garfield smelter, Utah, which desires the high iron-content of the ore. Output is to be doubled by end of 1917.

MONZONITE SILVER & COPPER CO.**UTAH**

Officers: S. S. Pond, pres. and gen. mgr.; D. Rigby, sec.; Geo. Baglin, treas.

Cap., \$50,000; shares 5c par; assessable. In treasury, Jan., 1916, 400,000 shares; bills receivable and cash, \$2,500. Stock listed in Salt Lake City.

Property: 7 unpatented claims, near Milford, Beaver Co., 6 miles from the railroad, surrounded by the Leonora, Hoosier Boy and Paloma Extension mines. **Ore:** silver and copper.

Development: 100' shaft with 50' of crosscutting. Is a prospect.

Letters returned from Milford, in 1917. Probably idle.

MOSCOW MINING & MILLING CO.**UTAH**

Offices: 1020 Boston Bldg., Salt Lake City, and Moscow, Beaver Co., Utah.

Officers: Matthew Cullen, pres.; J. L. Rawlins, v. p.; Athol Rawlins, sec.-treas.; G. S. Wilkins, supt.

Inc. May, 1907, in Utah. **Cap.**, \$1,000,000; shares \$1 par; assessable; issued, \$900,000. Listed on Salt Lake Exchange.

Dividends: \$108,000 to Sept., 1917, at rate of 2½c per share. Company does not reply to requests for information.

Property: 7 claims, including the Moscow mine in the Star district, 7 miles from a railroad, covers about one-half mile of the strike of an ore zone 50' to 60' wide. Ore mainly silver-lead, with some copper and zinc. The Moscow mine is one of the oldest in the district, having been worked over 30 years ago.

Development: tunnels and shaft to the 1,400' level. A winze is being sunk below this level to develop a new ore shoot, assaying 50 oz. silver and 50% lead; and a raise on the same is in good ore.

Shipments: have been fairly consistent during the past year. In June, 1917, output was 1,000 tons, averaging about \$30 per ton.

Company employs 60 men. Electric power is used.

O. K. EXTENSION MINING & REDUCTION CO. UTAH

Office: 222 D. F. Walker Bldg., Salt Lake City, Utah. **Mine office:** Milford, Beaver Co., Utah.

Officers: A. J. McMullen, pres. and gen. mgr.; T. M. Farrell, v. p.; Chas. A. Weaver, sec.-treas.; preceding with R. H. Greenhalgh, directors.

Inc. Nov., 1899, in Utah. **Cap.**, 300,000 shares; 3c par; assessable; issued, 125,000; total assessments to date, \$15,363. Annual meeting 2nd Tuesday in October.

Lands: 6 claims, 3 patented, 120 acres, near the Majestic mine, in the Beaver Lake district, show monzonite and quartz-porphry, carrying 2 fissure veins, of 5 to 24' estimated average width, traceable 150'. Opened by 7 pits and shafts of 15 to 510' depth, and a 150' tunnel, with 1,045' of workings, showing chalcopryrite estimated to average 2% copper. Inactive except for annual assessment work.

ORPHAN BOY MINING CO. UTAH

Idle. Milford, Utah.

Officers: James R. Craig, pres.; W. D. Williams, v. p. and mgr.; Chas. A. Doe, sec.-treas.; with M. R. Williams and P. J. Evans, directors.

Property: in Star district, 20 miles S. W. of Milford, Beaver Co., Utah, shows limestone, cut by quartz monzonite, with ore in veins and replacements. There are 11 claims, adjoining the Red Warrior and Mowitza mines, developed by 500' shaft with 1,200' of tunnels and workings from which considerable high-grade ore has been shipped. Vein, though narrow, has bodies of lead-carbonate ore carrying a little copper. Presumably doing annual assessment work.

PALOMA EXTENSION MINING CO. UTAH

Office: 218 Judge Bldg., Salt Lake City, Utah. **Thos. Marioneaux,** pres.; Lorin Hall, sec.

Inc. in Utah. **Cap.**, \$50,000; shares 5c par; assessable; 645,000 shares outstanding. Listed in Salt Lake City.

Property: 300 acres in Star mining district, Beaver county, shows N. E. fissures carrying silver-lead-copper ore. These fissures cross contacts between limestone beds running N. and dipping E., quartzite that runs E. and dips N., and a granite or quartz monzonite. Ore occurs where the contacts are crossed by the fissures.

Property a prospect.

PALOMA GOLD AND SILVER MINING CO. UTAH

Office: Judge Bldg., Salt Lake City, Utah. **Mines and works:** Moscow, Beaver Co., Utah.

Officers: M. P. Braffet, pres.; Chas. W. Olson, v. p., with W. Scowcroft, H. B. Cole and B. F. Caffey, directors; J. H. Braffet, sec.-treas.; C. J. Graff, supt.

Inc. in Utah. **Cap.**, \$100,000; shares 10c par; assessable; last assessment 1c levied Aug., 1917. Stock is listed on the Salt Lake Exchange.

Property: 14 claims in Star district, near Moscow, said to cover 3,000' along a limestone-monzonite contact intersected by 2 fissure veins, carrying silver, lead and copper ore.

Development: by 500' of trenching and 900' incline shaft, which was being deepened in June, 1917, and will be used as a main working shaft.

PROGRESSIVE MINING CO. UTAH
Office: 229 South West Temple St., Salt Lake City, Utah. Mine near Milford, Beaver Co., Utah.

Officers: L. B. Bohn, pres.; I. Lessing, v. p. and mgr.; C. T. Mixer, sec.-treas. and cons. engr., Box 56, Salt Lake City; preceding, with F. J. Nichols, C. C. Crismon and Jas. Barrett, directors.

Inc. Aug. 20, 1906, in Utah. **Cap.**, \$250,000; shares 50c par; assessable; fully issued. Total assessments to date, \$10,000.

Property: 6 claims, 80 acres, patented, in the Star district, 8 miles from a railway, carrying argentiferous copper and lead ores. The mine has a 150' incline shaft, with about 1,000' of workings, developing a 3' vein, said to carry ore assaying up to 8% copper, 35 oz. silver and \$1 gold per ton. A few small shipments have been made.

Mine under lease in 1916, but idle in 1917.

RED WARRIOR MINING CO. UTAH
Office: Providence Bldg., Duluth, Minn. **Main office:** Milford, Beaver Co., Utah.

Officers: Leonidas Merritt, pres.; Alfred Merritt, v. p.; W. H. Borgen, sec.; E. R. Ribenack, treas.; preceding with Jas. T. Hale, John E. Merritt, Angus Buchanan and W. F. Acker, directors; Wilbur J. Merritt, supt.

Inc. Jan. 25, 1908, in Minnesota. **Cap.**, \$250,000; increased Jan., 1911, from \$150,000, and again increased, Jan., 1917, to \$600,000; shares \$1 par; non-assessable; issued, 210,000. Shares are listed on the Duluth Stock Exchange and New York curb. Annual meeting, 2nd Tuesday in January.

Property: a silver-lead mine comprising 8 claims, 1 patented, 95 acres, in the Star district, eight miles from the Salt Lake Route. The claims show orebodies occurring along the bedding planes of limestone, the one under development said to have an average thickness of 6', width of 50' and proven depth of 600', and carries ore estimated by the management to average 21% lead, 1% zinc, 18 oz. silver and 25c gold per ton. In the deeper levels the mine has shown ore assaying 12% copper, 1% lead and 3 oz. silver per ton.

Development: by an 812' vertical shaft with levels at 500' and 675' and a 200' winze sunk on the vein from the 500' level. There are also numerous old shallow shafts and tunnels, the mine having about 3,000' of old and 4,000' of new workings. These workings were estimated to show 20,000 tons of ore, with about 10,000 tons blocked out for stoping by the former management. The mine was operated from 1870 until 1889 and was re-opened 1907, by this company. The shaft is to be deepened to 1,000'. New work has been concentrated on the 500' level, 1917.

The property of the Mowitza Mining Co., adjoining the Red Warrior, was purchased early in 1917.

It is understood that the mine has the same N.-S. ore channels mined in the Moscow mine, whose workings of equal depth are about 1,500' distant.

Equipment: includes a hoist good for 1,500' and a 3-drill compressor.

ST. CROIX CONSOLIDATED MINES.**UTAH**

Organized in August, 1917, to continue work of St. Croix Mines Co., which see, operating in Star district, Beaver Co., Utah.

Officers: M. J. O'Brien, pres.; A. D. MacIntyre, v. p.; P. M. Pearce, treas.; W. C. O'Brien, sec.; with D. Graham, W. M. Evered and E. O. Davie, directors; E. O. Davie, supt.

Cap., \$600,000; shares \$1 par.

ST. CROIX MINES Co.**UTAH**

Office: 601 Providence Bldg., Duluth, Minn. **Mine office:** Milford, Utah.

Officers: Hansen Ev. Smith, pres.; J. A. Pierce, v. p.; A. W. McNair, sec.; A. M. Colby, treas., with E. O. Davie, directors.

Inc. March 10, 1915, in Utah. **Cap.,** \$1,000,000; shares 25c par; non-assessable. Earnings in 1916 were \$5,000 from development work. Expenses in 1916 and to July, 1917, over \$12,000.

Property: 7 claims, 1 patented, 80 acres, in Star district, Beaver Co., Utah, said to show 5 contact deposits in so-called white and blue lime. Ore occurs as chimneys and contains copper, silver and lead. Copper mineral is chalcopyrite.

Development: by 300' shaft and 400' tunnel, opening ground to depth of 500'. Workings total 1,500'. Ore being blocked out in Aug., 1917.

Equipment: 35 h. p. gasoline hoist, and 4-drill compressor.

Production: intermittent since 1870.

ST. MARY MINING CO.**UTAH**

Office: 601 Providence Bldg., Duluth, Minn. **Mine office:** Milford, Beaver Co., Utah.

Officers: Hansen Ev. Smith, pres.; J. Eton Bowers, v. p.; Paul M. T. Thompson, sec., all of Duluth. W. D. Ryan, mgr.

Inc. 1908, in Arizona. **Cap.,** \$500,000; shares \$1 par; assessable.

Property: 4 claims, 3 of 90 acres area, patented, near the Moscow and Red Warrior mines, on the east side of Topache peak, 4 miles from Milford, in the Star district. Claims show 5 contact veins between limestone and an igneous intrusive. Orebody under development claimed to average 17% copper, 10 oz. silver and one carload said to have returned \$76 per ton.

Development: by a 165' shaft with several hundred feet of drifts.

The mine, opened 1870, produced until 1890. Again opened, 1909, and operated intermittently, producing about 250 tons of ore annually.

TALISMAN CONSOLIDATED MINING CO.**UTAH**

Address: P. O. Box 1065, Salt Lake City. **Mine office:** W. W. Crone, supt., Milford, Utah.

Officers: H. S. Joseph, pres.; S. S. Pond, v. p.; H. W. Brock, sec.; L. B. McCornick, treas.; with L. B. Merriman and M. J. Morris, directors.

Inc. July 7, 1917, in Utah. **Cap.,** \$100,000; shares 10c par; assessable: 300,000 issued.

Property: 20 claims; also Cedar Talisman and Empire mines under lease for 2 years, total 450 acres, in Star district, Beaver county, Utah.

Geology: fissures and contact deposits in limestone. Orebody is from 1 to 5' wide and ore said to assay 10% lead, 15 oz. silver, and 10% copper, with some zinc and gold.

Development: by incline shafts 200 and 1,000' deep. Workings total 5,000'. Reserves consist of 1,000 tons of high-grade and 40,000 tons of low-grade ore, the latter in the leased mines.

UTAH BALTIMORE CONSOLIDATED CO.**UTAH**

Officers: J. P. Evans, pres.; 408 S. 13 E. St., Salt Lake City, Utah;

J. M. Williams, v. p.; C. A. Doe, sec.-treas.; J. T. White, W. D. Williams, directors.

Inc. in 1916. **Cap.**, \$1,000,000; shares 5c par; no indebtedness.

Property: 10 claims, 5 in Beaver Co., Utah, known as the Mollie Pitcher group, 5 in the Rocky district, known as the Bill Williams group. Mollie Pitcher group has a 100' shaft in vein of copper ore, said to be 60' wide and of shipping grade. Loading station on R. R. about a mile from mine.

UTAH MINING, MILLING & TRANSPORTATION CO. UTAH
Moscow, via Milford, Beaver Co., Utah. Chas. T. Birchard, pres, and gen. mgr., at last accounts.

Property: include the Hub and Lady Bryan mines, latter bought 1909, of Mathew Cullen et al, S. of the Burning Moscow, 6 miles from a railway, in the Star district.

Development: by a 400' two-compartment main shaft, developing a vein variously reported as 2 to 30' in width, carrying silver-lead carbonates, and a bedded deposit in limestone showing high-grade cuprite, from which small shipments of ore have been made. Ore said to carry \$6-\$7 in silver and gold with heavy percentage of iron. No recent returns. Probably idle.

UTAH NATIONAL MINES CO. UTAH

Address: G. W. Field & Co., 50 Broad St., New York.

Officers: F. E. McMillin, pres.; M. Butler, v. p.; T. L. Lloyd, sec.-treas.; with D. C. Pettibone, George Henderson and J. T. Lloyd, directors.

Inc. Feb., 1917, in Delaware. **Cap.**, \$1,000,000; shares \$1 par; non-assessable.

Property: the Silver King mine, in Newfoundland district, Boxelder Co.; and the Lady Bryan in the Star district, Beaver Co., Utah.

Development: 3,000' of work said to have been done in the Silver King, opening silver-gold-copper ore assaying over \$60 per ton. In the Lady Bryan \$16 ore is exposed to depth of 510'. Estimated reserves in May were 75,000 tons.

The only news available about this property is published in a weekly review and statements seem to be exaggerated.

UTAH-UNITED COPPER CO. UTAH

Office: 222 D. F. Walker Bldg., Salt Lake City, Utah. **Mine office:** Milford, Beaver Co., Utah.

Officers: A. J. McMullen, pres. and gen. mgr.; Chas. A. Weaver, sec.-treas.; preceding with Arthur B. Gattrell and Jas. E. Edmunds, directors. D. P. Rohlfing, engr.

Inc. 1908, in Utah, as a merger of the Wasatch M. & M. Co. and Skylark Copper M. & M. Co. **Cap.**, \$6,000; shares 1c par, were originally \$1; assessable; issued 150,000; with \$30,909 assessments levied to March, 1913. Annual meeting, second Monday in October.

Property: 14 claims, 2 patented, a 10-acre mill site and a patented water right, including the Skylark and O. K. groups, in the Beaver Lake district, 6 miles from a railway and 12 miles W. of Milford.

Geology: limestone, monzonite and granite are cut by fissure veins and carry contact deposits between monzonite and limestone. The ore minerals include cuprite, melaconite and azurite together with chalcopyrite and marcasite in a ferruginous gangue.

Development: one vein reported to average 20' in width, is opened by 5 shafts, deepest 470', and by several tunnels, longest 250'. The ore is reported to average 2% copper and to carry small silver, gold and lead values.

Equipment: includes 25 h. p. hoist. compressor and 3 buildings.

For 2 years company has been driving a tunnel, which was in 175' on

July 7, 1917, and had 125' to go to cut intersection of E. W. and N. S. fissures at a depth of 200'. Work is to be resumed at the 470' shaft, where some high-grade copper was reported in 1915.

VICKSBURG GOLD AND COPPER CO.

UTAH

Mine near Milford, Beaver Co., Utah, leased June, 1916, to United States Mines Operating Co.

Property: 5 claims in Star district, covering 4,000' of limestone belt cut by ore-bearing fissures.

Development: shallow, but ore shipped May, 1916. Property will be equipped with machinery.

VOLUNTEER MINING CO.

UTAH

Letters returned in May, 1917, from last address. Milford, Beaver Co., Utah.

Officers: W. C. Albertson, pres. and gen. mgr.; W. H. Havenor, v. p.; S. G. Cole, sec.; H. E. Havenor, treas., asst. sec. and engr.; preceding with Geo. Havecamp, directors.

Inc. in Utah. **Cap.**, \$50,000; shares 10c par; non-assessable; issued \$25,550. Annual meeting, 2nd Monday in May.

Property: 6 claims, unpatented, 600 acres, in the North Star district, seven miles from the Salt Lake Route. Claims show contact deposits between limestone and intrusive porphyry. The mine has only two 12' pits and a 70' tunnel. Company reported March, 1916, to be operating a lease on the north end of the Lakeview Mining Co.'s property.

FRISCO OR NEWHOUSE DISTRICT

CALDO MINING CO.

UTAH

Company has a lease on the dump of the Horn Silver Mine at Frisco, Beaver county, Utah, said to contain 200,000 tons of silver, lead, zinc tailings. Operates a 200-ton flotation mill.

CEDAR TALISMAN CONS. MINES CO.

UTAH

Offices: 515 Newhouse Bldg., Salt Lake City and Milford, Beaver, Co., Utah.

Officers: S. S. Pond, pres. and mgr.; F. B. Sherwood, v. p.; Geo. Baglin, sec.-treas.; with H. M. Chamberlain, Geo. Lynch and G. L. Bemis, directors.

Inc. March, 1909, in Utah, as a merger of the Cedar Mining Co. and the Talisman Mining Co.; latter company described in The Copper Handbook, Vol. XI. **Cap.**, \$500,000; shares 50c par; assessable. The 10th assessment was levied on March 15, 1917, of 1c a share. All outstanding. Stock transferred at company office. Listed in Salt Lake City.

Financial statement, Jan. 1 to April 30, 1916, shows profit of \$2,851. At this time management changed and in report, May 1 to Sept. 16, on operating loss was given of \$8,193 on this period, or net loss of \$5,341. Management has been changed again and reports are not available.

Property: 13 claims, 8 patented, 250 acres, in the Star mining district, Beaver Co., Utah. **Ore:** carbonate of lead, copper and zinc containing gold-silver values.

Development: several thousand feet of shafts and underground workings, the lowest on the 1,000' level of the incline, or main working shaft. Recent work has been done from the 200' to the 1,000' level. On 300' level drift is out 267' and will probably be driven 200' further. Previous to the consolidation the two properties are said to have had a total net production of \$130,000, but for years they have not shown a production of any importance. Company claimed 50,000 tons mill ore on dump and blocked

out, that will average 8% lead, 14% zinc, 7 oz. silver. In July, 1917, the property was leased for 2 years to H. S. Joseph, who started shipping 12% lead and 10 oz. silver ore in August.

It will be necessary for the company to find a method for treating this low-grade ore before it can be realized upon and a 10-ton electrolytic zinc plant has been proposed for the purpose. Some high-grade zinc ore is shipped regularly.

Electric power was substituted in 1915 for steam power whereby a monthly saving of \$190 is claimed.

COMMONWEALTH MINES CO.

UTAH

Office: 420 Herald Bldg., Salt Lake City. **Mine office:** Newhouse, Beaver Co., Utah.

Officers: Wm. M. Bradley, v. p.; W. T. Aiken, sec.-treas.; Newton A. Dunyon, gen. mgr.; preceded with C. H. Strevell and Jas. H. Paterson, directors.

Inc. Nov., 1906, in Wyoming. Cap., \$600,000; shares \$1 par:

Property: the Commonwealth mine, 7 claims, in the Star district, adjoining Lady Bryan and Progressive mines. Claims show Topache limestone with intrusive sheets of altered green porphyry, cut by fissures, with more or less mineralization along fissures and outward along certain limestone beds. Considerable lead ore was produced from surface workings in the past and the Nellie claim has copper sulphides in its bottom workings. The Beaver claim has ores giving average assays of 13.2% copper and 17.2 oz. silver per ton, with more or less lead.

Development: by a 1,400' tunnel, with back of about 300'. Said to have secured ore assaying up to 4% copper, 20% lead and 60 oz. silver per ton.

Equipment: includes gasoline power and an air compressor. Development shows but little ore, mostly low-grade, and claims are not especially promising according to geological reports.

COPPER MOUNTAIN MINE

UTAH

Owned by Samuel Newhouse, Newhouse Bldg., Salt Lake City, Utah. Leased to A. J. McMullen, Milford, Utah.

Operating expenses for year were \$1,500 and gross earnings, \$795.

Property: 7 patented claims, 125 acres, in Beaver Lake mining district, Beaver Co., Utah.

Geology: Ores containing gold, silver, iron and copper occur as contact deposits in shoots coursing E.-W. with a dip of 70° to the north with a monzonite foot wall and a limestone hanging wall. Ore is copper oxides with lime and iron, containing 4% copper by general average of carload lots.

Development: by a shaft 100' vertical, then 150' incline and 620' of drifts. Mine is worked by overhead stoping.

Equipment: 15 h. p. gas hoist.

Production: 60 to 70 tons for 1916. Ore reserves are estimated at 10,000 tons. Lessees expect to increase production in 1917.

CUPRIC MINES CO.

UTAH

Office: 17 Battery Place, New York. **Operating office:** 206 Templeton Bldg., Salt Lake City, Utah. F. A. Bishop, sec.; M. C. Morris, mgr.

Inc. May 11, 1908, in New York. Cap., \$1,000,000; shares \$1 par; assessable; issued, \$500,000. Is affiliated in finances and is managed by the Horn Silver Mining Co.

HORN SILVER MINING CO.**UTAH**

Reorganized, 1916, as Horn Silver Mines Co., which see.

INDIAN QUEEN CONSOLIDATED MINING CO.**UTAH****Office:** Provo, Utah. **Mine office:** near Newhouse, Beaver Co., Utah.**Officers:** Jesse Knight, pres.; L. N. Morrison, v. p.; W. L. Mangum, sec.-treas.; K. S. Jordan, gen. mgr.; foregoing, with F. E. Smith and J. W. Knight, directors.**Inc.** 1907, in Utah. **Cap.**, \$150,000; shares, 10c par. Listed on Salt Lake Stock Exchange.**Property:** 39 patented claims in Newhouse district.**Development:** by 3 tunnels, 4,700', 300' and 200' long, respectively; also prospect tunnels and shafts. Worked by lessees from 1910, but company resumed in 1916. Extensive exploration under way in 1917.**Equipment:** includes compressor, drills, blower and electric power. Part of the mine under lease to Jens Nelson, who cut ore in August, 1917.**KING DAVID MINING CO.****UTAH****Address:** Provo, Utah. **Mine office:** Frisco, Beaver Co.**Officers:** Jesse Knight, pres.; David Evans, v. p.; W. L. Mangum, sec.-treas.; K. S. Jordan, gen. mgr.**Inc.** 1908, in Utah. **Cap.**, \$500,000; shares 50c par; assessable; 67,000 issued. Shares listed on Salt Lake City Exchange.**Property:** 63 claims, patented, 940 acres, adjoining the Horn Silver mine, is supposed to carry the extension of the Horn Silver vein. Claims are well mineralized.**Ore:** mainly silver-lead bearing, with small quantities of zinc and copper.**Development:** by 800' 3-compartment shaft and several prospect tunnels and shafts. Present work consists of drifting, sinking and diamond-drilling.**Equipment:** includes two 80 h. p. boilers, a double-drum hoist, 5-drill air-compressor, 14 machine drills, generator, blower and steel head-frame.**REVENUE CONSOLIDATED MINING CO.****UTAH****Frisco, Utah. Address:** John B. Taylor, 678 E. S. Temple St., Salt Lake City.**Property:** 66 claims, 22 patented, 1,320 acres in Pine Grove district, T. 28 S. R. 16 W. on west side of Wah Wah Mtns., 20 miles S. W. of Frisco or Newhouse, stations on Milford branch of Salt Lake Route. Elevation 7,500' at mine camp. Peaks 3,000'-4,000' higher.**Geology:** claims cover quartzite beds, overlain by 600' of green shales, capped by 5,000' of thickly bedded limestone, intruded by thin dikes and a boss of yellowish decomposed porphyry. These beds dip eastward into the mountains, at 20° to 40°, the west slope of the range being of similar structure, with igneous rocks forming the east side. A strong E. W. fault runs through the center of the property, dislocating the beds 1,000' to the east, on S. of fault, and ending in a porphyry intrusion. Ores are lead and silver bearing and occur in fissure veins in quartzite. Four parallel N. W.-S. E. veins north of Pine creek are 3'-6' wide, have smooth walls, quartz filling and carry galena of concentrating tenor, with occasional masses of shipping ore. There are several other undeveloped parallel veins, but all end at the shale belt. South of the fault a parallel 6'-20' vein represents the probable faulted continuation of the Cliff vein north

of the fault and cut by another fault continues on the N. S. south of the vein.

Favorable reports made 1906 by Chas. Calcolk Jones and by D. P. Rohlfing, former manager of Hornsilver Mine at Frisco.

Development: active in 1904-05, was resumed 1913, but stopped 1914. It comprises the 500' Buckbee and 600' Southside tunnels, 125' Cliff shaft with 200' drift work, 130' Tasor shaft and various lesser openings. The Revenue tunnel is to crosscut all these veins in depth and supply the mill.

Equipment: includes 300 cu. ft. compressor, Corliss steam engine, etc., but no mill machinery. Property promising.

SOUTH UTAH MINES & SMELTERS

UTAH

Office: 165 Broadway, New York. **Mine office:** Newhouse, Beaver Co., Utah.

Officers: Hugo Hoffstaedter, pres.; H. G. Robinson, sec.-treas.; with J. F. A. Clark, E. P. Earle and Samuel Newhouse, directors; W. L. Heidenreich, gen. mgr.; R. J. Tullock, mill supt.

Inc. Feb. 28, 1910, in Maine, as successor of Newhouse Mines & Smelters. **Cap.,** \$4,300,000; shares \$5 par; issued 645,800 shares. **Debentures:** \$1,071,000 of 6% 20-year income bonds, convertible into stock at par, remaining from a \$1,500,000 bond issue put out by the Newhouse Mines & Smelters. Interest on bonds is said to be payable annually, but only if and when earned, and then out of net profits of the year's operations. The old company defaulted in interest on its bonds, and the property was bought for \$500,000 under foreclosure, old shareholders, being given stock, share for share, plus a payment of \$1 per share for new stock. The re-organization brought about \$600,000 into the treasury, of which all but about \$200,000 was required to liquidate the floating debt of the old company. The annual report for year ended June 30, 1912, showed an operating loss of \$31,113, increasing a former deficit to \$118,353, and gave current assets as \$179,500 and current liabilities as \$33,723. No report has since been issued. Listed on New York Curb. Equitable Trust Co., New York, transfer agent; Windsor Trust Co., registrar. Annual meeting, third Monday in October. A dividend of 50c per share, amounting to \$300,000, paid Aug. 31, 1907, by the Newhouse Mines & Smelters.

Property: 13 claims, patented, 201 acres, with miscellaneous holdings, including the Midvale placer, 168 acres, water rights at Wah Wah springs, mill, town sites and grazing lands, total holdings of 7,882 acres.

The mineral property carries about 1 mile of the strike of the Cactus vein. The Cactus mine shows monzonite-porphry country rock, near a limestone contact, and ore is essentially an irregular mass of brecciated monzonite, carrying copper impregnations, including some oxidized ores in the upper workings, but at depth mainly chalcopryrite, associated with pyrite, averaging about 1.15% copper and 25c per ton in combined gold and silver values. Although the average grade of ore is very low, there is some high-grade sulphide ore, mainly chalcopryrite, assaying up to 15 and even 20% copper, but the quantity of such ore is very small.

The mine has practically no ore reserves, though there is an orebody between the 700' and 800' levels containing about 100,000 tons of 1.5% ore, with an additional 100,000 tons of probable ore. A new orebody opened on the 600' level for a short distance was said to show ore averaging about 1.8% copper.

Development: by two working shafts, of 600' and 900' depth, with levels at 100' intervals, and connected on the 600' level with a 6,300' main haulage

tunnel, having a grade of 5%, laid with 30-lb. steel rails. Tramming is done by electric locomotives, hauling trains of 21 cars. The tunnel is electric-lighted throughout, and cuts several cupriferous veins before reaching the main orebody. The mine has upwards of 4 miles of workings. Principal developments are between the 300' and 700' levels, and the 600' level, giving the principal showing of ore, was said to have an orebody of 135' width and about 125' length, carrying ore of a little better than 1% copper.

Equipment: includes 200 h. p. steam plant, with a 150 h. p. hoist good for 600', and a 40-drill Ingersoll-Sergeant air compressor, both operated electrically. There also is an auxiliary electric hoist on the second level.

The mine and mill are connected with the Salt Lake Route.

Mill: the 1,000-ton mill is 100x400' in size, in two 500-ton duplicate sections, designed on the unit plan, to allow for future expansion. The western section, which is the concentrator proper, contains a 15-ton Whiting traveling crane, and the power plant. Equipment includes three 10x24" Blake crushers, 4 sets of rolls, 1 Huntington mill, 22 Hartz jigs, 48 Wilfley tables, 10 Johnston tables, 8 Wilfley slimers, 16 Callow tanks and Sherman settling tanks and classifiers. Ore is received in 1,000-ton steel bins, whence it is drawn by belt conveyors, equipped with plunger feed, and transferred to elevators, of which there are 2 for each section, 1 for dry and 1 for wet ore. Concentration is about 12.5 into 1. A flotation unit was added in 1914.

The power plant includes five 350 h. p. Babcock & Wilcox boilers, a Green fuel economizer and a 165' steel smokestack of 8' diameter. The steam plant is held in reserve, machinery being actuated by electric energy, brought 50 miles over the lines of the Telluride Power Co. There are two 500 h. p. Westinghouse-Parsons turbines, making 3,600 r.p.m. Water is brought 8½ miles from 6 large springs, at Wah Wah, having a flow of about 1,000 gals. per minute.

Production: for fiscal years ending June 30 was 5,670,993 lbs. fine copper, 53,862 oz. silver and 2,272 oz. gold in 1906; 7,244,179 lbs. copper, 48,595 oz. silver and 1,721 oz. gold in 1908; from Sept. 1, 1910, to June 30, 1912, 5,527,810 lbs. copper, 43,691 oz. silver and 2,450 oz. gold, secured from 426,703 tons of ore, of which 701 tons were smelting ore and 34,062 tons of concentrates, giving an actual net extraction of about 13 lbs. fine copper, 6c silver and 11c gold per ton. During 3 months ended Sept. 30, 1912, production totaled 674,987 lbs. copper. The mine was closed down owing to a strike from Sept., 1912, to April, 1913. From April, 1913, to June, 1914, production was 3,294,113 lbs. of copper. Mine was again closed down, June, 1914.

Mining costs have been estimated at 90c and milling costs at 50c per ton. It is obvious that the Cactus is an exceedingly low-grade mine and will require careful handling to earn substantial profits.

BEAVER COUNTY

Includes scattered districts of Newton, Beaver, Jarloose, or Lincoln, and Fortuna. (See others under Milford and Frisco districts.)

BEAVER-BUTTE COPPER CO.

UTAH

Office and mine: Beaver, Beaver Co., Utah. Sherman McGarry, supt.

Inc. 1909, in Utah. Cap., \$50,000; shares 10c par; assessable. Property idle from 1912-1914, owing to lack of capital, but development of work resumed in summer of 1914, and property reported under lease to Senator A. B. Lewis, representing Eastern capitalists, 1916.

Lands: 15 claims, unpatented, in the Newton district, 8 miles from a railroad, show gold-silver ore and are believed to carry the continuation of the Sheep Rock ledge.

Development: by a 150' two-compartment shaft, crosscuts and drifts. Company claims to have 2' of \$10 ore on surface and 19' of \$8 ore on the 150' level with 1' of \$18 ore along the footwall side. Plans installing an electric hoist and drifting on the 150' level. See Beaver Gold Mines Corp. and remember Majestic Mines. No returns, 1917.

BEAVER GOLD MINES CORP.

UTAH

Officers: A. B. Lewis, pres.; E. C. McGarry, v. p.; M. P. Braffet, sec-treas., with B. F. Caffey, W. L. Cook, W. H. Stephens and S. Glazier, directors. A. B. Blainey, mgr.

Inc. in 1914. **Cap.**, \$3,500,000; shares \$1 par.

Property: claims covering the Sheep Rock, gold vein in the Newton district in eastern Beaver Co., 12 miles northeast of Beaver City, Utah.

Development: by a shaft 100' deep, in 1915. Company claims to have cut a vein of milling ore, 15' wide on the 60' level, and 18' wide on the 100' level. At last accounts was planning on sinking an additional 60'. In Jan., 1916, the company is reported to have obtained a bond, \$240,000, on the old Sheep Rock mine, a former high-grade producer, developed to the 300' level and equipped with a 5-stamp mill. Promotion methods have caused much comment.

BEAVER HORSESHOE GOLD MNG. CO.

UTAH

Beaver City, Beaver Co., Utah.

Officers: H. B. Ward, Mina, Nev., pres.; John Waldis, Tonopah, v. p.; C. R. Bunker, Salt Lake City, sec-treas., with Fred Zimmerman, J. W. Kelley and F. E. Becker, directors.

Inc. in May, 1915. **Cap.**, \$250,000.

Property: 19 claims located on south Fork of Beaver river, 14 miles east of Beaver City. Surface samples are said to assay \$24.60 in gold. Letter returned unclaimed, 1917. Probably closed down.

BEAVER LAKE METALS CO.

UTAH

Office: 400 W. 7th, South Street, Salt Lake City, Utah. Lewis Merri-man, mgr.; F. K. Nelson, sec.

Inc. April, 1916. **Cap.**, 1,000,000 shares; assessable; assessment No. 2 of 2½c levied June, 1917. Stock listed on Salt Lake Exchange.

Property: 14 claims, unpatented, adjoins the Beaver Copper Co., and is reported to be crossed by three N.-S. fissures which in turn are intersected by an E. W. vein. Vein was faulted on the 90' level.

Ore: a carload shipped in November, 1916, is reported to have averaged over \$46 per ton, samples carrying 11% zinc, 40% lead, 11 oz. silver and 11% iron.

Development: by 150' main shaft, 100' incline shaft and about 400' of drifts. Management is searching for the continuation of the vein cut above.

BLUE RIBBON GOLD MINING CO.

UTAH

Minersville, Utah.

Officers: W. B. Seymour, pres.; L. Shaw, v. p.; Fred R. Pryor, sec-treas., with J. H. McOmie and Clara D. Smith, directors.

Inc. Feb., 1915, in Utah. **Cap.**, \$100,000; shares 10c par; issued \$60,460.

Property: 8 claims in Jarloose mining district, 6 miles E. of Minersville, Beaver Co., Utah.

Ore: gold in shoots in vein 6' to 12' wide, between well-defined walls of rhyolite. Average assay said to be \$9.40 per ton.

Development: by 50' shaft. Plan the addition of 25 h. p. gasoline hoist, and sinking shaft of 500' depth. Is a prospect only.

FORTUNA GOLD QUEEN MINING CO. UTAH

Office: B. F. Capper, pres., 333 Judge Bldg., Salt Lake City, Utah.

Property: 3 claims at Fortuna, Beaver Co., Utah, said to show free gold in 8' quartz vein in limestone and porphyry. Opened by tunnels and 200' shaft. Has gasoline hoist. Closed down.

FORTUNA INDEPENDENCE MINES CO. UTAH

E. C. McGarry, pres., 1388 S. 9th E. St., Salt Lake City, Utah.

Property: 8 claims in Fortuna district, Beaver County, and 2 claims in Grand County, held under bond and lease. Ore occurs in intrusive rocks, porphyry and trachyte predominating. Mine is developed by 165' shaft and 400' adit, said to show an oreshoot 18" wide and exposed for 135', giving assays of \$20 gold and 3-5 oz. silver. Management plans extending the adit to 800' in 1917. Five-stamp mill under construction 1917, at company's Henry Mtn. property, 85 miles S. of Green River station.

IBAPAH GOLD MINING CO. UTAH

Property: the Queen of Sheba mine, in the south end of the Deep Creek country, Beaver Co., Utah, an old gold mine credited with a production of \$80,000. Mine shows vein 5-18' wide. Pay ore occurs in shoots assaying from \$10-\$13 per ton.

Development: by a 1,187' main tunnel, several short tunnels and a 376' raise.

Equipment: includes a small mill.

Worked under a 3-year lease from 1914 by C. E. Johnson.

SHEEPROCK MINING & MILLING CO. UTAH

Office: W. A. Wilson, 406 Dooly Block, Salt Lake City, Utah.

Officers: W. A. Wilson, pres. and treas.; C. W. Morse, v. p.; C. Browne, sec., with W. B. and F. B. Eisenman and L. A. Jeffs, directors.

Inc. Sept. 4, 1893, in Utah. Cap., \$100,000; shares 10c par; non-assessable; 450,000 issued.

Property: 10 patented claims, 177 acres, in Newton district, Beaver Co., Utah, said to show a fissure vein in rhyolite. Ore contains gold and silver.

Development: by 300' shaft and 1,000' tunnel.

Equipment: 25 h. p. electric hoist and 25 h. p. electric compressor.

In development stage only.

STAMPEDE MINES CO. UTAH

Address: A. T. Burton, sec., Beaver City, Utah.

Officers: B. F. Caffey, pres.; Archie MacFarland, v. p.; A. T. Burton, sec.-treas., with Sam. Glaser and R. H. Strickland, directors.

Inc. 1916, in Utah. Cap., \$100,000; shares 10c par; assessable; 800,000 issued.

Property: 14 claims, 250 acres, in Lincoln or Jarloose district. Beaver Co., Utah, said to show fissures in limestone, dipping 40° and pitching N. 70° E. Sulphide ore reported to contain 0.09 oz. gold, 25 oz. silver, 21.5% lead and 2.46% copper. Shoot occurs at junction of 2 fissures and is said to have been followed down by 350' shaft, ore showing persistence at depth with signs of bedding in dolomite.

Equipment: 6 h. p. gasoline hoist, 140 cu. ft. compressor, etc.

Production: 21 tons in 1916.

A small mine with possibilities. Rail and smelter facilities nearby.

BINGHAM DISTRICT

ALPINE GALENA MINING CO.**UTAH**

Owned and operated by Alpine and Provo men.

Property: in Alpine Canyon, near Bingham, Salt Lake Co., Utah, contains ferruginous lead ore, in bunches in black limestone.**Development:** by 312' tunnel and incline shaft. Plans to drive tunnel to reach blowout 350' below surface. Assessment called in 1914 in order to provide funds for further development.**BINGHAM AMALGAMATED COPPER CO.****UTAH****Office:** 61 Commercial Block, Salt Lake City, Utah. **Mine office:** Bingham Canyon, Salt Lake Co., Utah.**Officers:** B. F. Grant, pres.; L. A. Marks, v. p.; F. R. Snow, sec.-treas.; W. P. Davis, gen. mgr.; preceding officers, R. E. Miller and Dr. A. McCurtain, directors. E. W. Jones, supt.**Inc. Jan. 7, 1907, in Utah. Cap., \$5,000,000; shares \$5 par; non-assessable; issued, \$3,500,000. Shares are listed on the Salt Lake City Stock Exchange.****Property:** 24 claims, 300 acres, patented, known as the Illinois and Copper Glance groups, carrying 7 mineralized veins. The principal orebodies exposed in the Bingham Amalgamated are on the same vein as the Congor orebodies and of about the same character of ore. Vein is 15 to 40' thick, developed for several hundred feet in depth, but the water and high cost of wagon haul stopped further development. In a tunnel on the west side of the property a 20' vein shows streaks of good ore all through it. The Montana Bingham tunnel cuts this vein about 100' deeper, 3,948' from the portal, and opened it for 100'. Samples taken from this vein said to run from 3.2-6.5% copper, 7 oz. silver, \$1.20 gold and 25% iron. Development work resumed the latter part of 1915 after an idleness of several years.

The Illinois has a 640' shaft, with a 6 to 9' vein carrying a 2' pay-streak of about 5% copper ore, with occasional assays up to 40%, the average of 50 assays being 2.8% copper, 2 oz. silver and \$2 gold per ton. The Copper Glance group has a 1,400' tunnel, in McGuire gulch. Mine has a total of 2,450' of workings.

In summer of 1917, company mined ore from a raise at the East end of the 300' level. A trial shipment of 90 tons in June, yielded \$25 per ton, the ore carrying 4.73% copper, 2 oz. silver, \$1 gold, 26.4% iron and 35.6% insoluble. The shaft, flooded in July, was reopened later. Shipments in October were about 4 carloads.

BINGHAM ANACONDA COPPER CO.**UTAH****Office:** 11 Main St., Salt Lake City, Utah. Mine in Markham Gulch, Bingham, Utah.**Officers:** E. McCarrick, pres.; B. B. Gray, v. p.; P. L. Meyers, sec.-Cap., \$1,000,000; shares 10c par. Owns a group of claims under development, 1917.**BINGHAM CENTRAL MINING CO.****UTAH**

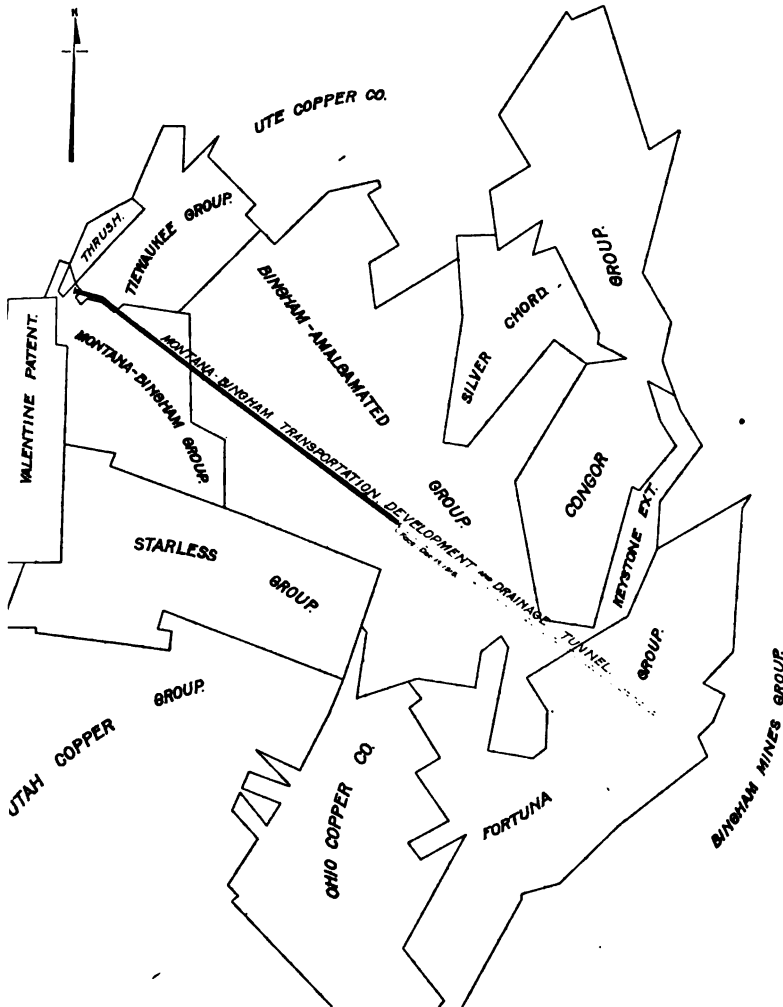
At Bingham Canyon, Salt Lake Co., Utah. Idle. This company and the Bingham Standard Copper Co. were controlled by the Bingham Central Standard Copper Co., which sold this stock, 1909, to Utah Metal Min-treas.; above with A. Gustaveson and R. E. L. Collier, directors.

ing Co. for stock in latter company and is now controlled by the Utah Metal & Tunnel Co., which see. Described Vol. X.

BINGHAM CENTRAL STANDARD COPPER CO.**UTAH**

Was organized as a holding company, controlling, through ownership

of practically entire stock issues, the Bingham Central Mining Co. an Bingham Standard Copper Co., and sold these subsidiary stocks, 1909, t the Utah Metal Mining Co. for 303,000 shares of latter, which was escrowe



PART OF BINGHAM DISTRICT, UTAH

1911 and extended upon payment of 10,000 additional shares unti 1912, and subsequently to Jan. 1, 1914, to permit building by Utal Mining Co. of a \$150,000 aerial tramway from the western end of the rnel to the International smelter at Tooele. On release of escrowe ompany was to be wound up.

Minority stockholders formed a committee in 1915, with E. J. Huff, chairman, offices at 405 Atlas Blk., Salt Lake City, and attempted to recover property, claiming irregular disposition of the company's assets. Stock valueless.

BINGHAM COALITION MINES CO.**UTAH**

Address: care E. O. Leatherwood, Boston Bldg., Salt Lake City, Utah. Mine near Bingham, Utah.

Officers: W. G. Thomas, pres., Portland, Me.; H. P. Sweetser, treas.; A. T. Hastings, gen. mgr.

Inc. in Maine. Cap., \$1,000,000, increased 1916 to \$1,500,000; shares \$1 par. Stock listed on N. Y. Curb. Registrar & Transfer Co., transfer agents.

Property: is a consolidation of the Butler Liberal, Red Wing and Massasoit properties, about 50 claims, which have yielded some ore in the past.

Development: several thousand feet of old drifts and tunnels and a 130' winze reported to be sunk on high-grade ore.

Equipment: includes 175-ton mill.

Shipping 4-5 cars of ore monthly, 1917, said to run about \$60 a ton.

BINGHAM COPPER BOY MINING CO.**UTAH**

Out of funds and idle several years, with no sale or market for the stock, so far as known. See Vol. XI, Copper Handbook.

BINGHAM EMPIRE MINES CO.**UTAH**

Address: Knight Investment Co., Provo, Utah.

Officers: Jesse Knight, pres., with A. M. Knight, W. L. Mangum, K. S. Jordan, G. A. Storrs, E. G. Jensen, directors.

Inc. July 31, 1915, in Utah, for development of property in the Bingham district. Cap., \$10,000; shares 1c par; 484,000 shares in treasury, Aug., 1915.

BINGHAM MINES CO.**UTAH**

Office: 60 Congress St., Boston, Mass. Imer Pett, gen. mgr., 404 Dooly Blk., Salt Lake City, Utah; Joseph Hyland, supt., Lark, Utah.

Officers: Jas. P. Graves, pres.; Sydney S. Millett, sec.-treas.; preceding officers, Henry N. Sweet, Alfred B. White, Thos. S. Woods, Arthur W. Chesterton and Lewis B. McCornick, directors. Fred R. Sands, purch. agt.

Inc. April 6, 1908, in Maine. Cap., \$1,500,000; shares \$10 par; non-assessable; issued \$1,000,000.

Is a reconstruction of the Bingham Consolidated Mining & Smelting Co., having exchanged 1 share of new stock for 1 of old, plus \$3.50 cash, payable \$1 cash and five 50c installments. Controls the Eagle & Blue Bell Mining Co., a dividend payer, of Eureka, Juab Co., Utah, and Yosemite Mines Co., of Bingham Canyon, Salt Lake Co., Utah, through ownership of \$451,250 out of \$900,000 issued stock. Purchased the entire capital stock of the Victoria Cons. Mng. Co., owning 49 acres mineral land at Eureka, adjoining the Eagle and Blue Bell, in 1914. First National Bank, Boston, registrar. Federal Trust Co., Boston, transfer agent. Stock listed on Boston and New York curbs. Annual meeting, third Wednesday in April, at 97 Exchange St., Portland, Me.

Company has liquidated its bonded indebtedness of \$1,480,790, besides having paid for the property of the Victoria Cons. Mng. Co.

Balance sheet Dec. 31, 1916, shows assets \$85,158 cash and loans, and \$9,439 accounts receivable, etc., with accounts payable of \$1,078. Gross earnings in 1916 were \$251,443, and operating expenses \$107,691, leaving a net operating gain of \$119,847 after deducting \$23,904 for prospecting and

development work. Earnings of the company and subsidiaries for the first 8 months of 1917 total \$669,938.

Dividends: initial dividend of 50c and Red Cross dividend of 25c a share paid July 2, 1917; 50c paid October 5, 1917.

Property: 60 claims, patented, 430 acres mineral land, in the Tintic district, comprising the Dalton & Lark and Commercial mines, and 596 acres non-mineral lands. The ores carry lead, copper, silver and gold. The lead ore averages 90c gold, and 11.65 oz. silver per ton, with 0.67% copper, and 18.64% lead. The copper ores average \$1.40 gold and 4.92 oz. silver per ton, with 1.58% copper and no lead. Some of the ores are high in iron, hence desirable for fluxing the ores of the district, which are highly silicious, as a rule.

The company now has the deepest shaft in the Tintic district, as connection is made between the Mascotte tunnel and the Yosemite shaft, a distance of 2,150' on dip of the vein. New work comprised 2,669' of drifts, crosscuts, raises and winzes in 1916.

Lessees working in the old workings mined 8,760 dry tons of ore 1916, netting the company \$43,024 as royalty. Mining is by square sets in the large deposits, up to 20' across, and by stulls in the smaller veins. There are many miles of workings.

The Victoria Cons. includes: 7 patented claims, 50 acres, with the Snowflake and Victoria mines at Eureka. Ore is gold-silver-lead with some copper, occurring in chamber deposits in limestone. Pay ore occurs in shoots and streaks of variable size, up to 100' in width.

Development: includes 1,200' shaft with 2,500' of workings. Has compressor, added 1913, 112 h. p. hoist, and uses electric power.

Production: 7,455 tons in 1912; 12,552 tons in 1913; 8,763 tons in 1914; 3,071 tons in 1915; a total of 58,806 tons. Shipments in 1915 averaged 9.06% lead; 12.40 oz. silver; .242 oz. gold. The Victoria mine has been the main producer.

Equipment: at the Dalton & Lark includes a 250 h. p. steam plant, with several hoists and a 25-drill Ingersoll-Rand air compressor. There are 10 buildings, including machine shop, smithy, carpenter shop, office and dwellings. A private rail line, with electric locomotives, connects with the Denver & Rio Grande railway.

The Commercial mine comprises 5 claims, patented, 30 acres. The main orebody occurs as a fissure in limestone and replacement in latter, with E.-W. strike and average dip of 38°. Ore is exclusively chalcopyrite. The Commercial was closed down Sept., 1916, as smelter did not require fluxing ore. Most of the lead and copper ore comes from the Brooklyn mine, 200' below the Mascotte tunnel.

Production: in 1916 was 27,709 dry tons of \$238,709 gross value, netting \$205,262.

Equipment: of the Commercial mine is exclusively electric, including a double-drum electric hoist with 52 h. p. induction motor, 75 h. p. induction motor, a 10-drill Ingersoll-Rand air compressor, and three 50 k. w. electric transformers. Buildings include an office, warehouse, sawmill, smithy, barn and ore bins. Company has no mill, but has privilege of 1/10 of capacity of 2,000-ton mill near mine. Mine is served by the Copper Belt line of the Denver & Rio Grande railway. Company installed electric power plant, 1916.

Production: ore shipped to smelters: 49,986.81 tons in 1912, 38,987.95 tons in 1913, 49,866.87 tons in 1914, and 44,975.19 tons in 1915; 28,892 tons in 1916, including 6,380 tons lead ore averaging \$21.31 per ton and 21,598 tons copper ore averaging 1.3% copper. Production for first 7 months

1917 amounted to 728,305 oz. silver, 470,965 lbs. copper, 8,354,563 lbs. lead and 5,249 oz. gold, netting \$590,869.

The present management has made splendid progress in handling difficult financial and mining problems.

Eagle & Blue Bell Mining Co.

Subsidiary of Bingham Mines Co.

Office: 60 Congress St., Boston, Mass. **Operating office:** 404 Dooly Block, Salt Lake City, Utah. **Mine office:** Eureka, Juab Co., Utah.

Officers: Jas. P. Graves, pres.; Henry N. Sweet, v. p.; Imer Pett, asst. treas.-gen. mgr.; Geo. E. Davis, sec.; preceding with Fred H. Williams, Duncan MacVichie and Fred R. Sands, directors; Sydney S. Millett, treas.; Wm. Owens, mine supt.

Inc. Sept., 1898, in Utah. Cap., \$250,000, increased, March, 1910, to \$1,000,000; shares \$1 par; issued 893,146 shares. Dividends: 4 of 5c each in 1913; 3 of 5c each in 1914; 1 of 10c and 1 of 5c in 1915; 2 of 5c in 1916, amounting to \$535,888 for the four years. Two dividends of 10c a share paid May 1 and June 1, 1917, the total now being \$800,000.

In March, 1910, issued 644,347 shares of new stock at 50c to take up a floating debt of \$269,925 and put \$50,000 in the treasury, for working capital. Is controlled, through stock ownership, by Bingham Mines Co. First National Bank, Boston, registrar; Federal Trust Co., Boston, transfer agent. Stock is listed on the Boston curb. Annual meeting, first Saturday after first day of October.

Annual report for year ending Dec. 31, 1916, shows total receipts, \$323,995; expenditures include operating expenses, \$120,528, and mine development, \$39,841. Net operating gain was \$154,776, as against \$143,345 in 1915.

Assets amounting to \$1,077,699, include mining properties and real estate, \$877,635; mine construction and equipment, \$132,483; cash and receivables, \$35,448.

Liabilities include: outstanding stock, \$893,146; surplus, \$184,553.

Profits for first 8 months in 1917 are \$452,614, against \$154,776 in this period of 1916.

Property: 17 patented claims, 73 acres, includes a 9-acre mill site carrying the water right to a spring having a flow of about 30 gals. per minute. Lands lie between the Centennial-Eureka, Victoria and Chief Consolidated mines, on the Victoria-Grand Central ore zone, in the Mammoth Limestone.

Geology: ore occurs as chamber deposits in limestone, carrying gold, silver, lead and some copper. The lime is cut by numerous fissures, at all angles, with mainly vertical dip, carrying pipes, shoots and erratic deposits of ore at the intersections of fissures and bedding planes, in massive blue limestone. The mine has considerable bodies of silicious copper ore, lead sulphides and carbonates. Pay shoots vary from 6-100' in width. Average assays of dry ore: .230 oz. gold; 12.99 oz. silver; .31% copper; lead ore assayed: .13 oz. gold, 16.81 oz. silver and 17.05% lead.

The mine workings indicate 4 separate ore channels striking northerly and southerly and occasionally joined together by immense ore deposits made along easterly and westerly cross faultings. The ore occurrence shows a great similarity throughout, giving the zone a width of over 600', but each channel apparently has its characteristic mineral association.

History: according to C. H. Blanchard, pres. of the D. & B. Mines Co., ore was discovered by 30' shaft, and mill erected before ore development warranted, with consequent abandonment. Relocated several times, and

eventually developed by 1,200' tunnel, that eventually found downward extension of oreshoot cut by shaft. Profitably worked till panic of '93; later reopened and all ore in sight taken out and mine was idle until sold to Bingham Mines crowd, who sank deep winze from tunnel; extracted all ore in sight and ran in debt for \$300,000; Hornblower & Weeks assumed debt, taking company notes, and installed Imer Pett as mgr. and Wm. Owens, as supt. New management followed for 800' a thin, iron-stained seam on the 1,000' level and found immense body of pay ore, making it one of the big mines of Tintic.

Debt is paid off, fine plant installed, and over \$700,000 paid in dividends, with ore reserves ensuring profits for years to come.

Development: has been extensive in the last few years; the 3-compartment shaft is now 2,018' deep, with levels at 700, 1,000, 1,350, 1,550, 1,700 and 1,875', and blind levels at 1,100, 1,200, 1,300, 1,425 and 1,538'.

Development in 1916 amounted to 3,086'. The main operating shaft was sunk from 1,700' to water level, 2,018', and a station was cut at 1,875'. Due to very favorable developments on upper levels, no station has as yet been made at 2,000', but this will be done in near future.

Lead-silver ore was encountered at a point 132' below the 1,700' level and found more or less continuous for 90'. In the North Extension ground, a big body of lead ore was found at 1,000'.

These disclosures demonstrate the extension of the big ore zone the entire length of the property and practically from surface to water level, giving the Eagle & Blue Bell a very large stoping area.

Equipment: includes a 180 h. p. Hendrie & Bolthoff double-drum hoist, good for 2,000' depth, a 100 h. p. tubular boiler and a 4x6' electric triplex pump. The mine was electrically equipped throughout and a 250 h. p. Ingersoll-Rand air compressor and 225 h. p. electric hoist installed in 1916. Electric power is supplied by the Utah Power & Light Co.

Production:

	Tons	Oz. Gold	Oz. Silver	Lbs. Lead	Lbs. Copper
1916.....	25,594	987	347,501	5,714,776	577
1915.....	26,744	1,226	441,263	8,275,734	3,806
1914.....	32,736	1,444	554,411	8,588,565	31,443
1913.....	35,244	7,514	417,279	4,664,362	129,062

Decreased production in 1916 was due to the fact that the mine was not operated to full capacity, owing to installation of new equipment and because smelters refused to take more than 50 tons daily for several months.

Total shipments to date since 1908, 156,688 tons. Average grade of ore shipped in 1916 was (dry ore) \$20.74 compared with \$8.13 per ton gross value in 1915. Gross value of total ore shipments in 1916 was \$530,850, giving net smelter returns of \$323,394. Shipments are made to Salt Lake Valley smelters.

Victoria Consolidated Mining Co.

Owned by Bingham Mines Co.

Office: 404 Dooly Blk., Salt Lake City. Mine at Eureka, Tintic district, Juab Co., Utah.

Officers: James P. Graves, pres.; Harold P. Fabian, v. p.; with A. L. Hoppage, R. E. Mark and Chas. C. Dey, directors. J. R. Brain, sec.; Sydney S. Millett, treas.; Provo. Imer Pett, gen. mgr.; Wm. Owens, supt.

Inc. March 7, 1899, in Utah. **Cap.**, \$70,000; shares 10c par; \$49,985 issued. Has paid \$232,492 dividends to June, 1917.

Annual meeting first Monday in January. Net operating gain in 1916 was \$35,451.

Property: 7 patented claims, 50 acres, includes the Snowflake and Victoria mines at Eureka. Ore is gold-silver-lead with some copper, occurring in chamber deposits in limestone. Pay ore occurs in shoots and streaks of variable size, up to 100' in width.

Development: includes 1,200' shaft with 2,500' of workings. Has compressor, added 1913, 112 h. p. hoist, and uses electric power.

Company has made an agreement with Plutus Mining Co. for running a crosscut from the Victoria 1,200' level into its ground. This work will explore Victoria ground for 400' or so east of the shaft.

Production: 7,455 tons in 1912; 12,552 tons in 1913; 8,763 tons in 1914; 3,071 tons in 1915; 7,339 tons lead ore in 1916; a total of 66,145 tons. Shipments in 1916 gave net smelter returns of \$73,136.

Yosemite Mines Co.

Subsidiary of Bingham Mines Co.

Property: 12 claims, patented, in the West Mountain mining district, Bingham Canyon, Utah.

Development: by the Yosemite shaft connecting with the Mascotte tunnel on the 2,200' level and the 1,650' Paradox tunnel. Work done on 500' level, Lead Mine vein, and on 800' level on the Yosemite vein, in 1916. A raise driven from 800' level to the Cluster develops the Cluster ore-bodies and ventilates the 800' level.

Production: 795 tons shipped, 1916, giving smelter returns of \$12,301.

Lessees produced 245 tons and paid company \$1,811 in royalties.

BINGHAM-NEW HAVEN C. & G. MNG. CO.

UTAH

Absorbed by the Utah Metal & Tunnel Co., and property described thereunder.

CONGOR GOLD & COPPER MINING CO.

UTAH

Office: 506 Auerbach Bldg., Salt Lake City, Utah. Mine near Bingham Canyon, Salt Lake Co., Utah.

Officers: Glen R. Bothwell, pres. and gen. mgr.; R. C. McConaughy, v. p.; Frank E. Loose, sec.; preceding, with E. F. Jenkins and C. G. Hall, directors, at last accounts.

Cap., \$1,000,000; shares \$1 par.

Property: 10 claims, 150 acres, adjoins the Bingham Amalgamated on the north, in Bingham Canyon, Salt Lake Co., Utah. Developing 3' vein from 4,000' tunnel of Montana Bingham Co., working about 100' from face of tunnel. Mine reported to have about 100,000 tons of ore exposed, running from \$6 to \$50 per ton and averaging \$14.

Company has a contract with the Montana Bingham Consolidated Mining Co., shipping its ores through the Miller Ore Transportation tunnel of that company to the Denver & Rio Grande railroad tracks at a cost of 25c per ton of ore and 12½c per ton of waste.

FORTUNA MINING & MILLING CO.

UTAH

Office: Bamberger R. R. Bldg., Salt Lake City, Utah. **Mine office:** P. O. Box 123, Bingham Canyon, Salt Lake Co., Utah. Simon Bamberger, pres.; J. B. Bean, sec.; E. A. Vail, engr.

Inc. March 10, 1904, in Utah. **Cap.,** \$300,000; shares \$1 par; non-assessable; fully issued.

Property: 23 claims, mainly fractional, 170 acres, adjoining the Congor in Keystone gulch. Mine was opened 1875 and closed 1908. The property is now operated under bond and lease by the Montana Bingham Cons. Mining Co. and is described under that title. The property has apex rights to six important bedded veins, of which the Mayflower and Fortuna are the most important. The former is a well defined bedding fault vein in quartzite, but inasmuch as the adjacent rock is shattered and impregnated

with pyrite coated with copper glance, the ore averaging 1.8% copper, the vein is actually 30' or more thick, whereas the pyrite vein filling may be but 2' to 8' thick.

Production: 1905-1907, under Wm. N. Rossberg, 16,000 tons copper-iron ore assaying 5% copper, with \$2 to \$4 in gold-silver; also 4,000 tons lead ore assaying 30% lead and \$4 to \$8 in gold and silver. The panic of 1907 closed the mine until June, 1916.

The bond is held by the Fortuna Mine Leasing Co., who gave option on a 75% interest to M. B. Cons. M. Co.

GENERAL EXPLORATION CO.

UTAH

Alfred Frank, gen. mgr., Newhouse Bldg., Salt Lake City, Utah.

Officers: Alfred Frank, pres.; E. L. Newhouse, Jr., v. p.; O. Bamberger, sec.-treas. (all of Salt Lake City); above, with John MacGinniss of Butte, and O. W. Saacke of New York, directors.

Inc. in Utah, in June, 1915. Cap., 10,000 shares; \$1 par; 7,500 outstanding.

Company was formed to operate the property of the Ohio Copper Co., under a lease obtained from the receivers and trustees in bankruptcy. Renewals of this lease were made from time to time until Jan. 1, 1917, when the property was taken over by the reorganized Ohio Copper Co. of Utah. Royalties aggregating upwards of \$500,000 were paid, and lessees are also said to have made large profits.

GREAT DIVIDE MINES CO.

UTAH

Inactive. **Office:** 422 McCornick Bldg., Salt Lake City, Utah. **Mine office:** Lincoln, Tooele Co., Utah.

Officers: Henry A. McCornick, pres.; Walter A. Cooke, v. p. and gen. mgr.; Jos. H. Hurd, sec.; Rodney T. Badger, treas.; John B. Taylor, supt.

Inc. Aug. 15, 1903, in Utah. Cap., \$2,000,000; shares \$5 par; non-assessable. Company controls Western Mining & Milling Co. and Homestead Tunnel & Copper Co.

Property: 108 claims, mainly patented, 1,735 acres, 600 considered as well mineralized, with 160 acres mill and smelter sites, lying on the Tooele side of the Oquirrh mountains and on the summit of the range, west of the holdings of the Utah Consolidated. Property shows Cambrian quartzite, monzonite-porphry and altered limestone, with a number of fissure veins and contact deposits between limestone and quartzite. Claims cover 11,600' on the westerly course of the mineralized limestone beds of Bingham. This tract is 2 1/6 miles from E. to W. and 10,800' N. S., and contains the apexes of many ore-bearing fissures, and the westerly extensions of the ore-bearing limestone bed worked in the Utah Consolidated, Bingham, New Haven, Utah, Apex and Yampa mines.

Development: includes the 400' Homestake tunnel in Pine Canyon: 525' North tunnel at 6,600' elevation, and the 2,457' Spring tunnel. These tunnels are prospect work only, but ore is cut in the last named at 1,050' in, and shows a 5' width for 40' along the drift and in a 25' raise. A vertical E. W. fissure 100' wide is also cut at 2,250' from the portal and shows kidneys and stringers of silver-lead ore.

Equipment: includes a 35 h. p. electric plant, with a 1-drill Ingersoll air compressor, and there are 10 buildings, including a small power house, 2 smithies, a bunk house, stable and dwellings. Electric current is taken from the Telluride Power Co., over this company's private line from the sub-station at Bingham. Property considered promising, but no recent news received.

HIGHLAND BOY GOLD & COPPER MINING CO.

UTAH

Controlled by Utah Cons. Mining Co., and described under that title

HOMESTAKE T. & C. CO.**UTAH**

Idle. Is a subsidiary of the Great Divide Mines Co. and controlled by John B. Taylor, v. p., 678 E. So. Temple St., Salt Lake City; Walter A. Cook, sec.-treas.

Inc. 1906, in Utah. **Cap.**, \$100,000; shares \$5 par; assessable; fully issued. Is a close corporation, with only 5 stockholders.

Property: 30 claims, in Pine Canyon, West Mountain section, Tooele county, with water rights, tunnel rights and franchise for a deep tunnel, from Pine Canyon into the Bingham district; also several hundred acres of bench lands, and an 800-acre smelter site, 4 miles from the International smelter. Claims show veins with lead and copper ores.

KEYSTONE EXTENSION MINING CO.**UTAH**

Mine near Bingham, in West mining district, Salt Lake Co., Utah. Company inactive for some time owing to heavy flow of water in mine workings. Property covers about 3,000' of the Keystone vein outcrop and shows ore said to average \$14 per ton in gold, silver, lead and copper values, from surface down to bottom of 165' shaft.

Development: by inclined shaft with drifts on vein opening up stopes from which shipments have been made. The Montana Bingham Consolidated Mining Co. is to open the ground by its deep tunnel, thus eliminating pumping costs and heavy wagon-haul charges on ore shipped, but no recent information can be obtained.

MINERAL LANDS CO.**UTAH**

Idle. **Office:** 36 Exchange St., Portland, Me. **Mine address:** Bingham Canyon, Utah. J. A. Waterman, treas.

Inc. 1913, in Maine. **Cap.**, \$500,000; shares \$5 par. Company owns entire capital stock of the Markham Gulch Mining & Milling Co.

Property: the Red Wing and Butler-Liberal mines, with about 300 acres in Markham gulch, formerly owned by the North Utah Co., at Bingham, Utah. The claims carry the Florence and Erie fissures, latter having been a good producer in the upper levels.

Development: mainly by tunnels, with about 5 miles of workings, showing ores carrying lead, silver, copper and gold values, in about the order named.

Equipment: includes 200 h. p. electric hoist and 12-drill compressor. No recent returns received.

MONTANA-BINGHAM CONSOLIDATED MINING CO.**UTAH**

Office: 66 West Broadway, Salt Lake City, Utah. **Mine office:** Bingham Canyon, Salt Lake Co., Utah.

Officers: C. G. Ballentyne, pres. and mg. dir.; L. R. Eccles, v. p.; E. A. Vail, sec.; John Pingree, treas., with W. E. Hubbard, and J. Jorgensen, directors; J. B. Leggatt, gen. mgr.; Harry Bowman, supt.

Inc. July, 1910. **Cap.**, \$3,000,000; shares \$1 par; issued, 1,783,000 shares. Owns 156,000 shares of Bingham Amalgamated C. Co. stock. Debentures: \$200,000, at 6%, due June 1, 1918; \$183,000 outstanding; total assessments to date, \$18,164.

Property: Original holdings consisted of the Puritan and Eddie groups, carrying the Quinn fissure, the main ore fissure of the Utah Copper ground.

During 1916 the company purchased the Tiewaukee mine, which has produced over \$1,500,000 of high-grade shipping ore; also the Valentine patent, which carries the mineral right under the town of Bingham; the Thrush claim; and in May, 1917, acquired a controlling interest in a bond and lease held by Jas. E. Higgins, of Butte, Mont., on the Fortuna mine, giving the company control of approximately 640 acres immediately adjoining the Ohio Copper and surrounding the Starless mine on three sides.

On Nov. 7, 1917, purchase of the Fortuna was completed. The deal was financed by sale of the balance of treasury stock to Honolulu, Salt Lake City and Los Angeles interests. About 1,000,000 shares were taken and paid for by the syndicate, and \$240,000 was set aside to redeem outstanding bonds, and complete payment for the Tiewaukee and Valentine mines.

The most important holding of the company is the Fortuna mine, which shows an intruded sheet of monzonite-porphry in tilted series of quartzite and limestone beds, traversed by four nearly parallel veins following the strike and dip of the monzonite sheet or of the quartzite bedding, occasionally cutting across, and accompanied by some fracturing and crushing. Veins 2' to 25' thick, carry streaks and shoots of pyrite, some of them with good copper value, as chalcopyrite and chalcocite. Southern workings have shoots of silver-lead ore and much copper ore occurs in Eastern end of workings, 20'-50' thick with 2% copper.

Development: by an incline shaft 1,100' deep, and an inner blind shaft below the tunnel. The main development is along the 4,200' Keystone tunnel with one lower and 2 above it. Total workings are 16,000'. Mine was opened in 1875 and closed in 1908. Is equipped with 1,500' hoists and a compressor.

The Montana-Bingham tunnel is a deep transportation and drainage tunnel, which develops the Congor, Fortuna and other holdings at great depth, the Fortuna group alone covering over 1,000 acres of patented mineral ground. On Aug. 25, 1917, the tunnel was in 5,470', has cut six veins and penetrated the quartzite beneath the Keystone porphyry of the Fortuna mine.

In the various properties owned and controlled by the Montana-Bingham there is said to be a large tonnage of milling ore and the company claims many million tons partly developed and indicated.

A flotation mill is now in operation on the Fortuna section of the property, which will treat 250 tons daily.

Tiewaukee mine: main tunnel, over 1,000' long, cut several bedded veins, large stopes of old workings north of it, that contain much milling ore. Pillars left in stopes show 18.9% lead, 6% copper, 27 oz. silver per ton. An ore-bearing fissure was cut at 310' from the portal. Tiewaukee shaft is 90' vertical, connecting with a drift from the main tunnel, while shaft continues as an incline on the bedded vein. In 1917 the shaft was continuing vertically 110' below the tunnel level, the rock changing from quartzite to limestone.

The Valentine mine, also in Bingham Canyon, has been an irregular shipper from an orebody, assaying 4% copper. It has a 500' tunnel and 225' shaft, cutting a vein of silver-copper ore.

Company has contracts with Bingham Amalgamated C. Co. and will receive 10% of net proceeds on all ore shipped through the tunnel; from Keystone Extension Mng. Co., 25c per ton of ore and 12½c per ton for waste; from Bingham-Congor C. Co., 15c p. t. of ore or waste; from Fortuna Mng. Co., 25c p. t. ore and 15c per ton for waste; also an agreement with Col. E. A. Wall to handle Starless ores when drift from tunnel has been extended on one of Montana-Bingham veins into Starless ground; 300,000 gallons water per day is flowing from tunnel, which is valuable for milling, etc. When completed tunnel will cut 10 veins at 1,000'-2,200' depth on their dip and will drain them, allowing cheap mining. Tunnel mouth is near the D. & R. G. railway sidings.

If properly financed and placed under one competent manager the company should become a dividend payer in a short time.

NEW ENGLAND GOLD & COPPER MINING CO.**UTAH****Office:** 67 Milk St., Boston, Mass.**Mine office:** Bingham Canyon, Salt Lake Co., Utah.**Officers:** Jas. S. Williams, pres.; E. E. Abercrombie, v. p. and managing director; Geo. F. Bradstreet, sec.-treas.; preceding, with Woodford Yerxa, Francis H. Dowse and Geo. Bancroft, directors.**Inc. June, 1899, in Colorado. Cap., \$2,000,000; shares \$10 par; issued, \$1,294,467.****Bonds:** \$500,000 authorized, at 6%; issued, \$390,000. Paid a 10% stock dividend, Oct., 1908. Federal Trust Co., Boston, registrar; Geo. F. Bradstreet & Co., transfer agents. Annual meeting, first Monday in June.**Property:** the Bingham group of 9 fractional claims, 18 acres, in the Bingham, or West Mountain district, Utah, lying south of the Boston Consolidated, next to the Last Chance group and near the Utah Metals property. The company also owns a group of 4 claims at Goldfield, Nev.

The old Nast mine of the Bingham group shows porphyritic country rock carrying 3 fissure veins, of 30' average width, opened by the 1,600' Nast tunnel and the 1,670' Benton tunnel, both in ore, and 2 shafts, 1 of 159', with a total of about 6,000' of workings. Veins are said to widen at depth and ores are said to give average assays of 30% lead, 10% zinc, 15 oz. silver and \$4.50 gold per ton, with small and variable percentages of copper, some of the monzonite country rock carrying copper values that may prove workable at some later date.

Equipment: includes a steam plant with 2 hoists, 1 of 30-h. p., good for 800' depth. The concentrator has a 4x12" Sturtevant crusher, 2 rolls, 2 Hartz jigs and 1 Wilfley table, operated by commercial electric current.**Production:** was 2,108 tons of lead concentrates and 165 tons of copper ore, 1907, but property was closed down, late 1907, and mine was worked on only a small scale, 1908 to 1910, securing 936 tons of ore, giving net smelter returns of \$36,986. In 1910, the Utah Metal Mining Co. sued this corporation for \$700,000 damages, alleging trespass and illegal ore-extraction. A survey proved that company was not guilty of trespassing and suit was cancelled.

In 1911 the mine produced milling silver-lead ore, yielding 150 tons high-grade concentrates per month, netting the company \$25,874. In 1913 output was reduced to 8,360 and the mine was shut down by reason of western creditors forcing their claims. The Trust Co. holding mortgage securing the bonds, foreclosed same, Dec., 1915, at request of the bondholders and a reorganization of the company was contemplated. Interest, amounting to \$46,800 on bonds has not been paid since Feb. 1, 1914.

NEW UTAH BINGHAM MINING CO.**UTAH****Office:** 62 Broadway, New York. **Mine office:** Bingham Canyon, Utah.**Officers:** J. C. Blanc, pres.; N. O. Connor, sec.; H. A. Bellows, treas.; preceding, with H. F. Hoewel, J. W. MacRae, F. Harold Brown and F. T. Bellows, directors; P. M. McCree, supt.**Inc. April, 1912, in Maine. Cap., \$1,375,000; shares \$2.50 par; \$2.50 paid; 230,287 shares outstanding.****Bonds:** authorized, \$100,000, 5-year, 7%, issued Sept. 23, 1911, and payable Sept. 23, 1916; \$14,000 outstanding, \$23,000 cancelled. Bonds now being re-funded. Security Transfer & Registrar Co., New York, transfer agent. Stock is listed on New York Curb and London Stock Exchange. Annual meeting 3rd Wednesday in June. Company acquired property and assets of the Utah Bingham Mining Co. for \$1,182,550, giving the shareholders one new share, \$2.15 paid, for each \$5 share held.**Property:** 20 claims, 19 patented, 130 acres adjoining the Telegraph mine

of the United States Mining Co., in Bingham Canyon, Utah. Claims cover about 3,000' along the footwall portion of the Jordan limestone ore-bearing zone of Bingham. The large orebodies of this district are found in fissures within the limestone, or along limestone contacts, and the Jordan belt is the most productive of the 3 belts known in the camp; 16 fissure veins have been opened. Before the company acquired the property a number of promising veins carrying ore in the porphyry; but too narrow to be valuable, had been exposed. These veins pass into the limestone and are expected to have large orebodies at the contact. Ore is mainly silver-lead.

Development: consists of about 15,000' of work, mainly by 3 tunnels. In the Turngren tunnel, over 1,300' long, 8 veins from 1 to 4' thick have been cut, 7 showing ore and 2 of them worked. These two veins run north, are parallel and contain high-grade ore in the Spanish mine and along the outcrop in the company's ground. The Harrison tunnel, 600' long, is in quartzite and will crosscut the Rough and Ready veins, which are opened by 3 other tunnels higher up the mountain, all showing ore. Work on these veins has been discontinued and all work concentrated on the Giant Chief.

The Giant Chief vein is a fault fissure, developed by a 200' shaft from which further exploration is being conducted on the 150' level; 600' of drifts and crosscuts driven in 1915 from this point have at 800' depth in the sulphide zone cut 7 fissures encountered in the higher workings. These veins carry oxidized mineral matter, surrounded by a soft lime, and show porphyry mineralized with iron pyrites. A small vein of carbonate ore, running nearly 50% lead, has been opened; the Bonanza tunnel was driven 977' along the Giant Chief vein, and then across it to reach the ore, 150' deeper than where first opened.

Equipment: includes compressor, 180-h. p. electric plant, taking current from the Utah Power & Light Co., hoist and all necessary buildings.

Production: recent shipments said to have assayed 17.33 oz. silver, 1.49% copper, 23.5% lead, 22.8% iron, 10.7% silica.

Property is well adapted for tunnel work, has large blocks of virgin ground and is considered promising. Company is an intermittent producer.

NIAGARA MINING CO.

UTAH

Is controlled by United States Smelting, Refining & Mining Co.

NORTH BINGHAM CONSOLIDATED MINING CO.

UTAH

Office: Provo, Utah. Mine near Bingham Canyon, Salt Lake Co., Utah. Jesse Knight, pres.; Wm. W. Mathews, v. p.; W. Lester Mangum, sec.-treas., and J. Wm. Knight, directors.

Inc. June, 1907, in Utah. **Cap.**, \$100,000; shares 10 cts. par; assessable; levied a one-half ct. assessment, 1910. Is controlled, through stock ownership, by the Knight Investment Co.

Property: 6 claims, in Barney Canyon, has a very wide ore zone, said to show leached ore carrying traces of copper and up to \$2.80 gold per ton.

Development: includes a tunnel of about 1,000', and a 2-compartment shaft. Property is considered a good development proposition. Idle.

OHIO COPPER CO.

UTAH

Liquidated and properties and assets transferred to the Ohio Copper Mining Co., in turn succeeded by Ohio Copper Mng. Co. of Utah, which see. Old company fully described in former volumes.

OHIO COPPER MINING CO.

UTAH

Property sold at foreclosure sale, Aug., 1916, to representatives of bondholders' committee and company reorganized as Ohio Copper M. Co. of Utah, which see. Also see Vol. XII.

OHIO COPPER MINING CO. OF UTAH

UTAH

Office: 43 Exchange Place, New York.

Officers: H. E. Rogers, pres.; Chas. A. Kittle, v. p.; E. S. Hooley, v. p.

S. K. Kellock, sec.-treas.; Alfred Frank, gen. mgr.; above with J. H. Flagler, M. N. Buckner, A. R. Rogers, A. R. Peacock, Hugh Aiken and S. B. Sherman, directors.

Inc. Nov., 1916, in Maine, as a reorganization of the Ohio Copper Mining Co., formerly the Ohio Copper Co. **Cap.**, \$2,500,000; shares \$1 par; 2,200,000 issued.

Net profit for first 3 months, 1917, was \$180,122.

History: the Ohio Copper Mining Co. was inc. July 8, 1912, as a reorganization of the Ohio Copper Co., with capital of \$8,000,000, acquiring the mining claims of the latter company. The Ohio Copper Mining Co. assumed \$1,242,000 Ohio Copper Co. 6% convertible gold bonds; dated September 1, 1907, due September 1, 1917; bonds were secured by first mortgage on all mining property, plants and real estate then owned, or which might be acquired thereafter.

On September 1, 1914, the company defaulted payment of interest on bonds, whereupon a bondholders' protective committee was formed, which requested deposits of the bonds with the Mutual Alliance Trust Co. of New York as depository. On September 14, in the United States District Court of New York, Judge Mayer appointed Morris J. Hirsch and George C. Austin as receivers of the company in bankruptcy proceedings brought by creditors. On October 27, Clark Grove, E. McCormick and Charles T. Lark were appointed trustees to represent the creditors. On September 19, 1914, the company filed a voluntary petition in bankruptcy, scheduling assets of \$1,343,257, and liabilities of \$1,668,838. On July 16, 1916, the Empire Trust Co. of New York, as trustee under the bonds filed suit to foreclose the mortgage. The property was sold under foreclosure on August 30, 1916, to a representative of the bondholders' committee for \$750,000. Meanwhile, the mine and mill were being operated by the General Exploration Co. under lease from the receivers.

After the foreclosure sale, three plans of reorganization were devised, one by the bondholders' protective committee and one each by two stockholders' committees. That of the "Rogers" (so-called from the name of the chairman, Hubert E. Rogers) stockholders' committee was acceptable to the Court; the former sale was set aside and the property sold to this committee for \$1,350,000.

Under the plan of the Rogers' Committee, there was to be paid into Court whatever amount should be found due upon the bonds less whatever sums had been realized on the property: (a) By the trustees in bankruptcy; (b) By the receivers appointed in the foreclosure proceedings; (c) By the purchaser since the foreclosure sale; after deducting, in all cases, whatever amount the Court should determine should be deducted for expenses in connection with these various matters.

Stock of the new company was to be issued to the committee to be disposed of as follows: 1,500,000 shares to be sold to an underwriting syndicate at par less 15% commission; 150,000 shares to be retained by the committee for reorganization purposes; 850,000 shares to be placed in the company's treasury for future needs. Of the shares to be sold by the underwriting syndicate, the stockholders of the 1,350,000 shares of the Ohio Copper Mining Co. were given first opportunity to acquire new stock in exchange for their holdings on a share-for-share basis and payment of \$1 per share. The amount raised by this sale of stock was sufficient to pay off outstanding bonds, clear the property of all indebtedness and provide a working capital of approximately \$200,000.

Property: 14 claims, patented, 120 acres, bounded on the N. and W. by holdings of the Utah Copper Co., on the E. by the Fortuna Mining & Milling Co., on the S. by United States Mining Co., and on the S. W. by the Boston Consolidated. The Mascotte tunnel, controlled by the Heinze Estate, through the Bingham Central railway, exacts a toll of 15 cts. per ton on all ore extracted through that avenue, yielding a very considerable revenue to the owners.

Reported Sept., 1917, that company has secured stock control of the Bingham Central R. R., which owns the Mascotte tunnel.

Geology: property carries some ore in veins along a mineralized zone with E.-W. strike and dip of 45° N., consisting of a belt of quartzite of 500' width carrying 2 parallel veins, known as the What Cheer and All's Well. These veins are more than 500' apart, and separated by mineralized quartzite which constitutes the main orebody of the property, the ore averaging 1.015% copper. The quartzite, which adjoins the laccolithic mass of monzonite-porphyrty of the neighboring Utah Copper and Boston Consolidated properties, is much shattered and broken, with ore disseminations and impregnations along shatter and cleavage planes, in the brecciated material, ore being chiefly chalcocite and chalcopyrite, associated with pyrite, readily amenable to concentration, and lying above the level of the Mascotte tunnel.

Estimates of ore developed vary greatly, the former management claiming that ore had been developed under about 5 acres, the porphyritic orebody being estimated as 400' wide, 1,000' long and 600' deep. One estimate gave 3,746,165 tons of ore developed with 9,738,690 tons of probable ore and the average tenor probably about that of the ore milled, or 1.01% copper.

The 14,000' single track Mascotte tunnel, connecting with the shaft at depth of 1,100', cares for the large volume of water coming from the workings. Ore is blocked out in 100' squares, with extensive development on the 3rd, 5th and 7th levels, and the caving system is used in extraction. Ore is sent from the upper workings, through chutes, to a 4,000-ton ore-bin, 20' wide and 200' long, extending over both tracks; loaded in about 4 minutes from the bins into trains of 18 to 20 five-ton double-bottom steel cars, and hauled by electric locomotives, to the concentrator at Lark.

The mill, at Lark, 3,200' from the mouth of the Mascotte tunnel, is 317' long and 391' deep, in 5 units, built in 6 terraces. Capacity is 3,000 tons daily, and in October, 1917, about 2,300 tons was being treated, the flotation units not being ready. Equipment includes 2 coarse and 4 fine Blake crushers, elevators, trommels, conveyors, 4 roughing and 8 finishing rolls, of Allis-Chalmers make, 16 Monadnock Chilean mills, 144 jigs, 288 Wilfley and James tables, and Callow classifying tanks. The installation includes 51 motors, ranging from 15 to 150-h. p.

Recovery was low, about 47%, and in 1917, an experimental 500-ton Minerals Separation plant and 150-ton Janney machine were installed. Results were excellent, at least 80% of the copper contents being saved. Flotation system is being installed throughout mill, 1917.

Production: for first 3 months, 1917, was 1,424,247 lbs., netting \$147,279. In August, 2,300 tons of ore were being handled daily. Company had 1,919,758 lbs. copper in the hands of the A. S. & R. Co., Aug., 1917.

The property should prove profitable from now on with higher extraction of copper and a thoroughly competent management.

PHOENIX MINING CO.

UTAH

See Utah Apex Mining Co.

PINE CANYON & BINGHAM TUNNEL CO.

UTAH

Office: 121 N. W. Temple St., Salt Lake City, Utah.

Officers: J. B. Moreton, pres.; Richard Savage, v. p.; Homer Benton, 2nd v. p.; Louis Levine, sec.-treas.

Inc. July 28th, 1916, in Utah. **Cap.**, \$1,500,000; \$1 par; 800,000 issued and in secretary's hands.

Property: 42 claims, 150 acres patented, covering apex of mountain, W. of Bingham, shows two N. E.-S. W. fissures, a bedded contact deposit and the Star vein, in quartzite, carrying limestone beds and cut by Bingham monzonite porphyry.

Company owns 2,000' tunnel running from Pine Canyon toward Bingham. Portal of the tunnel will be $1\frac{1}{2}$ miles from the International smelter at 5,600' elevation. The Great Western tunnel at an elevation of 7,300' is between the Great Divide group and the Star group, half way up the mountain side between the Nancy Hanks and the portal of the new Pine Canyon tunnel.

SAMSON MINING CO.**UTAH**

Subsidiary of the Bingham Mines Co.

SILVER SHIELD MINING & MILLING CO.**UTAH**

Office: McCornick Bldg., Salt Lake City. Mine office: Bingham Canyon, Salt Lake Co., Utah.

Officers: Henry Cohn, pres.; H. S. Joseph, v. p.-gen. mgr.; H. W. Cram, sec. with J. M. Hayes, Lou Moore, R. E. Mills and J. M. Solomon, directors.

Inc. in Utah. Cap., \$300,000; shares \$1 par; assessable; 285,000 shares issued. Paid \$4,500 in dividends prior to 1903. Listed in Salt Lake City. Requests for information ignored.

Property: about 320 acres, at Bingham Canyon.

Ore: carries mainly silver-lead, with some gold.

Development: by a tunnel over 8,000' long, connected with tunnel of the U. S. Mng. Co. Reported in 1916, that a 4' vein of \$40 ore had been found by a lessee, 3,500' from the tunnel portal. Several carloads of ore reported to have been shipped and mine now worked on company account. Also reported Sundays have been designated as days upon which visitors will be welcome.

Shaft from surface to tunnel is to be sunk 500'. Was down 100' in Sept., 1917. Lessees are working on lead ore near the surface and underground. Company states that it is earning expenses.

Equipment: hoist, 5-drill compressor, 50 h. p. motor, etc.

STARLESS MINE**UTAH**

Office: care Col. Enos A. Wall, owner, Salt Lake City, Utah. Mine office: Bingham Canyon, Utah.

Property: 8 claims patented, 160 acres, lying N. E. of the holdings of the Utah Copper Co., is developed by an incline shaft and numerous tunnels, longest 2,000', with crosscuts and upraises, aggregating 10,000'.

Development: said to block out 800,000 tons of 1 to 2% copper ore.

Equipment: includes a hoist.

The 125-ton mill, enlarged and remodeled 1910, at a cost of \$50,000, is equipped throughout with machinery of Col. Wall's own design, comprising Wall corrugated rolls, Wall steel rolls for middlings, 3 sets of jigs, 2 tables for concentrates, 2 Wilfley tables, and washers, of trough form, with valves and sprayers, concentrates being discharged through the bottom and sands from the top.

STIBNITE MINING CO.**UTAH**

Address: H. C. Baker, 2421 Washington Ave., Ogden, Utah.

Officers: H. C. Baker, pres.; A. M. Miller, v. p.; G. M. Flowers, sec.-treas.; with Leroy Buchmiller and H. J. Craven, directors.

Inc. April, 1917, in Utah. Cap., \$100,000; shares 10c par; 800,000 issued; non-assessable.

Property: 686 acres, patented, 4 miles N. of Bingham, in Wasatch Range, Box Elder Co., Utah.

Development: by 2,452' adit, total openings 4,315' to depth of 800', showing various types of deposits in limestone, quartzite and shale, the ore containing lead and antimony. Reserves are estimated at 126,000 tons. Antimony ore mined in 1916 was 67 tons, assaying 66% metal.

Equipment: compressor, 6,200' tram, 125-ton concentrating plant. Flotation is to be added in 1918.

TOM MOORE GROUP**UTAH**

Office: 159 South State St., Salt Lake City, Utah. Mine office: Bingham

Canyon, Salt Lake Co., Utah. A. M. Surbaugh and Thos. Moore Surbaugh, owners.

Property: 39 claims, 22 patented, 715 acres, with direct rail connection, in the N. E. part of the Bingham camp.

Development: by 16 shallow shafts and short tunnels, principal work being by the Highline tunnel, with another tunnel driving at lower depth. The mine carries gold and silver-bearing lead and copper ores, with small quantities of native copper, in quartz. Owners do not care to have output or other details made public, and returned letters unopened in May, 1917.

UTAH-APEX MINING CO.

UTAH

Office: 10 Post Office Square, Boston, Mass. **Mine office:** Bingham Canyon, Utah.

Officers: R. F. Haffenreffer, Jr., pres.; J. J. Murphy, v. p. and treas.; with N. P. Duvally, sec., W. F. Coffin and G. F. McGahey, directors; A. A. Robert, Jr., asst. sec.; V. S. Rood, supt.

Inc. May, 1902, in Maine, as a merger of the Copperfield Mining Co. and York Mining Co. Cap., \$3,000,000; increased 1906, from \$2,500,000; shares \$5 par; issued 528,200 shares.

Bonds: \$500,000, authorized at 6%, convertible, were retired July 1, 1916. Company absorbed the Highland Boy, Petro, Minnie and Phoenix mining companies. State Street Trust Co., Boston, transfer agent. Annual meeting, second Thursday in November.

Balance sheet for year ended Aug. 31, 1917, shows assets totaling \$3,840,349, including \$2,480,789 for cost of properties; \$486,702 cash; \$321,475 for development and equipment.

For fiscal year ending Sept. 1, 1917, gross ore sales, royalties, etc., were \$1,273,571. Mining, development and milling cost, \$688,172; general insurance, taxes, depreciation (\$94,066), etc., \$251,350, leaving a net profit of \$334,049. Dividends absorbed \$132,050.

Dividends: initial quarterly dividend, 12½c, paid Oct. 1, 1915, 75c in 1916, and 50c in 1917, to Oct. 15. Total is \$726,275.

Property: 34 claims, 244 acres, including the York, Copper Field, Petro, Highland Boy Consolidated and Phoenix groups, adjoins the Utah Consolidated on the S. and W., on York hill, Carr Fork canyon.

Geology: claims show limestone and quartzite, carrying the Parnell, Petro, York, and Andy bedded veins. These veins are cut by several fissures which have been more or less developed. The Dana, the principal orebody, is apparently a contact deposit between quartzite and limestone, showing an ore-shoot standing vertically, without disseminations in the contact, up to 15' in width and 500' in length on the 4th level. The mine primarily is a producer of high-grade lead ore, but has considerable copper, and some zinc; all ores carry silver and gold values with an excess of iron, giving low smelting charges. First-class ores carry about 2% copper, and \$6 to \$8 combined gold and silver values per ton, the second-class copper ores carrying about \$3 per ton in combined gold and silver values. First-class lead ores carry 35 to 50% lead, with silver and gold values, and second-class lead ores range 7 to 14% in lead tenor, with small gold and silver values.

Development: by 3 shafts and 6 tunnels, with several miles of openings. The main working shaft is down to the 1,500' level. The tunnels, known as the Parnell, Minnie, Smilax, Andy, Andy No. 2 and Parvenu, are spaced at 200' vertical intervals, and are connected by incline blind shafts, with electric hoists, on the Parnell vein, which is estimated by the company to be 5' in width and to be mineralized for about 1,000' in length and to 2,000' in depth. The Andy tunnel develops 3 ore-shoots, on the Parnell vein. The Parvenu tunnel, which is the principal working, is about 1 mile in length, cutting the Parnell vein with a back of about 2,200'. Since the decline in the copper market 1907, attention had been

devoted mainly to silver-lead ore. A silver-lead orebody opened in the Parvenu tunnel, having a maximum thickness of 100', with a width of better than 100' and length undetermined, shows direct smelting ore of 15 to 20% lead, with 3 to 5 oz. silver per ton, and excess of iron, estimated to carry net values of \$8 to \$10 per ton. The Parvenu shaft was completed to the surface, and a new hoist started in April, 1917.

A 3,000' Bleichert aerial tram, not in present use, runs from the portal of the Andy tunnel to a loading station. Ore is shipped over a spur track of the railway line of the Utah Copper Co.

Mine was examined 1916, by Pope Yeatman, who discussed the lead-silver, lead-silver-zinc and copper ore occurrences, of which lead has been the most important. There is little chance for development of ore between 200 and 1,000' but above 200' there are possibilities. The York beds show promise of ore at depth. The principal orebody is the Parvenu, which on Nov. 1, 1917, contained 50,000 tons of 14% lead and 14% zinc ore. Its lower extension seems to be close to the 1,500' level. The future lies in extensive development, all other departments being in good order.

From March to late in May, 1917, the mine was closed on account of a fire in the lower levels, necessitating flooding the workings. This cost \$43,000 cash.

Ore reserves are estimated at 73,000 tons, assaying 0.03 oz. gold, 3.5 oz. silver, 11% lead, and 8% zinc. Present indications show that new ore will be opened faster than that mined.

Equipment: includes two 15-drill air compressors and 2 electric hoists, 1 of which is a double-drum Davis hoist installed at the 7th level station in the Parvenu tunnel. In April, 1917, a new Nordberg hoist was installed on the surface. The old Phoenix mill at the mouth of the Parvenu tunnel was dismantled and a new 200-ton mill built 1909, on the same site. The new mill is said to effect a concentration of 4 into 1, with a saving of about 77% of assay values. In 1914, company increased the capacity of the concentrator to about 350 tons daily, and in 1915 a flotation equipment was added.

The lead mill treated 53,518 tons in the year ended Aug. 31, 1916, from which 16,947 tons of concentrates were recovered. The copper mill treated 2,010 tons. Average cost of milling was 72.2c per ton in 1915, as compared with 79.8c in 1914. In 1917 the mill treated 17,637 tons of ore, assaying 0.034 oz. gold, 3.76 oz. silver, and 11.37% lead.

Company has contracts with U. S. Mng. & Sm. Co. and American Sm. & Ref. Co. for daily shipments of 300-400 tons lead zinc ore and lead ore and concentrates respectively. Employs 400 men.

Production: years ended August 31:

Year	Gold, Oz.	Silver, Oz.	Lead, Lbs.	Copper, Lbs.
1917	3,551	396,989	24,414,451	.....
1916	4,924	620,022	37,304,675	2,355,475
1915	4,000	560,000	32,000,000	2,400,000

High prices for lead and silver resulted in larger profits, but with the recent decline in these metals the outlook is not so promising, specially also considering the conclusions of Pope Yeatman given above.

UTAH CONSOLIDATED MINING CO.

UTAH

Office: 42 Broadway, New York. **Operating office:** 608 Dooly Block. Salt Lake City, Utah. **Mine office:** Bingham Canyon, Utah

Officers: R. H. Channing, Jr., pres.; Adolph Lewisohn, v. p.; with Sidney Chase, J. S. Dunstan, H. H. Anthony, J. W. Allen, Maxwell Woodhull, directors; A. H. Melin, sec.-treas.; Frederick Cowans, gen. mgr.; A. S. Winther, supt.; T. S. Van Wagoner, purch. agt.

Inc. 1903, in New Jersey. **Cap.**, \$1,500,000; shares \$5 par. Is a reconstruc-

tion of Utah Consolidated Gold Mines, Ltd., a British corporation that in turn succeeded the Sevier Gold Mines, Ltd., Oct., 1896. Property of the Utah Consolidated Mining Co. is 2,490 shares of the 2,500 shares of the capital stock of the Highland Boy Gold & Copper Mining Co., of New Jersey, the latter corporation holding direct title to the Utah properties. The company also owns 8,250 shares of stock of the Anaconda Copper Mng. Co., stock derived from sale of Internat'l S. & R. Co. Shares are listed on the Boston and Salt Lake stock exchanges. Annual meeting, first Tuesday in April.

The company's total income for 1916 was \$4,773,962, with surplus of liquid assets over liabilities of \$2,549,995. Net earnings were \$1,038,637 in 1903; \$1,164,348 in 1904; \$1,887,385 in 1905; \$2,835,008 in 1906; \$1,179,412 in 1907; \$326,312 in 1908; \$154,263 in 1909; \$65,348 in 1910; \$438,430 in 1911; \$603,923 in 1912; \$636,470 in 1913; \$565,665 in 1914; \$1,128,122 in 1915; \$1,924,177 in 1916.

Dividends:

1903.....	\$3.20	1908.....	\$2.00	1913.....	\$1.50
1904.....	3.00	1909.....	2.00	1914.....	2.00
1905.....	3.50	1910.....	.50	1915.....	2.00
1906.....	5.00	1911.....	.50	1916.....	1.50
1907.....	7.00	1912.....	1.50	1917.....	3.75

Total dividends to Sept. 28, 1917, \$45.89 per share, or \$13,767,000.

Property: 43 claims, patented, 404 acres, known as the Highland Boy group, in Carr Fork canyon, 2½ miles from Bingham canyon. The Highland Boy mine was a considerable producer of silver-lead ore, 1870-90.

In 1915 the Bingham Copper Boy group adjoining the Utah Cons. on the north was purchased for \$18,747. Property promising but undeveloped.

Geology: property has 6 ore deposits which are replacements of limestone beds, 150 to 300' thick, with quartzite above and below. These beds dip from 25 to 45° N. and the rocks are cut by a series of porphyry dikes that are nearly vertical and run N. E. The ore deposits form well-defined shoots with E.-W. strike and N.-E. pitch. They are large, varying up to 100' in width and 100 to 200' in length, and are separated by barren limestone; the largest orebody so far developed is said to be 320' in extreme horizontal width and 340' in length. An ore-shoot carrying galena was found in the lower workings in an extension of the Yampa limestone. The predominant ore of the mine carries chalcopyrite, with some bornite and chalcocite, associated with pyrite in a limestone gangue.

Development: the Highland Boy mine is opened by an old 900' shaft, and 7 tunnels, of 1,000 to 2,600' length. No. 7 tunnel, 700' below the crest of the mountain, is 2,600' in length and is the main avenue of extraction, all tunnels being connected, and ore milled, through chutes, to the bottom tunnel. There are 2 blind shafts, deepest 500', starting from the 700' level, with large electric hoists, raising ore to that point for extraction by the electric haulage plant in No. 7 tunnel. The ore breaks easily and is extracted by the top-slice caving system, ore is broken mainly on contract.

New openings were 20,510' in 1913; 19,778' in 1914; 19,890' in 1915, and 25,819' in 1916.

On No. 13 level there was 5,328' of work done in 1916. East of the main shaft the principal copper orebodies were found smaller and more silicious. Two lead shoots were developed and one of 14,000 tons assay 17% lead, 5.52 oz. silver, 0.05 oz. gold and 0.7% copper. The other, opened for 70', contained 25.6% lead, 8.7 oz. silver, 0.06 oz. gold, and 0.65% copper. In the upper limestone, eastern section, at bottom of incline shaft, 70' of ore assayed 2.6% copper, 0.06 oz. gold, and 0.8 oz. silver, across 18" and 30' assayed 3% copper, 0.06 oz. gold and 0.8 oz. silver, across 24". West of the Occidental fault 5' of 15% lead, 4.04 oz. silver, 0.05 oz. gold and 0.3% copper ore was opened.

Ore reserves: estimated at end of 1915: 266,700 tons of 1.9% copper, \$1.00 gold and 0.69 oz. silver ore and 43,500 tons of 16.20% lead ore with 80c gold, 4.96 oz. silver and 0.7% copper; at end of 1916: 180,000 tons of 1.77% copper, 0.048 oz. gold and 0.69 oz. silver ore and 23,400 tons of 16.03% lead, 562 oz. silver, 0.038 oz. gold and 0.81% copper ore.

A 12,700' aerial tram leads from the portal of No. 7 tunnel to ore bins on the Rio Grande Western railway. There is a subsidiary aerial tram, crossing Carr Fork canyon, used for handling lumber and mining supplies.

While the great orebodies of the mine are worked out the property is far from exhausted, and development work is encouraging. In 1916, reserves were equal to half of the ore mined in that year.

Company mined 360,034 tons of 1.734% copper ore, and 74,542 tons 14.168% lead ore in 1916, the latter containing 4.249% silver per ton and 0.737% copper.

Production:

	Lbs. Copper	Lbs. Lead	Oz. Silver	Oz. Gold
1916	12,211,118	18,175,709	558,845	21,727
1915	8,836,091	17,777,604	370,985	19,387
1914	7,584,391	14,588,276	284,196	15,528
1913	7,710,668	19,208,063	378,960	14,172
1912	6,506,814	8,734,398	230,004	14,042
1911	9,162,023	3,311,939	160,366	16,730
1910	7,489,471		154,321	14,802
1909	10,043,900			
1908	10,648,243			
1907	13,987,557		390,296	34,554
1906	18,533,974		457,812	42,001
1905	17,264,474		374,685	28,290
1904	13,553,483			

In 1916 the quantity of copper ore mined increased 73% and the lead ore 14%.

UTAH CONSOLIDATED MINING & MILLING CO. UTAH

Idle. Office: 424 Atlas Bld., Salt Lake City, Utah. Mine office: Mammoth, Juab Co., Utah.

Officers: S. S. Jones, pres.; H. S. Cutler, v. p.; Hart J. Fitzgerald, sec-treas.; preceding, with Hon. Reed Smoot, A. N. Holdaway and Hugh J. Cannon, directors, at last accounts.

Inc. March 10, 1907, in Utah. Cap., \$250,000; shares 25c par; non-assessable. Shares listed on the Salt Lake and San Francisco exchanges.

Property: 6 claims, patented, near the Sioux Consolidated and Colorado mines, developed by a 500' shaft, with 2 levels opened. Part of the property is worked by lessees, who secure a small production.

UTAH COPPER CO. UTAH

Office: 600 McCornick Bldg., Salt Lake City, Utah. Mine office: Bing-ham Canyon, Salt Lake Co., Utah. Works office: Garfield, Utah.

UTAH COPPER COMPANY

Our Statistical Department will furnish complete information on application.

HAYDEN, STONE & CO.

Members New York, Boston and Philadelphia Stock Exchanges.

25 Broad Street, NEW YORK

87 Milk Street, BOSTON

Officers: Chas. M. MacNeill, pres.; Daniel C. Jackling, 1st v. p. and managing director; Chas. Hayden, 2nd v. p.; Chas. K. Lipman, 3rd v. p.; K. R. Babbitt, sec. and gen. counsel; other directors, Spencer Penrose, E. A. Guggenheim. H. F. Guggenheim, W. C. Potter, Stephen Birch, W. P. Hamilton, R. C. Gemmill (last named is gen. mgr.), W. Hinckle Smith, John Hays Hammond, Wm. B. Thompson and Eugene Meyer, Jr.; John M. Hayes, treas. and asst. sec.; J. D. Shilling, supt. of mines; F. G. Janney, Jr., gen. supt. of mills; H. C. Smith, supt. Magna plant; T. A. Janney, supt. Arthur plant; H. C. Goodrich, chief engr. of mines; J. K. MacGowan, purch. agt.; C. F. Jennings, asst. purch. agt.

Inc. June 4th, 1903, and reorganized April 30th, 1904, in New Jersey. **Cap.**, \$25,000,000; originally, \$4,500,000; shares \$10 par; cap. successively increased Oct., 1905, to \$6,000,000; Feb., 1907, to \$6,600,000; Jan., 1908, to \$7,500,000; Jan., 1910, to \$25,000,000; issued, \$16,244,900. The new stock issue, 1910, amounted to \$8,282,240, of which \$3,100,000 in stock was given for the property of the Boston Consolidated Mining Co.; \$4,445,120, or 445,512 shares, were given for 1,000,152 shares of Nevada Consolidated Copper Co.; \$734,370, or 73,437 shares, were sold for cash, at a premium of 400%, for \$50 per share, and 275 shares were issued for the conversion of \$5,500 of bonds at par. Shares are listed on the New York, Boston and Paris Stock Exchanges. D. A. Crockett, 120 Broadway, New York, and American Trust Co., Boston, transfer agents; Guaranty Trust Co., New York, and Old Colony Trust Co., Boston, registrars. Annual meeting, fourth Friday in April.

Comparative General Balance Sheet: Utah Copper Co. and Bingham & Garfield Ry. Co.

Assets:

	Property and Equip.	Def. Chgs. to Oper't'ns	Invest's	Copper in Transit	Other Current Assets	Total
1916	\$26,900,172	\$7,619,430	\$5,438,174	\$15,838,979	\$17,970,858	\$73,767,613
1915	25,359,919	6,444,346	5,087,899	8,675,199	6,117,122	52,344,485
1914	24,777,736	5,385,204	5,061,008	3,755,997	1,285,954	40,265,899

Liabilities:

	Capital Stock	Current	Reserve for Deprec.	Surplus from Sale of Sec't's	Earned Surplus	Total
1916	\$16,244,900	\$3,529,395	\$2,499,515	\$8,290,620	\$43,203,183	\$73,767,613
1915	16,244,900	2,228,252	1,796,970	8,290,620	23,783,743	52,344,485
1914(a)	16,244,900	1,056,794	1,125,349	8,290,620	13,522,736	40,265,899

(a) Bonds outstanding in 1914, Bingham & Garfield Ry. Co., \$25,500.

Comparative Income Account:

	Operating Revenue	Operating Expenses	Net Optg. Profit	Total Income	Total Deducts	Balance Dec. 31
1917*			\$15,704,454	\$20,644,084	\$17,869,390	.....
1916	\$50,280,074	\$16,532,334	\$33,747,739	\$39,738,675	\$20,083,612	\$43,153,137
1915	27,155,944	12,132,109	15,023,834	17,920,443	7,457,778	23,498,074
1914	16,222,456	10,230,293	5,992,163	8,730,422	5,403,667	13,035,408

* 9 months.

Earnings and Dividends on Stock, Per Share:

	Earned	Paid		Earned	Paid		Earned	Paid
1908....		\$1.00	1912....	\$5.35	\$3.00	1916...	\$24.46	\$12.00
1909....	\$2.93	2.00	1913....	5.37	3.00	1917 ..		14.50
1910....	3.46	3.00	1914....	5.34	3.00			
1911....	3.96	3.00	1915....	11.03	4.25			

Total dividends paid to Jan., 1918, amount to \$78,465,778.

The company controls the Nevada Consolidated Copper Co., owning slightly more than 50% of the outstanding stock, having exchanged its own stock on the basis of 1 share of Utah for 2¼ shares of Nevada. The company controls, through stock ownership, the Bingham & Garfield Railway Co., described later. During 1910 the Utah Co. absorbed the Boston Consolidated Mining Co. and the Shawmut Consolidated Copper Co.

History: in 1862 General P. E. Connor was stationed at Fort Douglas, Salt Lake City, in command of the Third California Infantry, a regiment of volunteers largely recruited from experienced California prospectors and miners. General Connor believed that the prosperity of Utah would be enhanced by immigration from the outside. He therefore encouraged exploration for minerals in the State and freely gave furloughs to his miner soldiers, in order that they might do the necessary prospecting. As a result, mineral was discovered in Bingham canyon early in the fall of 1863, and it is probable that it was not long after this date until the first prospecting was done in what is now called the "Bingham copper porphyry." This prospecting consisted of a tunnel, afterwards called "Soldier Tunnel," driven into the copper bearing porphyry for a distance of 200' on the westerly side of main Bingham canyon, and on property now owned by the Utah Copper Co.

The mining property now embraced in the holdings of the Utah Copper Co. had been known to be copper-bearing for many years, but was supposed to be too low-grade to pay and was not taken up for active development until the organization of the original Utah Copper Co. in 1903. Previous to that time, any work done was in hunting for the rich copper ore that is found here and there in the seams of the rock and in the fissures and fault planes. In the spring of 1903, the Utah Copper Co. acquired a controlling interest in the property, and began the construction at Copperton of a 300-ton experimental concentrating mill. The work at the mine was commenced in November, 1903, and the mill began its operations in April, 1904.

The early development of the mine was designed along the lines of properly opening up the ground for the application of what is known as the caving system of mining, and until June, 1907, all the ores extracted were derived from development work and by the application of that system. The underground mining operations at the Utah mine were discontinued permanently September 18, 1912, and those at the old Boston Consolidated on March 31, 1914, so that now all the mining is being carried on by steam shovel operations.

Property: the Utah Copper Co., excepting the Chile Copper Co.'s mine at Chuquicamata, has the largest developed orebody in the world, its proven tonnage exceeding that of the Rio Tinto, its nearest copper competitor, and even exceeding the proven tonnage of the greatest of the enormous iron mines of the Mesaba range, or the developed tonnage of gold ore of all the combined mines of the Witwatersrand. Not only has the Utah Copper Co. the second largest body of developed ore of any mine, but it also is the greatest ore producer, measured by tonnage, of any mine of any metal.

The entire mineralized area of the property is covered by a thickness of about 115' of low-grade and oxidized material that cannot be profitably treated by standard methods of concentration. At the inception of development, information as to the comparative thickness of capping and ore was very meagre, but as the work progressed it was readily seen that a system of mining, much cheaper than by caving, could be applied, and it was determined to adopt the use of steam shovels and remove the oxidized over-burden entirely, leaving the sulphide ore uncovered, so that it could also be handled by steam shovels at a very low cost. This character of work was commenced in August, 1906, and has since been prosecuted vigorously so that by the end of the year 1916, there had been removed from the property 39,706,865 cubic yards of capping and 54,678,700 dry tons of ore.

The maximum quantity of capping and ore ever handled in one day was 84,229 tons, and the maximum ever handled in any one month was 2,526,858 tons. The ore production from the property of the Utah Copper Co. has increased from 300 tons a day in July, 1904, to an average of over 30,000 tons daily, during the last half of 1916. In Aug., 1917, the average was 37,500 tons daily, while on one day in September the quantity was 47,000 tons of ore.

Geology: orebodies consist of an altered silicious porphyry, containing small grains of copper minerals, very uniformly disseminated throughout the mass, both in fracture seams and in the body of the rocks, and averaging about 1.45% copper, 0.12 oz. silver and 0.014 oz. gold. The primary copper mineral is chalcopyrite, but as a result of the oxidation of this mineral and the secondary deposition of others, practically all of the sulphide minerals of copper are now present, the predominating one being chalcocite. There are three zones in this deposit, as follows: the oxidized zone, about one-third of which contains carbonates of copper in sufficient quantity to render the material payable by leaching with a dilute solution of sulphuric acid; second, the zone of secondary enrichment, in which is found all of the concentrating sulphide ore of commercial value; and third, the zone of primary material, which is too low-grade to be profitable by any method of handling and treatment at present known.

Property: total area of lode mining claims in Bingham is 741.69 acres, of which 11.73 acres are outlying fractional claims and 729.96 acres is the group of adjacent claims lying on both sides of Bingham canyon above the town, and where the mine is located, and within the boundaries of which development has shown that at least 226 acres contain mineralized porphyry of commercial value. The entire porphyry area has not yet been developed; and the maximum thickness of the orebody in the 226 acres has not been fully demonstrated, but calculations show that previous to January 1st, 1917, there had been developed in the property, 424,524,258 tons of ore, averaging 1.415% copper, of which quantity, 270,000,000 tons were classed as fully developed, and 154,524,258 tons as partly developed. There was mined from the entire property prior to Jan. 1, 1917, a total of 54,678,700 tons of ore, averaging 1.449% copper; total reserves remaining, 369,845,558 tons, averaging 1.415% copper.

Development: in making the calculations to determine the tonnage of ore and its average assay, there were used 56,714 assays, representing 33,776' of diamond drill and churn drill holes, 293,637' of drifts, raises and winzes, and 16,630 linear feet of steam shovel cuts, or a total of 334,518' of development work. The orebody, as at present developed, has a maximum length of a little over one mile, and a maximum width of more than one-half mile.

Further development of the property will add materially to its ore reserves.

The total area of land other than lode claims owned by the company is 9,162.3 acres, consisting of 1,201.87 acres near the mouth of Bingham canyon, part of which was formerly used in connection with the operation of the Copperton plant, 675.69 acres in Utah and Davis counties, and 7,275.9 acres at the Magna and Arthur plants. Of this last acreage, approximately 2,340 acres are now included within the area upon which the tailings are being impounded.

The porphyry deposit on the westerly side of the canyon is worked by steam shovels. There are 24 steam shovel levels from A to W inclusive, the levels being named alphabetically, beginning with A at the elevation of the railroad tracks in the bottom of the canyon and extending to W level near the top of the mountain; also one level below A, called sub A. Each of these levels is connected with the bottom or main level, with standard gauge railroad tracks constructed on 4% grades, so that the steam shovels load the ore directly into railroad cars which are hauled by 50-ton saddle tank engines to the main yard and assembled into trains to be transported to the mills. From sub A to V level, the difference in elevation is 1,446', and from sub A level to the top of the mountain, it is 1,600'. The high face of ore extending from A to F level, across which intermediate levels have been cut out, has a vertical height of about 240'. From F to W level, the difference in elevation between the levels varies from about 68' to 100', depending upon certain topographical conditions which control the elevations of the stripping lines extending from the steam shovel levels to the waste dumps.

No work has yet been done on the easterly side of the canyon, except development by drifts, raises, cross-cuts and churn drill holes, with a small amount of underground stoping.

Equipment: at the mine at the end of 1916 included 38 standard-gauge switching locomotives, 11 narrow-gauge switching locomotives, 1 standard-gauge Shay locomotive, all operated by steam; 16 Marion, 2 Bucyrus and 2 Atlantic type, of standard-gauge steam shovels, 1 combination steam shovel and locomotive crane, 110 standard-gauge 12-yd. all-steel dump cars, 110 standard-gauge 6-yd. wooden dump cars, 140 narrow-gauge 4-yd. wooden dump cars, 50 standard-gauge 30-yd. all-steel side dump cars, 3 standard-gauge flat cars, 100,000 lbs. capacity, 9 narrow gauge flat cars, 1 engine tender, 4 star drills, 7 Keystone drills, and 6 air compressors having a combined capacity of 8,000 cubic feet of free air per minute.

The problem is to remove the stripping from the ore and carry it to adjacent gulches to waste, and load the ore into railroad cars to be transported to the mills. The rock is broken by blasting before removal by the steam shovels, holes being bored by churn drills operated by steam, and piston drills operated by air. The holes are sprung and prepared ahead of the steam shovel operations, and are loaded and shot at such times as are required by the individual shovels on the different levels. An average of 1 pound of powder has been required to break down about 5 tons of rock ready for the steam shovel to load. There are 53.14 miles of standard-gauge track in and around the mines, 2.48 miles of narrow-gauge and 1.7 of three-rail track, a total of 57.32 miles, all owned by the Bingham & Garfield Railway Co.

The shovels and locomotives at the mine are operated by steam, but extensive use is made of electric power received from the Utah Power & Light Co. Buildings at the mine include machine and carpenter shops, car repair shops, compressor buildings, storehouses, office buildings, club house, boarding houses and other minor structures.

Mills: company had three mills, one at Bingham canyon, now dismantled, and two at Garfield, 20 miles from the mine. The 900-ton Copperton mill at Bingham canyon, the first concentrator put up by the company, is fully described in Volume VIII, Copper Handbook. It was closed permanently August 1, 1910, and all machinery that was suitable was sent to the Arthur mill for use there.

The finely disseminated copper glance necessitates fine crushing with the formation of slime and a tailing loss of about 0.5% copper. Concentration is about 23 into 1.

The **Magna** mill, the first plant built at Garfield, stands on a 3,000-acre site, four miles E. of the Garfield smelter and 1 mile E. of the Arthur mill. It is connected with mine and smelters by the Bingham and Garfield, Denver and Rio Grande, and Salt Lake Route railways. The building is 505'x600' and contains two 3,000 ton units, each of 6 sections, each unit being 300'x505' in size, occupying a site of about 20 acres. The plant is so designed that 2 additional units of the same size can be added when desired. Milling was begun June, 1907, with two sections, and the 12th and final section of the mill was started in November, 1908. The ore bins of the Magna mill are of 25,000 tons aggregate capacity, with bins of 12,000 tons in the coarse crushing department and 13,000 tons in the fine crushing department.

The Magna mill treated 16,785 tons daily in 1916, and is divided, longitudinally, into three departments, for coarse crushing, fine crushing, and concentrating. Additions to this plant have increased its capacity to 24,000 tons daily.

To treat about 40,000,000 tons of oxide and partly oxide capping overlying the sulphide ore, a leaching plant including 12 tanks capable of treating 3,000 to 4,000 tons a day is about complete. This ore carries 13 lbs. copper per ton, of which 10 lbs. are soluble in sulphuric acid, at a treatment cost of 9c. per lb.

The coarse crushing department consists of 2 sections having a capacity of 8,000 tons each in 24 hours. Each coarse crushing section is equipped with 2 No. 7½ gyratory crushers, 4 sets of 54"x20" Garfield roughing rolls, 4 elevators, 12 conveyors, 60 steel apron ore feeders, 7 motors and one 25-ton, 3-way, motor crane. In this department the ore is crushed dry to approximately ¾" in size.

The fine crushing department contains 36-6' Garfield Chilean mills, 24 sets of 37"x15" Garfield rolls, 24 steel apron ore feeders, 24 elevators, 72-3'x4' impact screens, 12 motors, and one 15-ton, 3-way motor crane. In this department the ore is crushed dry to about 10 mesh of rolls, and wet to about 40 mesh by Chilean mills.

The concentrating department for the entire plant is built on 3 floors. and contains 22 roughing and 44 finishing No. 5 Wilfley tables, 122 Garfield roughing tables, 1,104-6' vanners of suspended type, 83 Richards-Janney classifiers, 240-9' and 148-7' 60" conical settling tanks.

Miscellaneous buildings at the Magna plant consist of machine shop, thoroughly equipped for all repairs, boiler and blacksmith shop, warehouse, transformer house, pumping stations, ice house, carpenter shop, rigger shed, main office and dormitory.

The reserve pumping plant No. 1, used in whole or in part when the main pumping plant No. 2 is out of primary water, is situated 1500' N. E. of the Magna mill, and includes a Nordberg triple-expansion condensing pump with capacity of 10,000 gal. of water per min.; 3 two-stage Jeanesville centrifugal pumps and 3 two-stage D'Olier centrifugal pumps driven by 450 h. p., 350 h. p., and 250 h. p. G. E. induction motors, and having

capacities of 4,500, 3,500 and 2,500 gals. per min. respectively. These pumps with a combined capacity of 31,000 gal. per min., pump through two 24" wooden stave pipe lines, each 1800' in length, against a 230' head into a 5,500,000 gal. concrete lined reservoir above the Magna mill. In addition to the above are three 3-stage Byron Jackson centrifugal pumps driven by 400 h. p. G. E. and two 250 h. p. Westinghouse induction motors, and having capacities of 3,000, 1,500 and 1,500 gal. per min. respectively, which pump through one line of pipe, 1,700' of which is 20", and 5,870' of 30" wooden stave pipe line direct to a 2,000,000 gal. concrete lined reservoir above the Arthur mill, elevating the water 330'. The total combined capacity of this plant is 37,000 gal. per min.

The sources of supply for this station are springs at the plant developing 15,000 gal. per min. and through a canal which returns the water from the tailings pond, where both tailings and drainage water are impounded over an area of 1,000 acres. In time of low water, when the pond elevation is not sufficient so that the water will flow to the pumping station, it is lifted a maximum of 10' from the pond into the return canal by a 24" 20,000 gal. per min. Byron Jackson centrifugal pump, driven by a 60 h. p. G. E. induction motor.

The main pumping plant, called plant No. 2, is situated immediately east of the Magna mill, and at the end of the Utah & Salt Lake Canal, which brings the water from Utah lake about 40 miles from the plant, and through which, at certain seasons of the year when the farms in Salt Lake county do not require water for irrigation purposes, all of the primary water for both the Magna and Arthur plants is received. The equipment in this plant consists of 2 single stage 10,000 gal. per min. Worthington centrifugal pumps, each driven by a 150 h.p. G. E. induction motor, and one single-stage 5,000 gal. p.m. Worthington centrifugal pump, driven by a 75 h.p. Westinghouse induction motor, all 3 of which pump direct into the Magna 5,500,000 gal. reservoir through 700' of 30" wooden stave pipe line, against a 24' head; and 3 single-stage 5,000 gal. p.m. Worthington centrifugal pumps, each driven by 200 h.p. G. E. induction motor, 1 single-stage 3,000 gal. Bryon Jackson centrifugal pump, driven by a 150 h.p. Westinghouse induction motor, all pumping direct to the Arthur mill 2,000,000 gal. reservoir through 6,300' of 30" wooden stave pipe line, against a static head of 120'. The total capacity of this plant to the Magna mill is 25,000 gal. p.m., and to the Arthur mill, 18,000 gal. p.m., which is 70% more than is required by either mill.

The Arthur mill, about one mile west of the Magna mill, was built by the Boston Consolidated Mining Co., at a cost of upwards of \$1,500,000. It was remodeled to a capacity of 13,253 tons of ore daily in 1916 by replacing the Nissen stamps with rolls and Chilean mills to correspond to the practice at the Magna mill. It has 13 operating sections. The ore bins at Arthur have a capacity of 21,500 tons, 9,000 in the coarse crushing department and 12,500 tons capacity in the fine crushing department. Additions to the mill have increased its capacity to 16,000 tons daily.

The coarse crushing department is in a separate building adjoining the coarse ore bins and is equipped with 3 No. 8 gyratory crushers, 4 sets of 72"x20" Garfield roughing rolls, 4 elevators, 14 conveyors, 102 steel apron ore feeders, 10 motors and one 25-ton, 3-way motor crane. This department has a capacity of 15,000 tons in 24 hours and the ore is crushed dry to approximately $\frac{3}{4}$ " in size.

A crushing plant costing \$250,000 is being erected at the Arthur mill, and will be the largest in the United States.

The fine crushing department contains 26 six ft. Garfield Chilean mills.

26 sets of 37- $\frac{1}{2}$ "x15" rolls, 78-3'x4' impact screens, 26 steel apron ore feeders, 26 elevators, 26 motors and two 15-ton, 3-way motor cranes. In this department the ore is crushed dry to approximately 10 mesh by rolls and wet to approximately 40 mesh by Chilean mills.

In the concentrating department there are fifty-two 4-compartment, fifty-four 5-compartment and thirty-nine 3-compartment Richards-Janney classifiers, 156 Garfield roughing tables, 26 roughing and 34 finishing No. 5 Wilfley tables, 840-6' vanners, 14 elevators, 312-9' and 52-7', 60° conical settling tanks and 14 motors.

Miscellaneous buildings at the Arthur plant consist of sub-station, machine shop, boiler shop, oil house, compressor building, warehouse, carpenter shop, foundry, pattern storage building, general office, telephone building and emergency hospital, dormitory, mess house, lumber shed, heating plant, assay office, time office, and scale house.

Electric power used at both the Arthur and Magna plants is taken from the Utah Power & Light Co.

The 13,000 h.p. steam-electric plant, 1,500' N. E. of the Magna mill was erected by the Minneapolis Steel & Machinery Co. The boiler plant has 20 Heine 419 h.p. water tube boilers, working under 175 lbs. steam pressure, equipped with American automatic stokers, having separate mechanical drives of special design. There are two 26x50x48" Allis-Chalmers cross-compound Corliss condensing engines direct connected to 1,500 k. w. A. C. generators, and three 32x70x48" Nordberg cross-compound Corliss condensing engines direct connected to three 2,250 k.w. A. C. generators. There are 2 concrete smokestacks, 180' high, 12' inside diam. at the top. This plant has not been in operation since Feb., 1914.

The Utah Copper Co. employs 1,640 men at the mines, and 1,650 at the mills and shops at Garfield.

Bingham & Garfield Railway

Inc. July, 1908, in Utah. Cap. of \$6,515,000; shares \$100 par. Controlled by the Utah Copper Co., through ownership of the entire share capital.

The main line from Garfield to the mines, including tracks to the smelter, Sand Spur, and the Carr Fork Extension to the Apex Yard, is 25.83 miles. Yard and side tracks along the main line aggregate 21.70 miles. This together with tracks in and around the mine, and tracks not owned but operated over, makes 111.73 miles of track. The average grade for the entire line is about 2%; the maximum grade is 2.5%, with curves compensated .04 of a foot per degree of curvature. There are 4 tunnels with an aggregate length of 4,821', all driven 18' wide and 22' high; the longest being 2,085.11. There are 3 steel viaducts with an aggregate length of 2,010', containing about 3,000 tons of steel; the longest, across Carr fork, being 690' long and 190' high. Equipment of the line includes 4 Mallet articulated compound locomotives, each weighing 228.5 tons on drivers; 1 consolidation type locomotive, weighing 87 tons on drivers; 14 switching locomotives; 500 hopper-bottom steel ore cars; 50 drop-bottom side-dump steel general service gondola cars; 124 steel concentrate cars, making a total of 674 cars, each of 60-tons nominal capacity, with 10% excess allowance for overload; 6 steel flat cars of 50-tons capacity; 4 steel frame powder cars of 50-tons capacity; 10 wooden flat cars of 25-tons capacity; 3 steel tank cars of 7,000-gals. capacity each; 7 caboose cars; 1 Jordan spreader; 1 scale-testing car; 1 business car; 2 passenger coaches; 2 tool and kitchen box cars; 13 outfit cars and one 120-ton wrecking crane.

The cost of the complete line was upwards of \$5,000,000. The first

train load of ore, about 2,600 tons, was taken down the main line on September 14th, 1911, and regular passenger and freight service was started the following morning. In 1916 the line handled 28,585 tons of freight and 661 passengers daily.

Production:

	Tons Treated	Cost per Ton Mine Cts.	Cost per Ton Mill Cts.	Total (b) Dollars	% Cu.	% Rec.	% Cu. in Cnts.	Lbs. Rec. per T. Ore	Cu.	Net Prod. Lbs. Cu.	Cost-Cts. per Lb. (d)	Sell. Price Cts.
1917(a) . . .	10,994,000	27.81	27.92	0.9355	1.43	62.34	18.71	17.90		185,452,425		
1916 . . .	8,494,300	24.41	34.02	0.8624	1.43	64.13	19.17	18.39		187,531,824	8.116	23.926
1914 . . .	6,470,166	32.32	35.36	0.9550	1.42	66.04	18.19	18.82		148,397,006	7.56	17.679
1913 . . .	7,519,392	32.88	36.76	0.9761	1.25	63.95	17.31	15.95		113,942,834	9.498	15.337
1912 . . .	5,315,321	42.33	41.58	1.1239	1.36	66.32	20.75	18.09		91,366,337	9.024	15.839
1911 . . .	4,680,801	44.79	41.68	1.1725	1.51	69.53	25.62	21.03		(c)98,436,224	7.865	
1910 . . .	4,340,245	40.97	46.63	1.1738						(c)85,644,511	8.069	

In 1916, transportation cost 27.92c per ton.

(a) 11 months. (b) Includes transportation, all fixed, general and maintenance charges. (c) Gross production. (d) After making allowances for smelter deductions, and crediting value of gold and silver recovered, but not including miscellaneous income.

Production in 1916 also included 461,596 oz. silver at 66.68c and 47,648 oz. gold, compared with 371,712 oz. silver @ 49.880c, and 36,760 oz. gold in 1915.

Monthly output:

	1917	1916	1915	1914	1913
January	13,913,811	11,999,910	8,009,646	10,649,036	7,560,521
February	13,459,829	11,849,972	8,202,467	9,492,898	7,819,900
March	15,512,678	12,714,651	10,203,882	12,704,220	8,504,040
April	17,231,512	14,557,282	12,015,148	13,133,779	9,834,894
May	19,262,856	15,950,215	14,053,765	13,616,993	10,312,695
June	19,909,097	18,000,000	14,730,912	13,268,106	11,637,949
July	18,127,154	20,302,228	14,641,009	13,768,958	9,849,043
August	18,796,012	20,315,440	15,966,543	8,245,520	10,620,981
September	17,839,378	20,462,256	14,159,289	6,672,194	11,817,428
October	18,100,000	20,325,520	16,004,607	6,765,396	10,236,575
November	16,300,000	16,421,192	13,722,723	6,668,049	11,121,078
December		13,976,533	14,497,485	6,795,567	10,762,490

Increase of ore reserves for 1916 was 23,530,258 tons in excess of tonnage mined. Much additional ore can and will be developed.

Total amount of capping removed was 5,911,455 cu. yards. The total area upon which stripping operations has been conducted was 226.6 acres and the actual area stripped was 111.58 acres.

Practically all ore produced was mined by steam shovel at average mining cost of 28.12c per ton, of which 7.5c represents charges for stripping and .38c charges for development, leaving actual working cost, including proper proportion of all fixed and general charges, 20.24c per ton as compared with 16.61c per ton in 1915.

The directors have authorized construction of a leaching plant to treat the oxidized material, estimated at 40,000,000 tons. It is the intention to build this plant with an initial capacity of from 2,000 to 3,000 tons per day. For the purpose of furnishing acid for this plant, the company participated equally with the Garfield Smelting Co. in financing construction and operation of an acid works near the smelter, now in operation.

Improvements under way promise not only a continuation of production increases but further reductions in costs.

Utah Copper is still the brightest star in the Hayden-Stone-Jackling

galaxy, and its aggressive and brilliantly competent management promises to keep the company in its present enviable position.

Profits for, 1917 are likely to be reduced about \$13,000,000 by payment of the Federal excess profit tax.

UTAH & EASTERN COPPER CO.

UTAH.

Office: 127 Church St., New Haven, Conn. **Operating Office:** 508 McCormick Bldg., Salt Lake City, Utah. **Mine office:** Dixie, Washington Co., Utah. **Works Office:** Shem, Washington Co., Utah.

Officers: Louis E. Stoddard, pres.; T. W. Farnam, sec.-treas.

Inc. 1901, in West Virginia. **Cap.**, \$1,500,000, increased later to \$3,500,000; shares \$5 par, in \$2,000,000 preferred and \$1,500,000 common stock.

Property: 11 claims, patented, 220 acres, and a 40-acre smelter site, including the old Dixie mine, in the Tutsagubet or Cave Springs district, near Green river.

Geology: 5 replacement deposits in limestone, 1 of 40' estimated average width, carrying cuprite, azurite, and massive malachite ores, said to give average assays of 15% copper.

Development: by a 775' blind shaft, sunk from the breast of a 225' tunnel. This tunnel caved, 1905, and it was necessary to run a new tunnel, of 800', to reopen the mine. Old workings said to show about 100,000 tons of ore.

Equipment: includes a small gasoline plant.

The company has 2 smelters, 1 worthless; the new smelter has a 100-ton water-jacket blast furnace, with water power, secured from the Santa Clara river, 2 miles distant, and a small auxiliary steam plant. The smelter is at Shem, about 50 miles from Acoma, on the Rio Grande Western railroad, the nearest shipping point, and transportation for 14 miles of the distance is by traction engine.

Production: 1,448,597 lbs. copper in 1904; 400,166 in 1905, and 391,779 lbs. in 1907. Property considered promising but is handicapped by lack of rail transportation. Worked by lessees, 1915, who shipped several cars of 30% ore.

Letters returned unanswered in May, 1917.

UTAH LEAD & COPPER CO.

UTAH

Office: Kearns Bldg., Salt Lake City, Utah. **Mine Office:** Bingham Canyon, Utah.

Officers: Carl Brandt, pres.; Harry M. Stonemetz, v. p.; J. P. McDonough, sec., all of Boston. W. D. Bohm, manager.

Inc. Dec 24, 1912, in Maine, as the successor of the Bingham Copper Co. **Cap.**, \$500,000; shares \$1 par. Debentures \$100,000, at 6% convertible bonds; outstanding, \$31,750. Federal Trust Co., Boston, transfer agent; Paul Revere Trust Co., registrar.

Property: 11 claims, patented, about 102 acres, on the eastern slope of Carr Fork Canyon. Company also owns a one-half interest in the Diamond Extension, and one-half in the Diamond claims adjoining.

The property shows 3 fissure veins, several bedded deposits of silver-lead ore and a fissure vein of copper ore of less promise. A big outcrop near the W. end line is said to have yielded considerable high-grade gold and silver ore with lead carbonates, to former owner.

Development: by 2 tunnels, longest 1,200', and 2 shafts on the Venice claim. There are about 3,000' of workings, showing ore below commercial tenor generally, but with occasional streaks of ore assaying up to 70% lead and 15 to 30 oz. silver.

Equipment: includes a small air compressor.

Property has been idle for some time, but was planning to reopen, at last accounts.

UTAH LEASING CO.**UTAH**

Office: 305 Newhouse Bldg., Salt Lake City, Utah. **Mine Office:** H. H. Adams, supt., Newhouse, Utah.

Officers: V. P. Strange, pres.; J. C. Dick, v. p.; D. R. Pingree, sec-treas.; with Herbert Salinger and F. W. Royer, directors.

Inc. in Utah. Cap., \$30,000; shares 10c par; assessable; 250,000 issued. Gross earnings in 1916 were \$335,168; less \$189,312 for general expenses; \$24,642 for royalties, and \$44,092 for depreciation.

Dividends: 31c per share in 1916, or \$25,000; and \$47,500 in 1917 to May 31.

Property: a lease on about 1,000,000 tons of copper-gold-silver tailing at the old Cactus mine, Newhouse, Utah.

Equipment: one 20-ton Marion steam shovel, 750-ton plant including two 8'x48" Hardinge mills, 2 Dorr classifiers and 2 Minerals Separation flotation units.

Electric power is obtained from the Beaver River Power Co., at 44,000 volts, stepped down to 2,200 and 4,400 volts.

Production: feed to the plant averages 0.7% copper, and concentrate assays 16.5% copper, 0.05 oz. gold, 2oz. silver and 25% iron. In 1916, 175,923 tons yielded 1,473,529 lbs. copper, 253 oz. gold, and 7,596 oz. silver. Recovery is 70%. To April 1, 1917, 225,000 tons had been treated.

This seems to be a profitable venture, especially on low-grade material, but at present rate of treatment the available resources will be cleaned up in under three years.

UTAH METAL & TUNNEL CO.**UTAH**

Office: Walker Bank Bldg., Salt Lake City. **Mine Office:** J. F. Bauchelle, supt., Bingham, Utah.

Officers: Jas. E. Rothwell, pres.; A. B. Martin, v. p.; W. E. L. Dillaway, sec-treas., 45 Milk St., Boston, Mass., with Walter B. Farmer, M. A. Taylor, H. M. Richmond and J. B. Hubbard, directors.

Inc. May, 1914, in Maine. Cap., \$725,000; \$1 par; increased from \$500,000; Nov., 1914, to purchase Bingham-New Haven C. & G. Mng. Co.; 691,588 shares issued. **Bonds:** \$350,000 authorized; \$221,000 outstanding. Commonwealth Trust Co., Boston, and Registrar & Transfer Co., New York, transfer agents. International Trust Co., Boston, and Empire Trust Co., New York, registrars. Company acquired 214,589 shares out of 228,689 issued shares, Bingham-New Haven C. & G. Mng. Co., by exchange of share for share. Latter company has been paying dividends since 1906, with \$285,861 paid in 1915, and a total of \$960,493. Listed on Boston Stock Exchange; traded in on New York Curb. Stock sold at \$1 to \$10.50 in 1915. Annual meeting, first Monday in May.

Company is a reorganization of the Utah Metal Mining Co., itself a consolidation of the Bingham Central, Bingham Standard, and Bingham Metal Mining Co.

Statement for 1916 covers the combined companies, as nearly all the Bingham-New Haven shares had been acquired and the whole of the property has since been purchased. Gross earnings were \$1,499,268 from ore mined and \$35,947 from water, etc. Costs were \$933,384. The profit after deducting taxes, interest, depletion charge, and adding interest earned, was \$528,737. Current assets were \$774,117, and liabilities, \$66,662.

A dividend of 50c. per share, or \$342,473, was paid in August, 1916. In 1917, 50c was paid on Feb. 15, and 30c on Dec. 10. Total to end of 1917 is \$895,768.

Property: is extensive, covering 3,539 acres, including 139 acres timber land in Bingham district, adjoining holdings of Utah Cons. and Utah Copper Co. (Boston Con.), and extending across the range to Middle Canyon, on the Tooele side. The company's active asset is a transportation and drainage tunnel, cut 11,500' through and 2,300' below the crest of the range, from near Tooele to Bingham Canyon (Carr Fork). This gives direct short transportation to Tooele and Garfield and develops a large flow—600,000 gals. per day—of water sold to the Garfield mill of the Utah Copper Co.

The Bingham or Carr Fork holdings include the Bingham Central & Bingham Standard groups, an area in which the various mineral bearing limestone beds of the camp are cut by the Saginaw-Burning Moscow and Nast veins and crossed by the Old Jordan fault. The claims on the Tooele side show similar limestones, cut by fissures, but the development work there has not thus far shown commercial orebodies, as it has on the Bingham side.

In Nov., 1914, the company started crosscut exploration from the big drainage tunnel at 8,200' from the Tooele portal. In March, 1915, 1,300' from the Bingham portal, the latter work encountered mineralized ground, and on upraising 70', an orebody 25' thick was cut. Drifting disclosed a second orebody E. of and above the first, and later a third orebody, already opened and mined by the Bingham New Haven Co., was cut. At present there are five productive orebodies on the combined properties. One copper ore shoot 300' below the B. N. H. tunnel has been proven for over 200'.

The transportation tunnel is 8'x9' in the clear, double-tracked, with ½% grade. It develops the mineral bearing limestone and veins at depths of 375 to 900' below any other workings.

By purchasing control of the Bingham-New Haven company, the two properties can be developed together, each mining its own ground from tunnel on the other's claims. It also gives the Utah Metal much needed tramway facilities saving 60c. per ton on ore shipments, and the use of the B.-N. H. mill. The Bingham-New Haven property is described later on.

Development: on the Utah Metal includes besides the 11,490' transportation and drainage tunnel, and the workings therefrom, extensive tunnel development on the Bingham Central and Standard group, embracing the 700' Saginaw, 2,000' Whiteley, 2,000' Jeff. Davis, 400' Deem, 950 Mtn. Maid, the Amelia and lesser tunnels, all showing ore at various points. On the Tooele side, the Middle Canyon group has one 5,000' tunnel, another 1,700' and a third 500' long.

New work in 1916 amounted to 13,413' at a cost of \$11.08 per foot. The ground already opened, and the orebodies found, indicate the existence of similar other deposits. A large amount of mill ore has been developed. In Utah Metal ground, the new deep shaft, No. 104, should encounter shipping ore opened on the upper levels. Three years' ore supply is estimated as available.

Equipment: includes a 400-ton mill using the Callow system of flotation, enlarged 50% Oct., 1917. In July, it was stated that a new mill might be erected at the other end of the tunnel, near the International smelter.

Production:

	Ore, Tons	Lead, Lbs.	Copper, Lbs.	Gold, Oz.	Silver, Oz.	Gross Value
1916.....	71,402	6,301,670	1,761,520	17,934	388,757	\$1,499,268
1915.....	.....	9,860,089	2,873,815	16,914	475,894	1,386,845

Cost of mining was \$2.51, and of milling, \$1.11 per ton.

In Oct., 1917, a five years' contract was arranged with the International Smelting Co. for Utah Metal ore, the price to be the average for the week preceding receipt of the ore.

Property: the Bingham-New Haven property includes 26 claims, 500 acres, adjoining the Utah Consolidated on the S. E., includes the Zelnora mine near the head of Carr Fork. Claims show 3 fault fissures in porphyry and a contact deposit 3' to 8' in width, between quartz-porphyry and limestone. The copper ore averages 3.5% copper, \$6 in gold and silver and about 12% excess iron. The lead ore averages 20% lead, \$7 in gold and silver and 1.5% copper, ores being chalcopyrite, galena and sphalerite. The main ore supply is from 3 beds of limestone, which strike E. W. and dip N. Company now mining 2 deposits of copper, 2 of lead and one of complex ore.

Development: by tunnels with a blind shaft starting 900' from the portal of the lowest tunnel, there being a vertical distance of 1,200' between the highest and lowest workings. The 1,030' lower tunnel cuts a wide fissure vein, giving assays of about 3% copper, 2.3 oz. silver, and \$2.50 gold per ton. Terminal at the upper tunnel was moved to the lower tunnel and mine is operated through the latter. The shaft is now down 320' below the 500', or Highland Boy level, and crosscuts have been driven 200' and 320' below the tunnel level to cut a recently found ore-body which averages 6' in width where cut. Estimated 2-3 years' ore reserves in sight. Mine has several miles of workings with an aerial tram, connecting with loading bins on the Copper Belt railroad.

Equipment: includes electric power, air compressor and 175-ton mill, equipped with jigs, Wilfley and Deister tables, vanners and ball mill for fine grinding. The completion of a connection with the main working tunnel of the Utah Consolidated Copper Co., in Dec., 1912, permits shipments over that company's tram line to the Tooele smelter, reducing transportation costs 20c. per ton.

Production:

	Lbs. Copper	Lbs. Lead	Oz. Silver	Oz. Gold
1914.....	908,424	6,791,644	294,995	9,478
1915.....	2,574,261	4,903,906	325,448	6,617

Gross earnings were \$718,676 in 1914, and \$726,203 in 1915, derived solely from ore sales.

Daily output of ore, 300 tons at present, will be increased and a flotation plant will be built. About 165 men are employed.

VICTORIA CONSOLIDATED MINING CO.

UTAH

Owned by Bingham Mines Co., which see.

WESTERN MINING & MILLING CO.

UTAH

Is a subsidiary of the Great Divide Mines Co., which see.

Office: J. H. Hurd, sec., 219 Douglas Ave., Salt Lake City. Controlled by John B. Taylor, 1154 Downington Ave., Salt Lake City, Utah. A. B. Hirth, pres.; E. D. Haskins, v. p.; W. A. Cooke, treas.

Inc. 1897 and reorganized 1905 in Utah. **Cap.**, \$300,000; shares \$1 par; assessable, with 2 assessments levied; issued \$200,000. Is a close corporation, having only 9 shareholders.

Property: 20 claims, 19 patented, 215 acres, in the Pine Canyon section of the Bingham district, on the western slope of the Oquirrh mountains. The claims are developed by numerous tunnels, and show the same limestone beds, cut by mineralized fissures, which have made the bonanza

orebodies of the Utah Cons. and other properties on the east side of the range.

YOSEMITE MINES CO.**UTAH**

Controlled by Bingham Mines Co., which see.

BOXELDER COUNTY**CEDAR RIDGE MINING CO.****UTAH**

Owns 5 claims, about 65 acres, adjoining the Lake View mine on N. E., Promontory Pt., Boxelder Co., Utah.

Samples show good zinc values on length of 1,500' development work, showing 11.7% zinc for 60 samples cut at regular intervals along workings.

CLIPPER MINING CO.**UTAH**

Successor of Mohawk Mining Co.

Inc. July, 1916, by T. J. Yates, J. S. Barlow, John Russon, Dr. G. N. Curtis and J. A. Dalton, all of Salt Lake City.

Property: 7 claims, near Tecoma, Boxelder Co., Utah, shows 2 veins exposed throughout property, carrying silver-lead and zinc ores.

Development: by an 80' shaft with 100' of drifting. Is a prospect only.

DEWEY SILVER AND COPPER CO.**UTAH**

Address: Lorin Hall, or Leo Atcheson, Brigham City, Utah.

Property: 5 claims, 5 miles N. of Brigham City, Boxelder Co., Utah.

Development: by tunnels, ore occurring in limestone. Surface ore said to contain up to 60% lead with some silver and copper.

GINZA COPPER CO.**UTAH**

Idle. Mine near Kelton, Boxelder Co., Utah. Operations stopped in 1915 after considerable prospecting had failed to locate ore of commercial grade. Described Vol. XI, Copper Handbook.

JAY HAWKES MINING CO.**UTAH**

Ogden, Utah, owns 6 claims in Little Valley, on Promontory Point, in Great Salt Lake, near the Lake View property. Ore carries galena with silver. About \$3,000 has been expended on development, in incline shaft and open cut work.

LAKEVIEW MINING CO.**UTAH**

Office: Ogden, Utah. **Mine office:** Promontory Point, Utah.

Officers: W. H. Wattis, pres.; Samuel S. Arentz, v. p. and mgr.; L. F. Farr, sec.-treas., with C. L. Farr and Jas. Wotherspoon, directors.

Inc. March 9, 1915, in Utah. **Cap.**, \$500,000; shares 5c par; assessable; all issued to officers of the company. Annual meeting March 9th.

Dividends: to May, 1916, amounted to \$124,000.

Property: 15 claims, unpatented, 235 acres, at Promontory Point, Boxelder Co., 3 miles E. of Saline on the S. P. R. R., shows zinc-lead ore in a contact deposit between limestone foot and shale hanging-wall. The ore-body measures up to 20' in width, runs N. 35° W. and dips 35° N. E. Pay ore occurs in shoots from 1'-20' wide and from 50'-250' along the strike. Assays reported to average 32% zinc, 5% lead, 2% iron, 16% insoluble.

Development: to 1,000' below the outcrop by 5 adits, from 250'-350' long. A 6' vein assaying 18% lead with some silver has recently been opened on the South Hill ground and is now under development. Zinc ore as shipped averages 32% and lead ore 26%.

Equipment: includes 600' tram and oil-driven Chicago pneumatic compressor of 187 cu. ft. capacity.

Production: to July 1st, 1917, 279 cars realized \$352,471, mostly from zinc carbonate ore.

The mine and management have made quite a remarkable record. Located Jan. 27, 1915, work was commenced March 9, with a small force and by December, 1915, all debts were paid, the mine was developed, equipped and shipping, a \$70,000 dividend paid to stockholders and a cash surplus remained in the treasury. Mine developing into a lead property with depth and sulphides replacing oxidized ore. Property examined and sampled by Pierre Peugeot, July, 1917.

LITTLE VALLEY MNG. CO.

UTAH

Owns 9 claims in compact group N. and E. of the Lakeview property, Promontory Point, Boxelder Co., Utah.

LUCKY BOY MINING & MILLING CO.

UTAH

E. E. Lowry, pres.; Ira Griffiths, sec.-treas.

Inc. April 20, 1916. **Cap.**, \$50,000; shares 10c par; assessable; 25,000 shares outstanding. Listed in Salt Lake City.

Property: 6 claims, in Clear Creek mining district, Boxelder Co., Utah, said to show copper-silver-gold ore.

MINERAL MOUNTAIN MINING CO.

UTAH

Address: Tecoma, Nevada.

Officers: G. Austin, pres.; F. Litz, v. p.; E. B. Whipple, sec.; C. T. Whipple, treas., with J. P. Weber, directors.

Inc. March, 1908, in Utah. **Cap.**, \$100,000; shares 10c par; 475,000 issued; assessable to 1c yearly.

Property: 13 unpatented claims, 250 acres, in Lucin district, Utah, 6 miles from Tecoma, Nevada.

Geology: contact and fissure veins in limestone, quartzite and granite. Shoots are from 12 to 24" wide. Ore carries lead carbonate and silver. Developed to 350' by incline shaft.

PENNUVA COPPER CO.

UTAH

Office: 954 Wilson Ave., Salt Lake City, Utah.

Officers: J. R. Austin, pres., Salina, Utah; G. D. O'Conner, v. p. and mgr.; W. R. McPherson, sec.-treas.; W. N. Beatty and Jas. Spelman, directors.

Inc. 1916, in Utah. **Cap.**, \$25,000; shares 5c par.

Property: 10 claims, unpatented, and 2 under 10-year lease, situated on Promontory Point, next to the Lakeview zinc mine and 2 miles from Salina on the S. P. R. R.

Development: 200' shaft on quartz shale bed showing bunches of chalcopyrite ore assaying 20-30% copper; also 110' drift on 60' level.

PLANETARY MNG. & MLG. CO.

UTAH

Address: T. E. Weyher, sec., 210 Judge Bldg., Salt Lake City, Utah.

Cap., \$10,000; shares 10c par; assessable; reduced from \$500,000 in Nov., 1917.

Property: claims near the old Century mine, N. W. of Kelton, Boxelder Co., Utah. Development work is provided for by assessments.

PROMONTORY MINING CO.

UTAH

Office: 54 Commercial Bldg., Salt Lake City, Utah. **Mine office:** Promontory, Boxelder Co., Utah. B. D. Siegfus, pres. and mgr.

Cap., \$600,000; shares \$1; issued, 450,000.

Property: about 7 miles north of Promontory point, shows a contact deposit between dolomite and porphyry.

Development: by a 105' shaft, sunk on an 8' vein, showing copper ore with a paystreak said to give assays of 5 to 18% copper, 1 to 40 oz. silver and about \$9 gold per ton. A 6' vein of low-grade zinc ore reported under development in 1916. See Lakeview Mining Co.

SALT LAKE COPPER CO.**UTAH**

Office: 11 Broadway, New York. **Operating office:** McIntyre Bldg. Salt Lake City, Utah. **Mine office:** Lucin, Boxelder Co., Utah.

Officers: Frederick Lewisohn, pres.; E. C. Westervelt, treas.; other directors, Walter Lewisohn, S. W. Peck, E. H. Westlake, E. J. Macnamara, O. B. Van Sant and Wm. Burns, mgr.

Inc. Oct. 10, 1906, in Maine. **Cap.**, \$2,200,000 shares \$10 par. **Debentures**, \$59,000, at 6%, payable out of net earnings.

Property: 108 claims, known as the Copper Mountain mine, at an elevation on 7,200' above sea level, in the Newfoundland district, and 100 acres within the limits of Salt Lake City.

The Copper Mountain mine has a number of tunnels and shafts, the 1,500' main tunnel having a back of about 400', and a 500' tunnel has been planned to be driven 1,200', to enter the hoped-for sulphide zone. The mine has upwards of 2 miles of workings, and is estimated to have in sight and blocked out, 75,306 tons of copper ore of 1.1% average tenor, not at present commercial ore. For the last few years the mine has been worked by lessees.

SANTA MARIA GOLD & COPPER MG. & REDUCTION CO. UTAH

Office: P. O. Box 517, Ogden, Utah. **Mine office:** Utah Hot Springs, Boxelder Co., Utah. Don Maguire, pres. and mgr.

Inc. 1907, in Utah. **Cap.**, \$500,000; shares \$1 par.

Property: includes mill and smelter sites, lying in a very rugged territory in the Sierra Madre district of the Wasatch mountains. Land carries 7 fissure veins, practically parallel, with a strong cross-fissure, and 1 contact deposit. The veins range from 12 to 70' in width, and ore contains chalcopyrite, associated with pyrite and occasional small amounts of galena, ore being mainly of concentrating grade.

Development: by the 2,000' Clara Belle tunnel, cutting 3 veins, and planned to cut 5 more, with backs of 200 to 1,800'. The mine has about a mile of workings, showing ore developed regarded as sufficient to warrant a mill.

Equipment: includes a power house, air compressor, smithy and boarding house. Idle several years.

UNITED PROMONTORY MINING CO.**UTAH**

Officers: B. D. Siegfus, pres., 572 S. 12 E. St., Salt Lake City, Utah; M. Rumph, v. p.; B. O. Siegfus, sec.-treas., with A. W. Phillips, O. P. Peterson and Geo. A. Horn, directors.

Cap., 700,000 shares; 1c par; 300,000 shares in treasury, June, 1916.

Property: 6 claims, in Boxelder Co., Utah, 7 miles N. of Promontory on the S. P. R. R., shows vein 20' thick in limestone-porphyrý contact. Developed by 125' shaft with levels at 45' and 115'. Upper level showed some high-grade copper ore; 115' level, at 18' from shaft showed bunches of copper ore. Company has been developing the mine for about 8 years.

In 1917, a compressor, etc., was installed, and management soon hopes to commence shipping ore.

VIPONT MINING CO.**UTAH**

Address: H. G. McMillan, 649 E. S. Temple St., Salt Lake City, Utah. W. A. Wilson, mgr.

Company owns 800 acres in Ashbrook district, in N. W. corner of Boxelder Co., developed by 5,000' of workings from which much ore was formerly shipped.

WESTERN ZINC CO.**UTAH**

Had lease and was operating the Lakeview Mng. Co. (which see) property on Promontory Point, Utah, in 1916.

MILLARD COUNTY

(includes Antelope district)

ANTELOPE STAR CONSOLIDATED MINES UTAH

Inc. March, 1917, in Utah. **Cap.**, \$300,000; shares 10c par. Is a consolidation of several properties in Mineral Mountain range, 9 miles S. E. of Black Rock, Millard Co.

The incorporators are: Leo Neilson, Logan, Darby Crandall, New York, W. R. Hensleigh, V. L. Arnold and Chas. M. Morris.

ANTELOPE STAR MINING CO. UTAH

Office: 602 Newhouse Bldg., Salt Lake City, Utah.

Officers: A. C. Nebeker, pres. and mgr.; M. O. Hardy, sec., with W. N. Williams, Aquilla Nebeker, John Matson and Martin Knight, directors; H. L. Parker, mgr.; A. McLease, supt.

Inc. in Utah. **Cap.**, \$10,000; shares 1c par; 250,000 shares in treasury. Stock listed on Salt Lake Exchange.

Property: 9 claims and a mill site, about 200 acres, 20 miles N. E. of Milford, in Millard Co., said to have a 5' fissure vein of milling ore, assaying 8-10% lead. The orebody is leached at surface, and contains barium, lead, silver, copper and iron.

Development: by 373' tunnel, 65' shaft and about 800' of drifting and raises. Promoted by Woolley Bros., Salt Lake City.

BEAVER RANGE MINE CO. UTAH

Address: Black Rock, Millard Co., Utah.

Officers: John B. Taylor, pres. and gen. mgr.; W. W. Moody, v. p. and supt.; R. B. Graff, sec.-treas.

Inc. July, 1916, in Utah. **Cap.**, \$100,000; shares 10c par.

Property: 10 claims, in the Mineral Mountain range, 10 miles S. E. of Black Rock on the Salt Lake R. R. Claims are in limestone near quartzite and said to carry copper and lead ore, in three prominent N. S. fissures.

Development: over 1,500' of tunnel and shaft work. Main Chicago tunnel is in over 300' and is expected to cut the shoots which show lead ore on the surface.

BLACK ROCK COPPER MINING & MILLING CO. UTAH

Address: Black Rock, Millard Co., Utah. Walter James, gen. mgr.

Property: 11 claims, 17 miles S. W. of Black Rock, being developed by 250' shaft and a drift on the 180' level, exposing a vein in limestone, said to show copper values.

DETROIT COPPER MINING CO. UTAH

Samuel A. King, agent, Judge Bldg., Salt Lake City, Utah; V. W. Kelly, pres., Deseret, Utah.

Inc. Jan., 1916, in Utah. **Cap.**, \$1,000,000; shares \$1 par; 400,000 in treasury. Holds 5-year \$100,000 bond and lease, from Nov. 24, 1915, on 40 claims, locally known as Ibex mine, and owned by Ibex Gold Mng. Co.

Property: the Ibex mine (see Ibex Gold Mng. Co.), situated in Detroit district, Millard Co., Utah, 35 miles from Oasis, and 20 miles west of end of Delta branch line. Claims were located 35 years ago, work began 1894, and the Ibex Co. was formed and smelter put up at Leamington, Millard Co., Utah, treating 50 tons per day. In winter of 94-95, company failed and property was idle till 1906, when Jesse Knight took it up and re-organized the Ibex Co., patented the claims and sank two shafts. Worked until panic of 1907. Idle till 1915, when lease and bond was taken from Mr. Knight by local farmers who organized the Detroit C. M. Co. and shipped ore.

Claims cover two horizons of limestone; one blue and hard, the other light and soft, both cut by porphyry dikes and intrusives. Ore occurs in veins and bedding offshoots, the veins being 25'-100' in width.

Ore: carries 2%-20% copper, with trace to 3 oz. per ton silver and \$1 to \$20 per ton gold. Elevation of mine 5,500' to 6,500' above sea level.

Development: 600' shaft on Keystone claim, a tunnel on Ibex, with 500' vertical depth at face and a 500' shaft on E. P. H. claim. Good auto road from Delta to Oasis. Reported on May 6, 1916, by Wm. A. Farish.

Freight to Oasis, \$6 (to R. R. terminal \$4); R. R. to Salt Lake, \$2.50; smelter treatment, \$4.

EAST ANTELOPE MINING CO.

UTAH

Address: 417 Vadner Ave., Salt Lake City, Utah.

Officers: John W. Chase, pres.; H. E. Giers, sec.-treas.; John Matson, acting manager; Albert Joest, supt.

Cap., 1,000,000 shares; 1c par; assessable. Expenditures for 1916, \$8,639, being money received from stock sold. Balance, \$1.68.

Property: 8 claims, unpatented, on Mineral Mountain, Millard Co., Utah, adjoins Keno and Antelope Star mines.

Development: by 400' tunnel with drift on limestone quartzite contact. Mr. Matson reports 800' new work in 1916-1917, showing excellent ore in small amount in west drift. Reported to have cut 22% copper ore, Sept., 1917, with galena stringers near it. Plans installation gasoline engine, and extension of both N. and of W. drifts to cut Copper King fissure.

KENO M. & M. CO.

UTAH

Controlled by Knight Investment Co., Provo, Utah. **Mine office:** Frisco, Utah.

Officers: Jesse Knight, pres.; W. Lester Mangum, sec.-treas.; Knight Starr Jordan, gen. mgr.; R. S. Andrew, supt.

Inc. March, 1907. **Cap.,** 500,000 shares; 10c par. Stock listed on Salt Lake Exchange.

Property: located in the Antelope mining district, Millard Co., is in the development stage, with good prospects of striking ore.

MAMMOTH COPPER MINING CO.

UTAH

Office: 219 Judge Bldg., Salt Lake City, Utah. Edward Bardsley, pres.; B. D. Lyon, sec.-treas.

Inc. in Utah. **Cap.,** \$10,000; issued, \$6,000; shares 1c par; assessable. Listed in Salt Lake City.

Owns 240 acres in Millard Co., 15 miles from Milford, said to show a vein of copper ore in monzonite. Development is surficial only, and property is a prospect.

SUMMIT COUNTY

PARK CITY DISTRICT

AMERICAN FLAG MINING CO.

UTAH

Office: 815 Newhouse Bldg., Salt Lake City, Utah. **Mine office:** Park City, Summit Co., Utah.

Officers: Geo. H. Rathman, pres., treas. and gen. mgr.; Wm. M. Curtis, v. p. and mgr.; John Cain, sec.; F. V. Bodfish, supt.

Inc. 1902, in West Virginia. **Cap.,** \$500,000, increased to \$1,000,000 on reincorporation in Nev., 1910; shares \$1 par; assessable; fully issued.

American Flag property is leased to the Park City Mines Co. and described under that title.

ANCHOR MINING CO.

UTAH

Idle several years. **Office:** Calumet, Mich.

Officers: John D. Cuddihy, pres.; F. W. Taylor, sec.-treas., and Henry L. Baer, directors.

Inc. June, 1908, in Michigan. **Cap.**, \$150,000; shares \$25 par; issued, 1,800. Annual meeting, second Tuesday in June.

Lands: 9 claims, patented, 131 acres; in the Snake Creek district, one-half mile south of Daly-Judge mine, near Park City. Company is the successor of the Wolverine Mining Co.

BIG FOUR EXPLORATION CO.

UTAH

Office: 804 Newhouse Bldg., Salt Lake City, Utah.

Officers: Morris P. Kirk, pres.; J. H. Leavell, v. p.; John Pingree, sec.-treas.; preceding, with E. B. Critchlow, directors.

Inc. Dec., 1912, in Utah. **Cap.**, \$500,000, increased Jan., 1917, to 600,000; shares \$1 par; assessable; a 10c assessment was levied in Oct., 1917. Listed on Salt Lake Exchange. Reported liabilities, Sept., 1917, \$258,000; assets consist of \$300,000 plant and \$40,000 worth of ore. Company is in financial difficulties and the directorate is said to favor a receivership. On Oct. 5, 1917, 200,000 treasury shares at 12½c each were issued.

Company operates a 750-ton wet concentration mill at Atkinson, 7 miles N. of Park City, Utah. Mill was constructed to treat dump estimated to contain over 1,000,000 tons of tailings, the accumulation from Park City mills.

Production: in 1915, 11,365 tons treated; shipping ore totaled 198 tons, yielding 164,509 lbs. zinc; concentrates, average grade, 38.4%, totaled 668 tons, yielding 371,538 lbs. zinc. Extraction 62%. An 800-ton mill was completed, 1917.

The U. S. Smelting Co. has an option on a controlling stock interest, in return for money advanced, amounting to \$200,000, Sept., 1917. The U. S. S. Co. also has a smelting contract with the Big Four, the terms of which are not reported.

BOSTON-UTAH MINING CO.

UTAH

Geo. T. Stenhouse, mng. director. Control held by St. Petersburg, Fla., capitalists.

Property: extensive holdings in the Morgan mining district, the supposed northerly extension of the Park City ore zone, shows native copper in fissure on a contact between flat dipping limestone beds and a granite hanging wall.

Recent work includes a new 35' tunnel and an incline shaft.

BROADWATER MILLS CO.

UTAH

Address: Park City, Utah.

Officers: C. C. Broadwater, pres.; L. D. Mills, v. p.; H. S. Shuey, sec.-treas., with C. W. Merrill and F. H. Ricker, directors; R. E. Adams, mgr.

Inc. 1915 in Nevada. **Cap.**, \$1,000,000; shares \$1 par; all issued.

Mill at Park City, has a daily capacity of 300 tons. Remodeled with Mineral Separation flotation system and other concentrating machinery, said to be treating 350 to 750 tons daily of silver-lead-zinc tailings from dumps owned by Grasselli Chemical Co., of Cleveland.

CALIFORNIA COMSTOCK CONS. MNG. CO.

UTAH

Office: Park City, Utah.

Officers: W. I. Snyder, pres.; B. F. Bauer, v. p.; M. H. Sowles, sec.-treas.; E. J. Raddatz, W. F. Snyder, J. A. Cunningham, Sherman Fargo, directors; J. C. Jensen, gen. mgr.

Cap., \$1,000,000; par \$1; 485,000 shares outstanding.

Property: a consolidation of the California and Comstock mines of Park City comprising 135 acres. See Professional Paper 77, entitled Geology and Ore Deposits of Park City District.

A new promotion by Evans, Morris, Whitney & Co., of Salt Lake City.

Development: by 3-compartment shaft, 450' deep, being sunk to 750' and crosscuts 1,500' long on the 250 and 450' levels; also 2 tunnels, each over 1,000' long. Three faces of silver-lead-zinc and 3 of 8% copper ore are exposed, ore reserves of the former being estimated at 10,000 tons, worth \$25 per ton.

Shipments in September were 30 tons daily. Company has a mill, built in 1903.

Property promising, with several ore fissures crossing the productive horizons of the sedimentary series.

CONKLING MINING CO.

UTAH

Mine office: Park City, Summit Co., Utah.

Officers: Col. Nicholas Treweek, pres.; Wm. C. Hall, v. p.; Geo. A. Lund, sec.; J. Leonard Burch, treas.; preceding, and Margaret Treweek, directors.

Inc. Sept. 17, 1908, in Utah. **Cap.**, \$500,000; shares \$1 par; assessable. Is a close corporation, with 25% of stock owned by Silver King Coalition Mines Co.

Property: 2 claims, 2 miles from a railroad, shows gold, copper and lead ores, developed by a 1,000' tunnel on the lands of the Silver King. No returns secured. Company has brought suit against the Silver King Coalition Mines Co. for illegal extraction of \$575,000 in ore from Elephant stope.

DALY JUDGE EXTENSION MINING CO.

UTAH

Park City, Utah.

Officers: Bishop W. D. Lewis, pres.; Mrs. Clarissa Whitehall, v. p.; S. L. Lewis, sec.-treas., with S. L. Raddon and Henry Spriggs, directors.

Inc. in Utah. **Cap.**, \$600,000; shares 10c par.

Property: 8 claims, 140 acres, partly patented, at Park City, developed by 700' tunnel and 2 shafts, said to show copper-lead-silver ore in fissure veins.

DALY-JUDGE MINING CO.

UTAH

Reorganized in 1916 as the Judge Mining & Smelting Co., which see. **DALY MINING CO.**

UTAH

Office: 918 Kearns Bldg., Salt Lake City, Utah.

Officers: Col. E. A. Wall, pres.; Geo. W. Parks, sec.

Inc. in Utah. **Cap.**, \$3,000,000; all issued; shares \$20 par; assessable; Farmer's Loan & Trust Co., New York, registrar. Listed on Salt Lake City Exchange.

Dividends: paid \$2,925,000 to 1897. Dividends resumed in 1917, bringing total to \$2,970,000, including \$45,000 to October 1.

Property: in Uintah district, Summit Co., Utah; 6 claims and an interest in 12 of the Ontario Silver Mining Co. claims; also an interest in 17 claims of the Daly West Co., and 195½ acres in joint ownership of the Ontario Silver Mining Co., total acreage 316, of which 116 are patented.

Ore: silver-lead-gold and copper in fissure veins in quartzite. The property is an old one, and at last accounts had 2,300' of shafts and much unexplored ground between the 800' and 1,700' levels. Work has been carried on intermittently during the past few years. Ore assays from 45 to 80 oz. silver, 8 to 15% lead, and \$0.75 to \$1.50 gold per ton. Present production is said to average about 250 tons per month.

DALY WEST MINING CO.

UTAH

Office: 163 South Main St., Salt Lake City, Utah. **Mine office:** Park City, Summit Co., Utah.

Officers: Frank J. Hagenbarth, pres.; H. G. McMillan, v. p. and gen. mgr.; Herbert S. Cohen, sec.; W. S. McCornick, treas.; F. L. Williams, Jr., gen. supt.; Edw. L. Talbot, mine supt.; John C. Thompson, mill supt.; F. I. Williams, engr.

Inc. Feb. 14, 1902, in Colorado. **Cap.**, \$3,600,000; shares \$20 par, and has been once reconstructed. Owns a 20% stock interest in the Little Bell Mining Co., an adjoining property. Corporation Trust Co., New York, North American Trust Co., New York, and McCornick & Co., Salt Lake City, registrars; American Loan & Trust Co., Boston, North American Trust Co., New York, and McCornick & Co., transfer agents. Stock listed on Boston Stock Exchange.

Revenue from ore in 1916 was \$237,681, less \$223,952 for mining, milling and general. The surplus was \$28,144.

Dividends: 30c quarterly reduced to 15c, in 1913; total to end of 1916, was \$6,606,000. Nothing was paid in 1914, 1915 or 1916, but 10c was paid in Sept., 1917.

Company is a large silver-lead producer, copper being a by-product, with annual production of about 800,000 lbs., or a total of 16,000,000 lbs., from 1898-1913.

Property: the Daly West and Quincy mines with 50 claims, patented, 250 acres in the Uintah district. Extensive orebodies carry gold and silver-bearing chalcopyrite, galena and sphalerite, with silicious gangue, values being mainly in silver and lead, with small copper values, and still smaller gold values. Ores are declining in value with depth. Production formerly equally divided between smelting and concentrating ore, is now mainly the latter. The property has 3 principal veins, of 4 to 6' minimum and up to 40' maximum width. Upper workings are practically worked out, lower workings show concentrating ore. Owing to fire, no work was done, 1914-1915, but operations were resumed in 1916.

Development: the main shaft is 2,300' deep, and the mine has about 15 miles of workings, an average of nearly 1 mile of new ground being opened yearly. Connection was made, Oct., 1909, with the 3-mile Ontario drainage tunnel, on the 2,100' level, for the use of which company pays \$750 monthly rental.

Ore mined in 1915 came mostly from the 1,400 to 2,100' levels; average assays were 25% lead, 24 oz. silver, \$2 gold, with copper values. In 1913, the concentrates shipped averaged 34¼% lead and 52 oz. silver, with 8,332 tons of lead concentrates and 1,598 tons of zinc concentrates. Production in 1913 was 60,788 tons of ore. The copper in the lead concentrates averaged 1.86%.

Equipment: includes hoists and air-compressor. The 350-ton concentrator was destroyed by fire Dec., 1913. A new 600-ton mill was built and went into commission Jan., 1915. Plant includes a flotation unit with capacity of 30 tons of dry slime per day. The mill is treating 200 tons daily.

Costs for 1913, producing 60,788 tons, were: \$5.28 per ton for mining; general expenses, \$1.56 per ton; milling costs, \$1.46 per ton of ore fed.

Production: recent shipments have been as follows: 20,344 tons in 1913; 24,341 tons in 1914; 13,620 tons in 1915; 9,980 tons in 1916. In August, 1917, the mill was treating 200 tons daily of 3 to 8% lead and 5 to 10 oz. silver ore. Shipments in that month were 1,700 tons of crude ore and concentrate.

Property, though an old one, has much new territory yet to be prospected and the known ore shoots give indications of going to greater depths. 100 men employed in 1916-1917.

D. & M. MINING CO.**UTAH**

Controlled by Silver King Cons., which see.

JUDGE MINING & SMELTING CO.**UTAH****Office:** 1022 Kearns Bldg., Salt Lake City, Utah. **Mine P. O.:** Park City, Summit Co., Utah.**Officers:** H. Otto Hanke, pres.; M. C. Fox, v. p.; G. M. Lambourne, sec.-treas. and mgr.; W. M. Bradley and A. C. Wall, directors; O. N. Friendly, gen. supt.; Geo. D. Blood, cons. engr.**Inc.** 1901, in New Jersey, as the Daly Judge Mining Co. Reorganized, 1916, under present name. **Cap.**, \$300,000; shares \$1 par, increased March, 1916, to \$500,000; 480,000 shares issued. Stock listed on Salt Lake Exchange.**Dividends:** paid in 1916, amounted to \$435,000; total dividends to date, \$1,590,000. Present rate is 25c per share, quarterly. Balance of \$555,290 in treasury, Jan. 1, 1917. Total receipts from ore sales in 1916, \$839,455.**Property:** company has valuable holdings, about 1,100 acres patented ground, covering 11,000' of a fissure vein system, in Park City district, adjacent to the Daly West mine. Is a large producer of silver-lead ores with much zinc and a small amount of copper.**Development:** mainly by tunnel and drifts, amounted to 12,677' in 1916, of which 49.65% is on the Daly vein, 48.21% on the Bock vein, and 2.14% on the Middle vein. The depth ranged from 300 to 1,900'. On the Daly the most important results were at the hanging-wall fissure, which has been consistently productive. A valuable shoot was developed on the 1,200' level of the Bock vein. It is 300' long and 256' high, of high grade. Generally, exploration was satisfactory.

The Snake Creek tunnel driven 14,500' to the property line was completed early in 1916; it will unwater the mines at greater depth and provide transportation. It is to be extended later for further exploration of the property.

Equipment: includes 400 h. p. electric hoist, compressor and 500-ton wet concentrating plant with flotation unit for treatment of slimes, making a zinc and lead product. During 1916, a 15-ton electrolytic zinc plant was erected.

Property is a regular dividend payer and the unexplored portion of the mine is promising. The technical direction is good.

Production: in 1916, 65,951 tons. The mill treated 61,787 tons of ore, yielding 10,019 tons of lead and 6,129 tons of zinc concentrate. Ratio of concentration was 4.7 to 1 for all products. Metal output was 477,852 oz. silver, 535 oz. gold, 8,114,627 lbs. lead, 5,153,049 lbs. zinc, and 341,198 lbs. copper. This includes the metal in 4,164 tons of ore shipped to smelters. To date the metal output is 6,100,272 oz. silver, 12,335 oz. gold, 124,716,008 lbs. lead, 92,090,199 lbs. zinc, and 3,326,073 lbs. copper, sold for \$7,322,289.

The company's progress in zinc production is of interest. As ore contracts expired in April, 1916, zinc concentrate was stored. By Feb. 1, 1917, a 15-ton electrolytic plant of good design, was erected and started. In 1916 the mill made 6,129 tons of concentrate, assaying 44.58% zinc, 4.38% lead, 6.54% iron, and 21.47 oz. silver. Of this, 2,929 tons were sold, the balance of 3,200 tons being held for the refinery. The process is roasting, leaching with 8% sulphuric acid, purifying solutions, filtering, and electrolytic deposition of pure zinc on aluminum discs. The filtered concentrate pulp is sold to lead smelters. The spelter was 99.9% pure in October, 1917.

KEARNS-KEITH MINING CO.**UTAH**

Out of business, property being conveyed to the Silver King Coalition Mines Co. of Park City, which see.

KEYSTONE MINING CO.

UTAH

Offices: 163 S. Main St., Salt Lake City, Utah, and 32 Broadway, New York.

Officers: H. G. McMillan, pres.; Ernest Bamberger, v. p. and treas., with John Dern, H. I. Wilson, C. W. Saacke, Alfred Frank, John McGinnis, directors. L. B. McCornick, sec.; Herbert Cohen, asst. sec.; J. L. Tilton, asst. sec.

Inc. Sept. 12, 1902, in Wyo. **Cap.**, \$700,000; shares \$1 par; outstanding \$500,000; assessable; last assessment 2c, Dec., 1915. **Transfer office:** J. L. Tilton, 32 Broadway, New York. Empire Trust Co., New York, registrar. Listed on Salt Lake Exchange and on New York Curb as a prospect.

Property: 16 patented claims, 66 acres, in Uintah mining district, 3 miles S. W. of Park City, said to show silver-lead ore.

Development: 225' vertical shaft and 700' tunnel, work of former years. Has been idle a number of years; a little work done in 1915. Sinking winze from tunnel level during 1916.

The property was rehabilitated in 1916, compressor and motor installed and exploration started. A suit against the Kearns-Keith Mng. Co. and the Silver King Coalition Mines Co., asking \$1,500,000 damages for alleged unlawful extraction of ore pending, June, 1916.

LITTLE BELL CONSOLIDATED MINING CO.

UTAH

Office: Newhouse Bldg., Salt Lake City, Utah. **Mine office:** Park City, Summit Co., Utah. Solon Spiro, pres. and gen. mgr.; S. M. Bamberger, sec.; Joe Kemp, supt.

Inc. 1902, in Wyoming. **Cap.**, \$1,500,000; shares \$5 par; nonassessable; fully issued. Began payment of 5c quarterly dividends, Nov. 1909, and up to and including Sept. 2, 1910, had paid 4 quarterly dividends of \$15,000 each. Shares listed on Salt Lake Stock Exchange; 20% of stock owned by Daly West Mng. Co.

Property: 30 claims, patented, in Park City district.

Development: extensive, showing deposits of lead-silver ore.

Equipment: includes steam power, with hoist and air compressor. Electric power is taken from the Knight plant at Provo. The old 100-ton mill at the Fortuna Mining Co., at Bingham Canyon, was bought 1910, and re-erected at Park City. Worked intermittently.

NAILDRIVER MINING CO.

UTAH

Is a subsidiary of the Ontario Silver Mng. Co., 163 So. Main St., Salt Lake City, Utah.

Officers: W. Mont. Ferry, pres.; Herbert Cohen, sec.-treas.

Inc. Oct. 2, 1902. **Cap.**, \$600,000; shares \$2 par; assessable; 287,450 shares issued. Stock listed on the Salt Lake Exchange.

Property: 13 claims in Park City mining district, Summit Co., Utah, shows silver-lead-gold-copper ore, developed to depth of 600' by shaft and drifts. J. D. Fisher was lessee at last accounts and had opened up ore in 3 places. Over 100 tons shipped in October, 1916.

NEW QUINCY MINING CO.

UTAH

Office: 202 Atlas Blk., Salt Lake City. **Mine office:** Park City, Summit Co., Utah.

Officers: W. S. McCornick, pres.; W. R. Hutchinson, v. p.; A. L. Thomas, sec., with F. J. Hagenbarth, H. G. McMillan, M. B. Johnson and Herman Bamberger, directors. Peter Harrington, supt.

Inc. June, 1915. Is a reorganization of the Thompson Quincy Mining Co. **Cap.**, \$125,000; shares 10 cts. par; assessable; with assessments not to exceed 3 cts. during the first year. Exchange of stock made on a share-for-share basis, calling for distribution of 1,055,958 shares. Stock is listed

on Salt Lake Exchange. The New Quincy Co. assumed the obligations of the Thompson Quincy.

Annual report for 1916 shows receipts totaling \$23,046, of which \$7,303 was from ore sales, \$10,426 from assessment, \$3,040 from sale of shares, and \$2,261 balance from 1915. Disbursements amounted to \$21,726, \$16,983 being spent at the mine. Cash remaining was \$1,320. Indebtedness at end of 1916 was \$42,326, plus \$3,199 interest.

Property: 140 patented acres in Park City district, with rights of way and easements from the Daly West, Daly and Ontario companies. The claims supposedly carry the extension of the Quincy orebody of the Daly West mine. Developed by a 625' two-compartment vertical shaft, a cross-cut tunnel through the Little Bell mine, cutting a contact vein, said to carry ore assaying up to 20% lead, 160 oz. silver and \$2 gold per ton, and through the Ontario drain tunnel No. 2, which was extended to the Quincy mine by the Ontario company. Work in 1913 under the former management was mainly from the 900' level of the Daly and Ontario companies and a shaft raised from the 900' Daly West level to the contact was completed.

In 1915, a 293' crosscut was run N. 31° W. across the Plumed Knight ground. This crosscut is 84' above the 900' level, Daly West, and starts from the Talbot raise; a raise was also driven on fissure No. 4 on a 43° incline a distance of 250', giving a vertical height of 160'. The crosscut intersected 9 fissures, all of which showed some slight signs of mineralization.

In 1916, milling ore from 1 to 10' wide was found at various points, and 870 tons shipped returned \$7,303 net. In the Bonanza Flat area there is still 2,000' of unexplored ground. Total development work in 1916 was 743'.

Workings from a raise above the 260' level, which is above the 900' of the Daly West, opened 3' of rich ore in July, 1917. Shipments are being made from this point.

The company's engineer advised as necessary for the proving of the property further drifting west on the so-called Thompson-Quincy workings, which is now being done, crosscutting south from the Talbot fissure another 400' until the Thompson-Quincy fissure is intersected at a point about 700' west of the old workings, thus opening up new territory; also crosscutting south on the intermediate level to intersect other fissures known to exist.

NEW YORK BONANZA MINING CO.

UTAH

Park City, Summit Co., Utah. Reported in July, 1916, that work was to be resumed at this old mine.

Old company described in Copper Handbook, Vol. XI.

PARK CITY KING MINING CO.

UTAH

Officers: Thos. Marioneaux, pres., Kearns Bldg., Salt Lake City; Frank Barnes, sec.-treas.; Sam'l Dowse, supt., with D. M. Griffith, directors.

Inc. May, 1917, in Utah. Cap., \$100,000; shares 10c par; 625,000 shares in treasury.

Property: 60 acres, adjoining the Silver King on the W. at Park City, said to carry 3 fissure veins, showing copper and silver values. The tunnel is being extended to 450' in Nov., 1917.

PARK CITY MINES CO.

UTAH

Care of American Flag Mine, Park City, Utah.

Officers: J. H. Leavell, pres.; H. R. MacMillan, v. p.; John Pingree, sec.-treas.

Inc. in Utah. Cap., \$1,000,000; shares \$1 par; 521,526 shares issued, 36,000 in treasury, June, 1916. Listed on Salt Lake City Exchange.

Company has bond and lease on the American Flag mine at Park City, for \$250,000 and owns 34,000 bonds and 65,000 shares of American Flag stock.

Development: 1,150' shaft, with levels and drifts. Ore reserves estimated at 10,000 tons. Production to June, 1916, \$400,000, the ore averaging \$31 and \$20 net.

PARK UTAH MINING CO.

UTAH

Office: Kearns Bldg., Salt Lake City, Utah.

Officers: H. O. Hanke, pres.; W. M. Bransford, v. p.; G. W. Lambourne, gen. mgr.-treas.; S. G. Taylor, sec.; above with M. C. Fox, G. D. Blood, H. Pingree and H. L. Nehring, directors.

Inc. 1917, to develop several hundred acres of patented ground in the Park City district, Utah.

Development: company is crosscutting N. and S. from the Ontario drain tunnel at about 10,000' in from the portal. Management is trying to solve the problems of the Frog Valley and McHenry faults. Installed compressor and drills, October, 1917.

SILVER KING COALITION MINES CO.

UTAH

Offices: Kearns Bldg., Salt Lake City, and Park City, Utah.

Officers: David Keith, pres.; Thos. Kearns, v. p. and gen. mgr.; J. S. Bransford, 2nd v. p.; W. S. McCornick, treas.; preceding, with Henry Newell, W. M. Ferry, Jas. Ivers, J. S. Bransford, J. F. Judge, and M. C. Fox, directors. F. J. Westcott, sec.; B. E. Kearns, asst. sec.; Jas. Humes, supt.

Inc. May 20, 1907, in Nevada. Cap., \$6,250,000; shares \$5 par, all issued. Annual meeting third Monday in May. Transfer agents: Empire Trust Co., New York; Federal Trust Co., Boston, and F. J. Westcott, Salt Lake City. Registrars: Equitable Trust Co., New York; First National Bank, Boston, and Utah Savings and Trust Co., Salt Lake City. Stock listed on Salt Lake City and Boston Stock Exchanges.

Balance sheet as of Dec. 31, 1914, showed: assets, \$6,520,264, which included property account, \$6,320,950; ore in transit, \$62,903; cash, \$135,713. Liabilities included accounts payable, \$90,292; reserved for depreciation, \$124,358; dividend checks not deposited, \$49,970; surplus, \$7,644.

Dividends: to Oct. 1, 1917, \$15,272,385, which includes \$10,675,000 paid by original Silver King Mining Co. Present rate, 15c quarterly, or \$187,500.

Property: 327 patented claims, about 2,250 acres, covering 19,000' along the strike of the ore zone at Park City, 35 miles S. E. of Salt Lake City, consists of the holdings of the following mining companies: Silver King, Union, Park City, Fairview, Alliance, Woodside, Mass., Jupiter, Kearns-Keith, Crescent, Apex, Boss, Baltimore, St. Louis-Magnolia, Pinyon Ridge, Odin, Belmont and Uintah Treasure Hill Coalition.

Ore: silver, lead, copper and a minor amount of gold, occurs in limestone and quartzite. For geology see U. S. G. S. Prof. Paper No. 77.

Development: shafts and tunnels, with many miles of workings. One of the main workings is the 3-compartment Silver Hill winze sunk from the Alliance tunnel level, at a point 8,500' from the portal; the collar of the winze is 1,600' from surface. In 1917 extensive development was done N. W. of the shaft, towards Thayne canyon and large orebodies found in the Park City limestone.

Ore reserves not reported. The management gives out but little information, which may be due to the fact that the company has had considerable litigation over apex rights.

The mine is electrically equipped, and company owns a 600-ton mill; 400 tons being treated daily at last accounts. A flotation section which

started operating Dec. 5, 1915, is said to give an increased saving of from 10% to 15% silver and 10% lead. Company employs 400 men.

Production: 29,285 tons of ore and concentrate in 1916; in 1917 shipments ran about 600 tons ore, or 1,000,000 lbs. lead per week. Output is at rate of 27,000,000 lbs. lead, 1,200,000 lbs. copper, 1,700,000 oz. silver and 1,200 oz. gold per annum.

A judgment was rendered against the company in November, 1916, for ore extracted from the Conklin Mining Co.'s ground; the amount claimed is \$500,000. The Silver King claimed the Judge, Keystone and Conkling companies will drain its Alliance tunnel and take its water supply and therefore seeks an injunction.

SILVER KING CONSOLIDATED MINING CO.

UTAH

Offices: Newhouse Bldg., Salt Lake City and Park City, Utah.

Officers: Solon Spiro, pres.; R. P. Morris, v. p.; D. L. Wertheimer, treas., with H. A. Lee, Sherman Fargo, W. C. Lewis and Herman Harms, directors. G. W. Browning, sec.

Inc. 1902 in Wyoming as the Silver King Cons. Mng. Co.; re-incorporated Feb. 24, 1908, in Utah. **Cap.**, \$700,000, increased Sept. 12, 1912, from \$500,000; shares \$1 par; issued Jan. 31, 1916, 688,581. Empire Trust Co., New York, transfer office. Metropolitan Trust Co., New York, and Columbia Trust Co., Salt Lake City, registrars. Stock listed on New York Curb and Salt Lake Exchange.

Annual report for year ended Feb. 1, 1917, shows: balance Feb. 1, 1916, \$232,645; receipts for year, \$676,304, of which \$500,499 was from ore sales; balance Feb. 1, 1917, \$235,457.

Dividends: year ended Jan. 31, 1914, \$308,791, derived from judgment paid by co-tenant; 1915, \$251,033; 1916, \$255,032; 1917, \$294,562; to Oct., 1917, \$105,000, making \$1,422,705 to date.

Property: 1,076 acres near Park City, adjoins Silver King Coalition on the west. **Ore:** carries lead, silver, gold and copper in replacement deposits in limestone and quartzite. For geology of the district see U. S. G. S. Prof. Paper No. 77.

Development: by shafts, lowest level is at 1,800' depth. Ore mined during 1916 came mostly from stopes between the 1,500 and 1,625' levels. The flat ore-shoots adjacent to the main fissure are said to be over 32' thick and 4' to 30' wide. Branches from this main orebody, 1' to 5' thick, extend out into the adjoining country on both sides of the vein, making a mass of ore in places 100' wide. Development in 1917 totaled 7,058'. Average grade of ore produced in 1916, 43.52 oz. silver, 0.042 oz. gold, 26.13% lead and 1.13% copper, realizing \$49.57 per ton. Company employs 200 men.

Production (years ending Jan. 31):

	Ore, Tons	Lead, Lbs.	Silver, Oz.	Gold, Oz.	Copper, Lbs.	Net Value
1917*	.....	3,123,328	282,085	...	.....	.....
1917	10,082	5,273,216	439,007	423	228,819	\$500,499
1916	13,719	7,843,139	652,076	605	411,086	519,478
1915	9,987	5,593,786	503,784	514	257,912	346,990
1914	609	316,434	22,319	40	6,343	19,847
1913	612	461,830	27,813	55	9,656	27,143

* February 1 to September 1.

New work includes a 14,000' working tunnel which is on company ground and will serve for drainage, transportation, and development. Estimated cost of tunnel, \$400,000. By September, 1917, this tunnel was in a

distance of over 4,000'. Its purpose is to explore the Thaynes Canyon area, where some rich ore was opened recently. A 10,200' tramway was built in 1916 to convey ore to the mill and railroad. A mill, initial capacity 70 tons daily, was built by Traylor Eng. & Mfg. Co., employing flotation.

The property has become a steady producer during the past two years and the company, apparently, is on a sound footing; its earnings are mainly from the lead-silver content of the ore and vary with the market price of these metals.

THOMPSON-QUINCY CONSOLIDATED MINING CO. UTAH

Reorganized, 1915, as New Quincy Mining Company, which see.

THREE KINGS SILVER MINING CO. UTAH

Office: 616 Newhouse Bldg., Salt Lake City, Utah. Mine office: Jas. McGlenn, supt., Park City, Utah.

Officers: W. R. Elliott, pres.; W. Anderson, v. p.; P. J. McIntosh, sec-treas.

Inc. May 13, 1914, in Utah. Cap., \$100,000; shares 10c par; \$75,000 issued. Annual meeting, June 8.

Property: the Nelson, Mineola groups, 156 acres at Park City, showing usual geologic conditions of that camp, with fissures carrying silver-lead ore.

Development: 550' shaft. In 1917 a winze was sunk 200' below the main tunnel level, cutting the limestone quartzite contact and exposing some galena stringers, besides iron and manganese ore.

Management is confident of finding commercial ore.

PIUTE COUNTY

INCLUDES MARYSVALE DISTRICT AND OTHERS

ARROWHEAD MINES CO. UTAH

Officers: H. D. Chase, pres., 76 G St., Salt Lake City, Utah; Chas. A. Root, v. p.; G. Alma Gardner, sec-treas.; A. J. Hogan, managing director, with J. A. Reeder, H. Mann, R. M. Usher, Chas. Anderson and W. J. Allen, directors. J. H. Nelson, supt.

Cap., \$10,000; shares 10c par; assessable; 261,953 shares in treasury. Stock listed on Salt Lake Exchange.

Property: the General Connor mine, 9 claims, 1 patented, near Marysvale, Piute county, said to show a 15' fissure vein of free milling ore, with a 16" streak averaging \$18-\$20 in gold and silver.

Development: by 95' shaft, 225' tunnel, winzes and crosscuts. Ore reserves estimated at \$275,000. Five men employed. Management plans sinking from tunnel level and erecting a mill.

BEAVER MINES CO. UTAH

Office: 222-23 Continental Bank Bldg., Salt Lake City, Utah. Mine address: Marysvale, Piute Co., Utah.

Officers: A. H. Cutright, pres. and mgr.; Geo. R. Raymond, v. p.; W. E. Kilburn, treas.; A. Maxwell, sec., and Alex. Beckstead, directors.

Inc. Dec. 17, 1910, in Utah. Cap., 1,000,000 shares, 1c each; issued 850,000 shares. Annual meeting, second Saturday in January.

Property: 11 claims, 220 acres, in the Ohio district, 5 miles from D. & R. G. R. R. Claims carry copper-bearing gold-silver ores in fissure veins in andesitic porphyry, giving average assays of from \$1 to \$60 per ton. There are 7 veins, 2 developed by crosscut tunnels, 725' and 72' long, to reach the main vein. Mine has only a prospecting outfit. Management plans drifting and developing on several veins.

COPPER BUTTE MINING CO.**UTAH**

Idle. Office: Richfield, Sevier Co., Utah. Wm. Johnston, pres.; George H. Ogden, sec.-treas.

Property: is a copper prospect on Gold mountain, in the Kimberly district, Piute Co., Utah.

Development: by a short tunnel, showing a 6' vein of low-grade silver-bearing copper ore. Company claims to have discovered a large deposit of alunite, a potash ore, in 1916.

MINERALS PRODUCTS CORPORATION.**UTAH**

Address: Marysvale, Utah. Controlled by Chicago capital.

Property: alunite bearing claims, 9 miles S. W. of Marysvale.

Equipment: includes aerial tram 6,200' long, 600 h. p. steam plant and 50-ton mill to extract potash from the alunite, which is a hydrous sulphate of aluminum and potassium. On Oct. 25, 1917, mill was destroyed by fire, loss given as \$200,000 net.

WEDGE GOLD MINING & MILLING CO., THE.**UTAH**

Office: 1102 W. 7th South St., Salt Lake City, Utah. Mine near Marysvale.

Officers: E. P. Mowers, pres.-gen. mgr.; N. W. Sonnedecker, v. p.; M. L. Grovenor, sec.-treas.; the foregoing, E. J. Schenck and K. D. Schenck, directors.

Cap., \$300,000; shares \$1 par; all outstanding.

Property: near head of Bullion canyon, 10 miles S. W. of Marysvale, Piute Co.

Mine contains a gold-bearing quartz fissure vein in latite; dip 15° S. E. strike N. E.-S. W. Orebody varies from ½" to 20" in width. Mine has been developed and worked chiefly under lease. Workings include a shaft, 400' adit and 200' of drifts. Shipments are of high-grade ore only.

*TINTIC AND SANTAQUIN DISTRICTS***AMERICAN MINES SYNDICATE.****UTAH**

Office: Houghton, Mich. Mine office: Eureka, Juab Co., Utah.

Officers: Walter Fitch, pres.; J. H. Rice, v. p.; Wm. P. Seager, treas.; preceding officers, Cecil Fitch and Exilda Fitch, directors.

Inc. 1907, in Arizona. Cap., \$100,000, shares \$100 par; paid in, \$80 per share; issued, \$86,350. Is a holding company, controlling the Chief Consolidated Mining Co. through ownership of 361,000 shares.

APEX STANDARD MINING CO.**UTAH**

Inc. 1917, in Utah.

Officers: Lewis Merriman, pres.-mgr., Eureka, Utah; Frank Kimball, v. p.; S. S. Pond, sec.-treas., with F. W. Brock and Hugh Hefferman, directors.

Property: 20 claims, 400 acres, E. of the Tintic Standard, East Tintic district, Juab county. Developed by 165' shaft.

Management plans sinking to 1,000' in 1917 before crosscutting.

BECK TUNNEL CONSOLIDATED MINING CO.**UTAH**

Merged April, 1916, with the Colorado Mng. Co. and now called the Colorado Cons. Mines Co., which see.

BLACK JACK CONSOLIDATED MINING CO.**UTAH**

Merged 1917 with Empire Mines Co., which see.

BOSTON & TINTIC MINING CO.**UTAH**

Office: Provo, Utah. Mine office: Mammoth, Juab Co., Utah. Jesse Knight, pres.; Wm. H. Tibbals, v. p.; W. Lester Mangum, sec.-treas.

BULLION BECK & CHAMPION MINING CO.**UTAH**

Care U. S. Smelting, Refining & Mining Co., 55 Congress St., Boston, Mass., and Newhouse Bldg., Salt Lake City, Utah. **Mine office:** Eureka, Juab Co., Utah.

Officers: Geo. W. Heintz, pres.; Jos. F. Smith, v. p.; Ambrose Nord, sec.-treas.; C. E. Allen, mgr.; preceding officers, J. H. Horlick and M. C. Morris, directors. L. C. Doty, supt.

Cap., \$1,000,000; shares \$10 par; 63,787 issued; last assessment of 20c called in April, 1914. Dividends: to end of 1909, were \$2,738,400, last dividend being 10c, July 11, 1908. Company is a veteran of the Tintic district and a close corporation whose stock is mostly held by the U. S. S. R. & M. Co. through its ownership of the Centennial Eureka Co., which holds a majority interest in the Bullion Beck & Champion Mining Co. Balance sheet December, 1915, shows gross earnings of \$3,453; current assets \$7,459 and current liabilities \$1,363.

Property: 3 claims, adjoining the Centennial-Eureka, which is under the same control, and with which sideline agreements stopping litigation were secured, 1908. Mine was discovered, 1876, and has been a producer since 1880.

Development: 1,300' shaft, with 200' winze below the bottom level, and by the Beck tunnel. Ore is mainly carbonate and chloride in limestone formation, carrying copper, gold, silver, lead and zinc values.

Equipment: includes a 200-ton mill, with steam and electric power.

Production: in 1915 was 2,700 tons, averaging \$11 per ton and yielding 41 oz. gold, 29,306 oz. silver, 775,728 lbs. lead, 27,042 lbs. copper and 375,670 lbs. zinc.

About 60 men working leases on property.

CARISA GOLD & COPPER MINING CO. OF MAINE.**UTAH**

Inc. 1907, in Maine. **Cap.**, \$500,000, increased Jan., 1909, to \$600,000; shares \$1 par; issued, \$545,000. Was a reorganization of the Carisa Gold & Copper Mining Co., which levied assessments of \$30,000 and paid dividends of \$60,000.

Stock purchased in April, 1917, by the Knight interests for \$115,000, which amount was to be divided pro rata among the Carisa stockholders. Property is now part of the holdings of the Empire Mines Co. and described thereunder.

CENTENNIAL-EUREKA MINING CO.**UTAH**

Subsidiary of U. S. S. R. & M. Co.

Office: 55 Congress St., Boston, Mass. **Operating office:** Newhouse Bldg., Salt Lake City, Utah. **Mine office:** Eureka, Juab Co., Utah.

Officers: Wm. G. Sharp, pres.; C. G. Rice, v. p.; F. W. Batchelder, sec.-treas.; preceding officers, B. Preston Clark, J. J. Storrow, Sidney W. Winslow and Niel W. Rice, directors; Geo. W. Heintz, gen. mgr.; Clarence E. Allen, mgr.; A. P. Mayberry, supt.

Inc. 1876, in Utah, and reorganized, 1899, in Maine. **Cap.**, \$5,000,000; shares \$25 par; issued, \$2,500,000. Is controlled by United States Sm., Ref. & Mining Co., through ownership of 99,980 shares of the 100,000 shares of issued stock.

Dividends: \$7 per share in 1906; \$2.50 in 1907; \$11.50 in 1908; nothing in 1909; \$6 in 1910 and 1911; \$3 in 1912 and 1913, making a total of \$4,050,000 to end of 1914. Last dividend of \$1 per share declared April 1, 1916. Annual meeting, third Wednesday in April.

Property: in the Tintic district, includes the Centennial, Eureka, Tintic, Dove, Swan and Pelican group. Ores carry fair values in gold, silver, copper and lead. Majority interest of Bullion Beck and Champion mining companies held by company.

Development: by a 3,260' shaft, and the 2,160' Holden tunnel, completed 1909, connecting with the shaft just below the 500' level. This tunnel permits the ore to be delivered directly to railroad cars, eliminated the rope tramway and handles the water from the mine. Ores are shipped to the Midvale smelter of the U. S. Smelting Co., at West Jordan, Utah. The mine is timbered with square sets, and formerly was dry, but the lower levels are wet, water being handled by a 500-gal. Sulzer-Winterthur electric pump. About 300 men are employed. Surface equipment includes 40-stamp mill, steam and electric power with necessary engine houses and shops.

Production: in 1909 was 109,538 tons; 1910, 90,375; 1911, 109,079; 1912, 117,957; 1913, 101,101; 1914, 58,365; 1915, 47,996; 1916, 51,381.

CHIEF CONSOLIDATED MINING CO.

UTAH

Office: Houghton, Mich. Wm. P. Seager, sec.-treas. Mine office: Eureka, Juab Co., Utah.

Officers: Walter Fitch, pres. and gen. mgr.; F. W. Denton, v. p.; Cecil Fitch, supt.; above with J. H. Rice, W. A. Hodgson and D. L. Robinson, directors.

Inc. Feb. 9, 1909, in Arizona. **Cap.**, \$1,000,000; shares \$1 par, nonassessable; issued, 884,020. Houghton National Bank, registrar; Boston Safe Deposit & Trust Co., transfer, agent. Has about 1,900 shareholders. Stock is listed on the Boston curb. Annual meeting, thrd Tuesday in February, at office of company, Tucson, Ariz.

Dividends: 1913, 20%; 1914, 10%; 1915, 10%; in 1916, 20%; 1917 to Nov., 25%. Total to date, \$665,121.

Statement for the year ending Jan. 1, 1917, showed receipts of \$1,601,903, including \$1,315,441 from ore sales and \$210,034 balance from 1915. Disbursements include dividends Nos. 7, 8, 9 and 10, amounting to \$176,481; purchase of properties, \$148,705; machinery and equipment, \$31,634 and mining costs, \$684,611, which left a balance of \$477,295, on Jan. 1, 1916.

Total receipts since organization to Dec. 31, 1916, were: \$228,160 from sale of 249,185 shares of stock; \$3,086,680 from ore sales and \$20,474 from interest; a total of \$3,335,314. Disbursements: mining claims, \$428,539; buildings and equipment, \$131,002; mining expense, \$1,752,770; dividends, \$841,900. Report for first half 1917 showed balance on hand, \$614,017; ore sales for six months, \$872,598, and \$487,566 on Oct. 1.

Property: patented claims, 1,315 acres and unpatented claims, 3,250 acres, in the Tintic and North Tintic mining districts. Company owns the mineral rights under the city of Eureka, the Little Edgard Mining Co. and the Deprizim group; controls the Homansville Mining Co., the Baltimore Consolidated Mining Co. These last four groups comprise about 600 acres. Company also controls the majority of the shares of the Plutus Mining Co. of 14 adjoining claims. The company has continuous ownership for 3½ miles east from its mine, covering 2/3 of the mineralized district. Original property of company was 100 acres.

The Eureka lands carry about 4,000' of the strike of the Victoria ore channel, which has an extreme width of about 400', the Victoria ore channel being on the Mammoth-Grand Central ore zone, and parallel to the Centennial-Eureka zone. The Victoria ore channel has a practically N.-S. strike, the ore occurring in pipes and shoots in nearly vertical lime beds.

Development: by an 1,800' and a 600' vertical shaft with about 62,000' of workings, principal development being on the 1,000', 1,200', 1,400', 1,600' and 1,800' levels. The main shaft was enlarged to provide a double hoisting compartment and a ladderway. This was done without interfering with hoisting and an increased production results.

For the year 1916 development work amounted to 25,844'; 2,619' was

done on the Pinyon Peak tract, including 593' of shaft sinking; and 246' on the Plutus. Total amount of development work by the company since its inception, 63,147'. For first half of 1917 company did 6,261' of work at its mine, 800' at the Plutus and 1,615' at the Pinyon Peak tract.

Company surrendered its lease on the Scotia mine.

Production:

	Ore, Tons	Copper, Lbs.	Lead, Lbs.	Zinc, Lbs.	Gold, Oz.	Silver, Oz.	Value Net
1916....	83,606	1,795	18,439,153	879,410	8,331	1,739,004	\$1,315,441
1915....	36,142	5,648	8,232,606	622,465	4,634	403,854	309,136
1914....	39,629	237,901	5,782,118	71,665	6,291	645,419	324,299
1913....	51,173	117,328	2,597,091	.....	4,806	1,030,132	381,287
1912....	30,038	.....	1,141,222	.....	7,838	969,907	509,426
1911....	6,703	.....	825,551	.....	389	306,362	117,533
1910....	8,273	.....	800,302	.....	584	531,483	217,059

Gross average value ore in 1916, \$14.71 per ton, net \$7.94; in 1915, \$20.55, and \$9.96 respectively.

For 1916 the average gold content was 0.1015 oz., silver 21.18 oz., lead (on lead ore) 13.31%, copper 1.95%, zinc 30.52%. The zinc-lead ores averaged 19.58% zinc and 18.2% lead, with gross value of \$31.52 and an average net value of \$18.64 per ton. Average New York price received for metals was 66c for silver, 6c for lead, 26c for copper and 5.4c for zinc.

Production for first half of 1917 was 35,919 tons, mostly lead ores; the average net value was \$24.41 per ton and net profit after payment of all charges was \$355,678.

Equipment: the plant has three 150-h. p. boilers, with mechanical stokers, a hoist and 15-drill Nordberg air compressor. The double-cylinder hoist has 6' balanced drums, 1½" steel cable, and operates 2 triple-deck cages in balance, carrying 1-ton cars, to depth of one-half mile. Buildings include a power plant, housing the boilers, hoists and air compressors; a machine shop, carpenter shop, and a smithy, all of steel frame. Property considered valuable and management excellent.

COLORADO CONSOLIDATED MINES CO.

UTAH

Office: Provo, Utah.

Officers: Jesse Knight, pres.; J. William Knight, v. p.-mgr.; W. Lester Mangum, sec.-treas., with R. E. Allen, J. S. Smith, K. S. Jordan and A. M. Knight, directors. Controlled by Knight Investment Co.

Is a consolidation of the Beck Tunnel Cons. Mng. Co. and Colorado Mng. Co.

Inc. April, 1916. **Cap.** 2,500,000 shares; 10c par; stock in old companies exchanged share for share. Listed on Salt Lake Exchange.

Dividends of \$675,000 have been paid by the Beck Tunnel and \$2,600,000 by the Colorado Cons.

Property: 28 claims, near the Sioux Consolidated, in the Tintic district, Juab Co., Utah, contains large deposits of low-grade ore carrying silver, gold, lead and copper values.

Development: main shaft is 2,000' deep and will be sunk to water level. A drift on 2,000' level is being driven east to cut various fissures, October, 1917. Lessees are also doing development.

COLORADO MINING CO.

UTAH

Merged April, 1916, with the Beck Tunnel Cons. Mng. Co. and now called the Colorado Cons. Mines Co., which see.

COPPER LEAF MINING CO.

UTAH

Mine in the Tintic district.

Officers: J. C. Diehl, of Provo, Utah; J. E. Mayer, of Salt Lake City;

J. W. Taylor, mgr., of Eureka; T. F. Pierson and Alex. Hedquist, of Provo. Inc. 1916, in Utah. **Cap.**, 600,000 shares; \$1 par.

Property: several claims in the Tintic mining district. Company said to be sinking a shaft 500' and to be installing a 40 h. p. hoist.

CROESUS MNG. CO.

UTAH

Address: Major Catlin, Eureka, Utah.

Property: the Connolly, Dunderberg and California claims in the Eureka district. The first named claim has a 400' shaft, at which depth \$50 lead-silver ore was cut in October, 1917. The other two mines have produced in the past.

CROWN POINT MINING CO.

UTAH

Knight Investment Co., Provo, Utah. John Roundy, pres. and gen. mgr., Knightsville, Juab Co., Utah.

Inc. 1907, in Utah. **Cap.**, \$100,000; shares 10c par; assessable. Listed in Salt Lake City.

Ore: silver-lead. Development by 800' shaft to be sunk to 1,100' with 400' drift south on 800' level.

Funds for development work raised by assessments.

DELSA MINING CO.

UTAH

Property about 6 miles from Santaquin, reported operated under lease by G. M. McLean in 1917. Ore occurs in veins, 1-2' wide, carrying silver-lead-zinc. Developed by tunnel, 500' long at vertical depth of 300'.

DESERET MOUNTAIN MINES CO.

UTAH

Office: 409 Atlas Bldg., Salt Lake City.

Officers: W. Mont Ferry, pres.; D. H. Livingston, v. p.; Wm. D. Livingston, sec.; S. J. Truman, treas., with J. W. Mellen, J. H. Turner and I. D. Wines, directors. D. E. McPherson, supt.

Cap., 1,000,000 shares; 500,000 reserved for treasury.

Property: 12 claims, 250 acres in the West Tintic mining district, Juab County, said to show a contact vein, between limestone and porphyry, 12' wide, carrying copper ore that assays better than 3%.

Development: by 300' new incline shaft and an old shaft 218' deep, drifts, stopes and raises. Plans continuing shaft to 500' level. About middle of October, 1917, the 300' level crosscut had cut the vein. 10 men employed. Complete equipment being installed, July, 1917.

DRAGON CONSOLIDATED MINING CO.

UTAH

Office: care Knight Investment Co., Provo, Utah. Mine near Tintic, Juab Co., Utah.

Officers: Jesse Knight, pres.; J. Will Knight, v. p.; W. Lester Magnum, sec.-treas.; R. E. Allen and L. E. Ritter, directors; E. R. Higginson, supt.

Inc. 1911, in Utah. **Cap.**, \$2,000,000; shares \$1 par; issued 1,750,000; 250,000 in treasury. Stock listed in Salt Lake City. Annual report for year ending Dec. 31, 1915, shows assets, \$2,006,266, which includes: mining property, \$1,636,931; cash and accounts receivable, \$40,000, and liabilities, \$6,266. Receipts totaled \$103,982 from ore sales, and operating expenses, \$78,285, leaving a net gain for the year's operations, \$25,697, and a total gain to date of \$68,857.

Initial dividend of 1c a share declared Feb. 20, 1917 and continued quarterly, \$75,000 being paid to Nov., 1917. Is heaviest shipper in the Tintic district, as ore is low-grade pyrite used as a flux by smelters.

Property: 28 claims, patented, 122 acres, comprising the Dragon and Governor groups in Tintic district. The Governor group has 2,000' or more of the big Iron Blossom fissure in limestone, from which the great production of that and the Sioux mines has come. The Dragon group

shipped 100 tons per day of iron ore to the U. S. smeltery, for a long time. The Governor ground has a rich orebody of copper-silver ore developed by drifts from the Iron Blossom on the 300', 600', 800' and 1,000' levels, showing a 20' vein with 0.5 to 10% copper and 20 to 50 oz. silver. Part of the property is worked through the Black Jack shaft.

In 1915 development work consisted of 1,143' of drifting, 983' of tunneling and about 400' of raises, winzes and opencuts. In the tunnel connecting the workings with the Iron Blossom property, large bodies of low-grade ore were encountered. Work is being prosecuted on the 900' level, in 1916.

Equipment: includes electric pump on 1,000' level which secures water supply of the Knight-Christensen mill, and a hoist installed in 1915.

Production: 1,743 tons in 1914, yielding 44,006 oz. silver, 135,814 lbs. copper, 57,552 lbs. lead and 432.37 oz. gold; 7,804 tons in 1915, yielding 102,143 oz. silver, 490,750 lbs. copper, 14,766 lbs. lead and 2,559 oz. gold.

Shipping 260 tons daily, 1917.

DULUTH & UTAH DEVELOPMENT CO.

UTAH

Idle. Office: 503 Utah Savings & Trust Bldg., Salt Lake City, Utah. E. J. Raddatz, pres.-treas.; Peter Porter, v. p.; Harvey J. Jones, sec.

Inc. in Utah. Cap., \$500,000; shares \$10 par, as successor of No-U-Dont Mining & Milling Co.

Property: 4 fractional claims, about 50 acres, near the Honerine tunnel and next north of the Honerine mine, which carries copper, at considerable depth. Mine has 2 shafts, deepest 500', with about 3,000' of workings, and under former ownership, produced silver-lead ore from above the 500' level, shipments said to have returned 35 to 60% lead and 20 to 30 oz. silver per ton, and to have aggregated \$250,000 in value. Copper ore is expected at depth.

Property was to be absorbed by Bullion Coalition Mining Co. upon completion of payment of the \$15,000 purchase price. Part payments in 1914 and February, 1915, have already been distributed as dividends among the stockholders.

EAGLE COPPER MINING CO.

UTAH

Mine office: Santaquin, Utah Co., Utah.

Officers: Armon Cravens, pres.; C. W. Higginson, v. p.; C. E. Snell, sec.-treas.; L. F. Peterson, supt.

Inc. May, 1907, in Utah. Cap., \$1,000,000; shares 10c par. Last assessment of ½c delinquent, April 11, 1914.

Mine, on Mount Nebo, east of Santaquin, has shipped a little high-grade lead and copper ore. Developing with a small force.

EAST TINTIC DEVELOPMENT CO.

UTAH

Property bought, 1916, by Eureka Lilly Mining Co., which see.

EMERALD MINING CO.

UTAH

Mine office: Mammoth, Juab Co., Utah. J. E. Oglesby, pres.; J. L. Yundt, gen. mgr.

Inc. 1896, in Utah. Cap., \$300,000; shares \$1 par; assessable, fully issued; last assessment one-third cent a share, delinquent June 15, 1914.

Property: 4 claims, and additional land bought, 1910. Mine has 1,100' shaft, with about 4,000' of workings, on a narrow but rich vein, carrying copper, silver and lead ores.

In May, 1913, it was reported that 22' of ore cut on the 2,000' level of the Opex mine extended into this property. In July, 1913, company started a drift on the 1,100' level to be driven 1,200' north, to open up the ore formerly worked on the 2,000' Opex, the latter company having withdrawn permission to use the workings.

Development: on the Emerald property in the 700' winze disclosed a 4' vein between well defined walls, showing heavy iron mineralization and sugar quartz.

Company has levied assessments for years and been regarded as the "wildest of wildcats," but is now in favor and may repay stockholders for their blind faith and yearly contributions.

Reported April, 1917, to look promising on 700' level. Company also working on the 1,000' level.

EMPIRE MINES CO.

UTAH

Address: Jesse Knight, Provo, Utah.

Inc. 1917, in Utah. Cap., 3,000,000 shares; 5c par.

Is a consolidation of the Black Jack, Boston & Tintic, Central Mammoth, Lower Mammoth, Garnet, Old Colony, Eureka, Manhattan and Opex Consolidated mining companies, all controlled by the Knight Investment Co.

In April, 1917, the stock of the Carisa Gold & Copper Mng. Co. of Maine at Mammoth, Utah., was bought for \$115,000.

Property: over 700 acres in the Tintic district, Utah, east of Silver City and south of Eureka.

Development work is being done from the Lower Mammoth deep shaft, crosscuts being driven at the 1,500 and 1,800' levels.

The consolidation should result in a thorough development campaign of this part of the Tintic district.

The Black Jack Cons. property comprises 26 claims, patented, 350 acres in Tintic mining district.

Development: by a 2,000' tunnel and a two-compartment shaft, planned to be deepened eventually to 2,000'. The 1,000' level shows auriferous copper ore, of fair tenor, in broken ground, and the bottom level, at 1,400', showed a 10' vein carrying silver-lead ore. Mine also has some copper ore high in iron, available for fluxing use.

Results to date discouraging, although about 25,000' of work has been done. New workings have passed from white into gray limestone, considered more favorable for ore.

The Boston Tintic property comprises 3 claims, patented, 46 acres, near Black Jack mine, carrying 2 fissure veins, in porphyry, of which 1, of 3 to 5' average width, traceable 2,000', has been opened by tunnels of 40', 70' and 120', and by a 240' incline shaft that followed the vein and cut bunches of good ore assaying 1 to 3% copper, 20 to 55% lead, 25 to 45 oz. silver and 80c gold per ton. The ore occurs on a limestone-porphry contact and a 103' shaft is said to be in shipping ore.

Property of the Carisa G. & C. Mng. Co. consists of the Carisa and Spy mines, 8 claims, patented, 57 acres, adjoining the Centennial-Eureka at Mammoth, Tintic district, Utah. Claims show deposits between limestone and quartzite, 3 of which give average assays of 4.51% copper, 3.5 oz. silver and 0.037 oz. gold per ton. Mine is pockety, but shows considerable concentrating ore.

Property of the Lower Mammoth Mng. Co. consists of 6 claims, 50 acres patented, adjoining the Mammoth and Grand Central mines, carrying a continuation of the Mammoth orebody.

Development: by 700' tunnel, and 2,000' three-compartment shaft. The extensive workings show large bodies of low-grade ore, decreasing in values with depth. The oxidized zone extends to depth of at least 1,800', ores to this depth including lead carbonates, ruby silver and native silver. The copper ore occurs mainly on the footwall of the Mammoth vein, and is overlaid by silver-lead ore of smelting grade, the segregation of the

copper and lead ores being remarkably complete. The lower workings in the sulphide zone show auriferous and argentiferous galena, chalcopyrite and pyrite, coming in at a depth of 1,800' to 2,000'. Recent development consists of a drift on the 700' to cut the orebody, followed by a raise from the 1,000' level.

Equipment: includes 2 electric hoists, 1 of 165 h. p., with double drum, good for a half-mile depth, and an electric air compressor. Buildings include a carpenter shop, smithy, assay office and superintendent's dwelling.

Production in 1916 was from the 1,500 and 1,700' levels. Company claims to have a 200,000-ton orebody, averaging 13% zinc, between the 1,500' and 1,800' levels.

EUREKA BULLION MINING CO.

UTAH

Address: J. M. Bestelmeyer, mgr., Provo, Utah.

Officers: D. R. Beebe, pres.; H. C. Hicks, sec.-treas.; N. C. Hicks and August Bostelmeyer, all of Provo, directors.

Inc. 1916, in Utah. **Cap.**, \$1,000,000; shares 5c par; assessable.

Property: 7 patented claims, formerly owned by the Grutli Mining Co., were bought at sheriff's sale, 1916, for \$8,960. Claims are in the East Tintic district, N. W. of the Tintic Standard property, and are said to show a 50' vein on surface with a limestone porphyry contact.

Development: by 525' shaft reported to show quartz in a cave 150' long, 50'-75' high and 75' wide at 500', with manganese.

Equipment: includes compressor, 60 h. p. steam boiler, hoist, etc.

EUREKA CROESUS MINING CO. OF NEW YORK

UTAH

Controls or owns the Eureka Utah Mining Co. of Salt Lake City.

Property: the Huebner mine, Eureka, Juab County, Utah, shipping high-grade lead-silver ore regularly.

EUREKA HILL MINING CO.

UTAH

Office: Dezeret National Bank Bldg., Salt Lake City, Utah. **Mine office:** Eureka, Juab Co., Utah.

Officers: Moylan C. Fox, pres.; Waldemar Van Cott, v. p.; Jas. E. Berkey, sec., with Ed. W. Packard, directors. Jackson C. McChrystal, managing engr.; Chas. Weisbaker, supt.

Inc. Nov. 12, 1875, in Utah. **Cap.**, \$1,000,000; shares \$100 par. Is a close corporation, credited with having paid \$2,000,000 in dividends. Paid \$1 dividend, 1916. Annual meeting, third Tuesday in February.

Property: 5 claims, 27 acres, patented, also a 25-acre mill site and 150 acres miscellaneous lands, in the Tintic district, adjoins the Bullion-Beck and Centennial Eureka. The Eureka Hill mine has a 1,500' main working shaft and about 30 miles of workings. Orebodies are lenticular deposits, carrying cuprite, malachite and enargite, with average values of about 1.4% copper, 6% lead, 25 oz. silver and \$3 gold per ton. Mine worked for 45 years, but shut down, 1911, and only old workings mined by lessees since then. Produced many millions of silver-lead ore from above 1,000' level. Deep development in future will be from adjacent mines.

Knight-Dern interests, 1916, leased tailing dumps of Eureka Hill, reported to contain 200,000 tons of ore, averaging \$4.50 per ton.

Lessees produced about 2,300 tons of ore in 1916.

EUREKA LILLY MINING CO.

UTAH

Office: Judge Bldg., Salt Lake City, Utah. **Mine office:** Eureka, Utah.

Officers: Grant Snyder, pres.; Gideon Snyder, sec.-treas. A. N. Holdaway, mgr.; Brig. Snyder, supt.

Inc. 1908, in Utah. **Cap.**, \$1,000,000; shares \$1 par. Company is a consolidation of the Lilly and Provo mining companies. In 1916, the East Tintic Dev. Co.'s property was bought.

Property: 7 patented claims in the East Tintic mining district, adjoining the Tintic Standard mine and including the Ralph mine of the East Tintic Dev. Co., bought in 1916, from which considerable high-grade silver-lead ore was mined years ago.

Development: by 1,325' incline shaft, which passed into hanging wall of vein, and overshot it 20 or 30' on 1,250' level. Ore was cut in shaft and 3 headings on 1,400' level (Sept., 1917) are reported in orebody. Bottom is reported in limestone impregnated with sulphides.

Produced over \$150,000 worth of ore from above the 200' level.

EUREKA MINES CO.

UTAH

Address: John H. McChrystal, gen. mgr., Eureka, Utah.

Officers: Wm. R. Wallace, pres.; Jackson C. McChrystal, v. p.; J. E. Berkley, sec.-treas.; above with H. S. Auerbach, directors.

Inc. 1916, in Utah; Cap., \$1,000,000; shares 10c par.

Property: in the Tintic district is bounded by the Chief Consolidated, Gemini, Centennial, Eureka and Eagle and Blue Bell mines.

Ore: silver-lead of milling grade, averaging about 6 oz. silver and 4% lead with occasional zones of enrichment.

Development: mine has been opened up through the deep workings of the Gemini on the 900' to 1,500' levels. Shipments being made in 1917 are reported to carry 90 oz. silver and 9% lead and to average \$70 to \$80 a ton.

In August, 1917, a 16' winze on 900' level cut 30 oz. silver ore with 12% lead, and stoping was started. A connection was made between the 1,300' and 1,400' levels.

EUREKA STANDARD MINING CO.

UTAH

Address: Knight Investment Co., Provo, Utah.

Property acquired by the Knight interests in 1917, from the Uvada Copper Co., for 550,000 shares of E. S. stock.

Directors: Jesse Knight, W. Lester Mangum, J. Will Knight, John Pingree and F. C. Richmond.

Inc. 1917. Cap., \$1,000,000; shares 10c par.

Property: 14 claims, about 280 acres, in the East Tintic district, formerly known as the Montana group. Shows several large outcrops.

Development: by 500' 3-compartment shaft which will be sunk to 1,000'.

FARRAGUT MINING & MILLING CO.

UTAH

Address: c/o Ashby S. Thatcher, Boston Blk., Salt Lake City.

Property: the Admiral Farragut group of claims in the North Tintic district, near Eureka, developed by a 265' shaft, which is to be sunk to 500' in 1917.

GEMINI MINING CO.

UTAH

Office: 723-4 Kearns Bldg., Salt Lake City, Utah. **Mine office:** Eureka, Juab Co., Utah.

Officers: E. W. Packard, pres.; Jackson H. McChrystal, v. p. and gen. mgr.; J. E. Berkley, sec.; E. O. Howard, treas., with W. Van Cott, directors. John H. McChrystal, supt.

Cap., 5,000 shares, \$100 par.

Dividends: to March, 1917, totaled \$2,460,000. In 1916 there was distributed \$80,000, equal to \$16 per share.

Property: the Gemini is a silver-lead mine with accessory copper ore, in shoots. There are 3 fissure veins, in an ore-channel about 450' wide, cut transversely by a number of cross-fissures, making a rather complex system of orebodies, the main fissure, of 15 to 20' width, having a S. E. dip, with ore shoots raking to the north. Ore in the upper workings aver-

ages about 12% lead and 40 oz. silver, while the bottom level, at 1,600', shows a 20' vein carrying argentiferous 3% copper ore. The mine has a 1,700' shaft and a 300' winze, equipped with electric hoist. The adjoining Ridge & Valley mine is operated through the Gemini shaft. Company operating on 1,600 and 1,700' levels, opening the new ore system. Upper levels leased, over 100 men being employed, they contributing largely to the daily output of 70 tons. One set of lessees mined gold-silver-copper-lead ore that returned over \$13,000 per carload.

The Gemini has been a regular producer since 1886.

GODIVA MINING CO.

UTAH

Office: 735 Kearns Bldg., Salt Lake City, Utah. **Mine office:** Eureka, Juab Co., Utah.

Officers: E. W. Packard, pres.; J. C. McChrystal, v. p. and gen. mgr.; J. E. Berkley, sec.; E. O. Howard, treas.

Cap. 1,000,000 shares; \$1 par; 100,000 treasury stock sold in 1917, remaining 200,000 offered public.

Property: 64 acres of patented claims in Tintic district. Only leasing done for some years, company not operating on account of settlement of estates. From 1908 to April 1, 1917, production was 13,701 tons of crude ore and 2,861 tons of concentrate, worth \$805,687. In 1916 zinc and silver-lead ores yielded \$93,000, mostly from 700' level.

Development: by 1,200' shaft, with work under way at that level. Several sets of lessees are mining ore. At 700' 31% lead and 15 oz. silver ore has been opened.

Equipment: 250 h. p. hoist, compressor, 100-ton concentrator, ore bins, buildings, etc.

GOLD CHAIN MINING CO.

UTAH

Provo, Utah. Mine office: Mammoth, Juab Co., Utah.

Officers: C. E. Loose, pres. and gen. mgr.; J. T. Farrar, v. p.; P. G. Peterson, sec.-treas.; preceding officers, G. Simmons and John R. Turloes, directors. W. D. Loose, supt.

Inc. Dec., 1910, in Utah. Cap., \$250,000; shares 25c par.

Dividends: to date, \$130,000. Company absorbed the Ajax Mining Co., said to have paid upwards of \$1,000,000 in dividends.

Property: the Gold Chain group and Ajax mine in the Tintic district. Recent development on the 1,500' level has shown an orebody which averages 15 to 20 oz. silver, 40 to 50% lead and \$2 to \$3 gold per ton.

Development: from Lower Mammoth mine to west end of the property, 900' below the deepest previous work, disclosed another orebody said to carry 3% copper, 44 oz. silver and \$2.50 gold per ton.

Production: about 100 tons per day, from the 200 to 700', inclusive, and 1,500' levels.

Ore: shipped is medium grade. Output in 1916 over 10,000 tons. Finances are favorable for resumption of dividends.

Equipment: hoist, 17-drill compressor, and electric motors.

GRAND CENTRAL MINING CO.

UTAH

Office: Provo, Utah. **Mine office:** Mammoth, Juab Co., Utah.

Officers: Jos. T. Farrar, pres.; H. L. Holbrook, v. p.; Preston G. Peterson, sec.-treas.; Col. Edwin C. Loose, gen. mgr.; W. D. Loose, supt.

Inc. Feb. 1902, in Colorado. Cap., \$600,000, increased 1909 from \$250,000; shares \$1 par, nonassessable; issued 500,000. Stock listed on Salt Lake Exchange. Last dividend 4 cts; total dividends to June, 1916, \$1,675,250.

Property: the Grand Central is the deepest mine of the Tintic district. It adjoins the Centennial Eureka and is opened to the 2,600' level, carrying a vein with an orebody 200' wide in places and of low average grade.

ugh it is the largest orebody in the Tintic camp. A second ore shoot, west of the old one, and with parallel strike, was opened on the 2,000' and 2,100' levels. This ore shoot averages 15 to 20% copper on the 2,380' level and has been opened up on the 1,600' level for a distance of 1,200', showing a thickness of 50 to 100'. At this point the ore is bunched, requiring careful sorting. It is producing from the 400' to the 2,300' levels, inclusive.

Equipment: includes hoist, tramway and electric power. Mill to be constructed after the Knight Christensen plant has proved successful.

Production: for 1916 was 27,000 tons of ore. Monthly shipments in 1917 about 2,500 tons. Employs about 35 men. Property and management good.

ANITE MINING & MILLING CO.

UTAH

Santaquin, Utah.

Officers: E. O. Bylund, pres.; Jos. Tietjen, v. p.; Jas. Goodall, sec.; C. A. Westrom, treas. and supt.; preceding officers, T. B. Heelis, R. J. Armstrong, Jos. Crook, directors.

Property: 12 claims, unpatented, near Santaquin, includes the Granite mine. Mines show limestone with ore-bearing fissures, carrying replacement deposits of copper and silver-lead ore developed by 1,000' tunnel.

UTLI MINING CO.

UTAH

Mine at Eureka, Juab Co., Utah.

Inc. Dec., 1908, in Utah. Cap., \$100,000; shares 10c par. Listed on Salt Lake Exchange.

Property: 7 claims, patented, adjoining the East Tintic Consolidated on north, 2 miles from a railroad. Mine has a 250' main shaft, winze and crosscut, showing gold, silver and lead ores.

Equipment: includes steam hoist and compressor. Developing at last openings.

MBUG MINING CO.

UTAH

Merged with Uncle Sam Consolidated Mining Co.

MAX GOLD MINING CO.

UTAH

Joy, Juab Co., Utah. A Knight Investment Co. property, under lease on bond to Detroit Copper Co. and described thereunder.

IRON BLOSSOM CONSOLIDATED MINING CO.

UTAH

Officers: W. Lester Mangum, sec.-treas., 11 Knight Blk., Provo, Utah. Wm. Knight, pres.; J. Wm. Knight, v. p.-gen. mgr.; preceding, with R. E. Knight and A. M. Knight, directors. H. V. Birch, asst. mgr. Chas. Zabriskie, supt.

Inc. Nov. 7, 1899, in Utah. Cap., 1,000,000 shares; 10c par; assessable; outstanding.

Dividends: \$400,000 in 1913; \$330,000 in 1914; \$350,000 in 1916; \$250,000 in 1917. Paying 5c quarterly, 1917, with extras of 25c to Oct, a balance to Dec. 31, 1916, showed receipts: \$819,722; \$594,766 from ore sales, with cash balance on hand of \$135,095, April 30, 1917.

Property: 15 claims, patented, 147.75 acres in the Tintic mining district, Iron Blossom Co., Utah. The Iron Blossom mine is in limestone cut by a large fissure through which the orebodies are aligned.

Development: property is opened to a depth of 1,900' and is mining a very large orebody of silver-lead ore. In Oct., 1915, high-grade copper ore, carrying 10% copper, was opened in a winze on the 900' level and a large tonnage of this ore is expected to run 10%. A crosscut 80' from the winze on the 1,000' level, showing 10% in vein matter, carried 20' of copper ore, assaying from 9-16%.

Management reports that 1916 was an excellent year, and the future is favorable. Indications point to a shoot of copper ore developed from the 900' level to 1,200' level. A raise 75' above 1,300' found it inclining N. E. Connection has been made with the 1,700' level which will improve ventilation.

Diamond drilling for 1,300' on the 1,900' level failed to disclose anything of value.

Mine had 58,193' of underground workings at end of 1916, of which 5,751' was done in 1916.

Production: of smelter ore in 1916 was 33,530 tons (dry), yielding 4,601 oz. gold, 923,468 oz. silver, 3,099,300 lb. lead and 619,761 lb. copper. The gross value was \$26.84 per ton and cost \$9.89 per ton. Milling ore amounted to 13,547 tons, averaging 1.305% copper, 9.58 oz. silver and 0.077 oz. gold per ton; or in value, \$9.03 gross and \$4.516 per ton cost. This ore is treated by the Tintic Milling Co. Production for first half of 1917 was 35,000 tons of all classes of ore. Daily output is 90 tons of 4 to 6% copper ore.

Property good, but ore shoots erratic, although past experience indicates that the company will keep up its record for several years.

IRON KING MINING CO.

UTAH

Mine near Eureka, Juab Co., Utah.

Officers: Col. C. Edw. Loose, pres.; Reed Smoot, v. p.; P. G. Peterson, sec., all of Provo, Utah.

Cap. \$2,000,000; shares, \$1 par, increased from \$1,000,000 in July, 1917.

Property is in Tintic district and has not yet found a body of silver-lead ore. Assessments of 1 ct. a share have paid for development work. Mine has a 600' shaft and a 3,500' tunnel, planned to be driven 6,000' eventually. The mine is said to show 100,000 tons of iron ore blocked out and ready for stoping. Mine closed down March, 1912, owing to inability to market the iron ore at a profitable figure, but was re-opened in April, 1917. A new shaft is being sunk from the tunnel level and contracts arranged for sale of the iron ore.

Equipment: includes compressor, etc.

JOE BOWERS MINING CO.

UTAH

Office: 515 Dooly Blk., Salt Lake City, Utah. John Dern, pres.; A. Reeves, sec.

Inc. in Utah. **Cap.**, 450,000 shares; 25c par; assessable; 460,216 shares outstanding. Listed in Salt Lake City.

Property: 40 acres in the Tintic district shows silver-lead ore. Is a prospect.

KING WILLIAM MINING CO.

UTAH

Office: 546 E. 1st South St., Salt Lake City, Utah. **Mine address:** Eureka, Juab Co., Utah.

Officers: Chas. H. Blanchard, pres. and gen. mgr.; F. G. Morse, v. p.; W. A. Wright, sec.; N. G. Hall, treas.

Inc. 1907, in Nevada. **Cap.**, \$1,250,000; shares \$1.25 par; non-assessable.

Property: 2 claims, patented, 16 acres, surrounded by the holdings of the Eagle & Blue Bell, Centennial-Eureka and Grand Central.

Development: is through the Eagle & Blue Bell workings, on the 500' and 1,000' levels, corresponding with the 1,400' and 1,900' levels of the King William. There are several shallow shafts.

In Oct., 1916, the mine was sold by the sheriff to a company that has 1,000,000 shares, on which an assessment of 1/2c each was levied. There is no information from the mine for 1917.

KNIGHT INVESTMENT CO.

UTAH

Offices: Knight Blk., Provo, and 817 Newhouse Bldg., Salt Lake City, Utah.

Officers: Jesse Knight, pres.; Amanda M. Knight, v. p.; W. Lester Mangum, sec.-treas.; preceding, with R. E. Allen, J. Wm. Knight, Knight Starr Jordan and R. Knight, directors.

Controls 17 properties, ranging from prospects to successful dividend paying mines, in the Tintic district, Juab Co., Utah, including the Beck Tunnel Cons., Black Jack Cons., Bonneville Mining, Dragon Cons., Iron Blossom Cons.,

Lucky Boy Cons., Opex Cons., Spring Canyon Coal, Tintic Milling, Utah Ore Sampling, Colorado Mining, Knight Christensen Metallurgical companies, the Rico Wellington Mining Co. at Rico, Colorado, and the Lucky Tiger and Black Hawk Zinc mines near Neck City, Mo., acquired in 1915. The latter 2 properties are fully developed, equipped with 250-ton mill and credited with production of high-grade ore.

Company also operates the Knight Woolen Mills and Eureka Hill R. R. Co. The new 100-ton Knight Christensen custom milling plant at Silver City, designed by N. C. Christensen to treat the complex, low-grade Tintic ores, was started Oct., 1913, and operated successfully on Iron Blosson ore, attaining an 85% extraction at a cost of less than \$2 per ton, until completely destroyed by fire, April 4, 1915.

LEHI-TINTIC MINING CO.

UTAH

Address: H. J. Fitzgerald, sec.; George Nichols, pres., 125 Atlas Block, Salt Lake City, Utah.

Property: 12 claims in the Tintic district, about 4 miles from Eureka, shows silver-lead-gold ore in fissure vein.

Development: by 2,100' tunnel. Equipped with compressor and steam power. Operated intermittently with proceeds from assessments. 22 of which had been called to April, 1917. Reported early in November, 1917, that the tunnel had cut the Empire vein, assaying 28% lead, 6 oz. silver, and \$2 gold per ton. Stock listed on Salt Lake Exchange.

LILLY MINE.

UTAH

Office: 414 Judge Bldg., Salt Lake City, Utah.

Officers: Grant Snyder, pres.-mgr.; Thos. Bonoth, v. p.; Gideon Snyder, sec.-treas.; above, with H. Blementhal, G. N. Holdaway, directors.

Property: 12 claims, 10 acres at Eureka, in the Tintic mining district, Utah, adjoining the Tintic Standard mine.

Mine credited with past production of \$100,000 worth of ore from upper workings.

LOWER MAMMOTH MINING CO.

UTAH

Merged, 1917, with Empire Mines Co., which see. Stockholders receive 15 shares of Empire for every 100 of Lower Mammoth held.

LOWLAND TUNNEL WATER & TRANSPORTATION CO.

UTAH

Office: 819 Newhouse Bldg., Salt Lake City. **Mine office:** Starr, Utah.

Officers: Louis Fugal, v. p.-mgr; C. L. Whitney, sec.-treas.; with Geo. F. Wasson and D. H. Livingston, directors.

Inc. Nov., 1912, in Utah. Cap., 1,000,000 shares; 1 ct. par; non-assessable; 350,000 issued.

Property: 36 unpatented claims, 700 acres, in Nebo mining district, Juab Co., Utah, said to carry gold-silver-lead-copper-zinc-iron ore. Formation is quartzite, lime and granite.

Ore: occurs as a contact deposit and in fissure veins, running N.-S. with dip of from 40-90°.

Company is driving a 10,000' drainage and transportation tunnel into the Mt. Nebo mineral belt to serve 11 companies operating in that district and to develop its own mineralized ground. The tunnel was in 600', Jan. 1, 1917.

MAMMOTH MINING CO.

UTAH

Office: 409 Hooper Bldg., Salt Lake City, Utah. **Mine office:** Mammoth, Juab Co., Utah.

Officers: Samuel McIntyre, pres. and gen. mgr.; Samuel McIntyre, Jr. v. p. and supt.; Col. R. M. Wilkinson, sec.

Inc., 1881, in Utah. Cap., \$10,000,000; shares \$25 par. Reincorporated Dec. 5, 1906, in Nevada. Cap., \$1,000,000; shares \$2.50 par. Controls the Cleveland

Mining Co., through ownership of 70% of capital stock. Annual meeting, first Tuesday in February.

Dividends: 5c per share in 1913, nothing in 1914, 5c in 1915, 25c in 1916, and \$1 in 1917; total to Nov., 1917, \$2,820,000.

As a result of 9 years' litigation, a judgment in favor of the Grand Central Mining Co. was rendered, 1910, against the Mammoth Mining Co., and necessitated the levying of a 10c assessment, 1910, the first in the history of the company.

Property: 19 claims, in Tintic district. Mine opened about 1870, is developed extensively and has a 2,300' main shaft, the deepest in the Tintic camp. Irregular shoots and chimneys of lead and copper ores occur, values being mainly in silver and lead.

Production: 36,000 tons in 1914; 26,000 tons in 1915; 36,600 tons in 1916; 24,000 tons to July, 1917. Dumps containing over 250,000 have been leased, yielding company 50c to \$1 per ton net.

Prospects are brighter than at any time in company's life of 25 years.

Equipment: includes complete plant, installed in 1910. About 130 men are employed.

MAMMOTH NO. 2 MINING & MILLING CO.

UTAH

Idle. **Office:** 409 Hooper Bldg., Salt Lake City, Utah. Mine at Mammoth, Juab Co., Utah.

Officers: Wm. H. McIntyre, pres.; Samuel McIntyre, v. p. and treas.; Isaac Jennings, sec.

Inc. 1900, in Utah. **Cap.**, \$300,000; shares \$1 par; assessable; fully issued.

Property: 2 claims, patented, adjoining the Mammoth Mining Co., shows lead and copper ores.

MAY DAY MINING & MILLING CO.

UTAH

Address: Box 1418, Salt Lake City, Utah. **Mine office:** Eureka, Juab Co., Utah.

Officers: John Dern, pres.; M. P. Braffet, v. p.; A. Reeves, sec.; W. S. McCornick, treas.; with J. C. Dick, directors. C. C. Griggs, supt.

Inc. 1896 in Utah. **Cap.**, \$200,000; shares 25c par; assessable; all outstanding. Stock transferred at company's office. Annual meeting, first Monday in April. Listed on Salt Lake City Exchange.

Balance-sheet for year ended March 31, 1917, shows \$61,071 received from ore sales, \$31,799 from sundries and 1915 balance, a total of \$92,770. Expenses totaled \$64,761. Cash on hand, \$12,009.

Dividends: to April, 1917, total \$268,000; including \$16,000 paid in 1916-17.

Property: 6 claims, 5 patented, 60 acres, in the Tintic mining district.

Ore: zinc silver and lead in limestone.

Development: by 1,100' vertical shaft and 1,500' tunnel. The mine has been practically out of ore several times; at one time the supply was so low the stock dropped to 1c per share; the larger part of its dividends has been paid since then.

Equipment: includes 50-h. p. electric hoist and compressor, capacity 250 cu. ft.

Production: for year ending March 31, 1917, 1,360 tons lead ore, valued at \$40,980; 569 tons zinc ore, valued at \$18,378. Regular shipments are being made, but production is not large.

Development: work is being carried on with the hope of finding new orebodies, though it is said the present rate of production can be maintained for some time even if none are found. Part of the property is leased, and company itself leases part of the Chief Consolidated ground.

Prospecting, started 2 years ago in the S. part of the property, was disappointing and has been suspended. Work between the 500' and 700' levels has opened a little ore.

NORTH SCRANTON MINING CO.

UTAH

Address: A. Adams, supt., Lehi, Utah.**Officers:** H. B. Merrihew, pres.-mgr.; B. C. Lott, v. p.; F. R. Heidebreich, sec.-treas.; with D. H. Cox, directors.**Inc.** May, 1905, in Utah. **Cap.**, \$100,000; shares 10c par, assessable; 421,000 issued. Operating expenses in 1916 were \$1,684.**Property:** 10 unpatented claims, 200 acres, in North Tintic district, Utah, said to show a fissure in dolomitic limestone.**Ore:** consists of 6 to 8" streaks, reported to carry 23% lead and 6 oz. silver per ton.**Development:** by tunnel and winzes to depth of 300' with total workings of 2,200'. The fissure has been followed down for 200'.

Is a prospect.

OLD SUSAN MINING CO.

UTAH

Office: 411 Felt Bldg., Salt Lake City, Utah.**Officers:** W. H. Simmons, pres.; P. F. Thompson, v. p.; E. D. R. Thompson, sec.-treas.-mgr., with F. A. Druehl, directors.**Inc.** 1899, in Utah. **Cap.**, 400,000 shares; 10 cts. par; 257,572 shares outstanding. Annual meeting first Monday in January.**Property:** 3 patented claims, 25 acres in Tintic mining district, Juab Co., Utah, shows gold-silver lead ore in fissure veins in porphyry and monzonite. Developed to depth of 300' by 1,500' tunnel. The mine is now worked by lessees on a royalty basis.**OPEX CONSOLIDATED MINES CO.**

UTAH

Is a part of Empire Mines Co., which see.

OPOHONGO MINING CO.

UTAH

Office: Provo, Utah.**Mine address:** Samuel Cox, supt., Eureka, Juab Co., Utah.**Officers:** Wm. Hatfield, pres. and mgr.; J. H. Hatfield, v. p.; J. W. Hatfield, sec.-treas.**Inc.** 1908, in Utah. **Cap.**, \$250,000; shares 25 cts. par; assessable. Shares are listed on the Salt Lake Stock Exchange.**Dividends:** Three 1-ct. and two 2-ct. declarations in 1911-12 and one of 2 cts. on Jan. 30, 1913, a total of \$80,907 to 1916. Stock is listed on the Salt Lake Exchange.**Lands:** 3 claims, patented, in the vicinity of the Black Jack and Ajax mines.**Development:** by shafts and tunnels, with about 2,000' of workings, to depth of 1,000', with principal workings on the 500' and 700' levels. The mine is operated jointly with the Gold Chain, with which it is connected on the 300' level, and hoisting is through the Black Jack shaft. The 450' level shows an 18' orebody, said to give assays up to 10% copper and \$60 gold per ton. The 700' level shows this same ore shoot. Present development is mainly in the main tunnel of Gold Chain mine, now being driven to cut the main vein. The 1,000' level shows the fissure in the east drift, but no ore, as the ore shoot has not been reached. Lessees are at work in the upper levels and are getting 7% copper ore on the 300-750' levels. The ore contains 7-10 oz. silver and \$1-\$2 gold per ton.

Machinery equipment, owned jointly with the Gold Chain, includes an air compressor.

Production: has been intermittent since it began in 1909. Lessees operating from 400' to 700' levels, shipped about 850 tons of copper ore, 1916.

Producing about 150 tons monthly, 1917.

OXFORD CONSOLIDATED MINING CO.

UTAH

Eureka, Utah. James Crooks, pres.; Geo. W. Owen, sec.-treas.; C. H. Spriggs, mgr.

Inc. June, 1909, in Utah. **Cap.**, \$25,000; shares 5 cts. par; assessable.

Lands: 9 claims, patented, show copper and lead ores. Levied an assessment of one-half cent, early 1911, to pay indebtedness incurred through litigation. No work has been done since patent to property was issued.

PLUTUS MINING CO.

UTAH

Controlled through stock ownership by Chief Consolidated Mng. Co.

Address: Eureka, Juab Co., Utah.

Inc. 1907; in Utah. **Cap.**, \$100,000; shares 10 cts. par, fully issued; assessable. Last assessments of 1 ct. per share levied May and Oct., 1917. Absorbed the Tetro Mining Co., Jan., 1909. Shares are listed on the Salt Lake Stock Exchange.

Property: 14 claims, patented, including the Tetro group of 3 claims, from which the Tetro Mining Co. paid \$18,000 in dividends. Mine carries auriferous and argentiferous lead and copper ores, developed by a 600' shaft, about 3,700' of tunnels, and 1,250' of other workings.

Equipment: includes a 75-h. p. electric motor, hoist and air compressor. Buildings include necessary shops and an office.

PROVO MINING CO.

UTAH

Address: Provo, Utah.

Officers: J. C. Leetham, pres.; J. W. Farrer, v. p.; D. W. Conover, sec.-treas.; with J. N. Strong, J. D. Dixon and J. C. Graham, directors.

Inc. Feb. 28, 1887, in Utah. **Cap.**, \$100,000; shares 10c. par; assessable; 828,440 issued.

Property: 3 patented claims at North Tintic, adjoining the Tintic Standard. Lead-silver-zinc ore occurs in pockets. Development by 300' shaft.

QUEEN ISABELLA MINES CO.

UTAH

Officers: Alex. Caldwell, pres., Eureka, Tooele Co., Utah; Alex. Ray Irvine, v. p.; S. R. Thurman, sec.-treas., with Daniel Caldwell and Bert Thurman, directors.

Inc. 1916, in Calif. **Cap.**, \$50,000.

Property: 14 claims adjoining the Sharp mine, Tintic district, and carrying the extension of the Sharp vein. The Sharp mine while under 2-year lease and bond to Mr. Alex. Caldwell produced 15 carloads of silver-lead ore, netting \$15 to \$20 per ton, and 100 tons not yet shipped are said to have a higher value. The new company will develop the prospect.

RAYMOND-ILLINOIS MINING CO.

UTAH

Office: 312 McCornick Bldg., Salt Lake City, Utah.

Mine office: Eureka, Juab Co., Utah.

Officers: F. J. Hagenbarth, pres. and mgr.; J. M. Wheeler, v. p.; J. C. Lynch, treas.; preceding, and Thos. Kearns, directors; M. B. Kearns, sec.

Inc. 1905, in Utah. **Cap.**, \$450,000; shares \$1 par; assessable. Assessments of one-half-cent a share fell due May 7, and June 29, 1917.

Property: 15 patented claims, in the Tintic district, shows fissures and replacements in limestone. Developed by about 1 mile of tunnels and a 1,500' vertical shaft, which as yet have shown but little ore. The bottom workings are wet. Diamond drilling was done, 1909-10, from the bottom of the shaft. Idle since 1914.

RICHMOND & ANACONDA CONSOLIDATED MINING CO.

UTAH

See Uncle Sam Consolidated Mining Co.

RIDGE & VALLEY MINING CO.

UTAH

Address: 723 Kearns Bldg., Salt Lake City, Utah. **Mine office:** Eureka, Juab Co., Utah.

Officers: Wm. R. Wallace, pres.; Jackson C. McChrystal, v. p.-mgr.; H. S.

erbach, treas.; J. E. Berkley, sec.; J. H. McChrystal, supt., above with Sarah McChrystal, directors.

Cap., \$1,000,000; originally \$150,000, increased 1915 to \$500,000 and in 1916 present amount.

Property: 39 claims, 448 acres, adjoining the Gemini property, and erated through the Gemini shaft for many years. Ores carry lead-silver-copper-gold values.

Development: by 1,700' shaft, and extensive workings. Lessees extracting : reported to assay 49% lead, 16 oz. silver. Shipments amounted to 800 tons March, 1917. Most of the work in July was at 1,700'.

NTAQUIN CHIEF MINING CO.

UTAH

Letters returned in 1917, from 529 Newhouse Bldg., Salt Lake City. L. A. rtin, pres.; C. E. Martin, sec.-treas.

Inc. April 29, 1911, in Utah. **Cap.**, \$100,000; shares 10 cts. par; assessable. treasury, April, 1916, 176,993 shares stock and 476 cash. Total debt reported \$1,956. Listed in Salt Lake City.

Property: 7 unpatented claims, in Santaquin mining district, 65 miles E. of Salt Lake City, several miles from a railroad, and adjoining its twin other, the Santaquin King on the south. Is said to show a well-defined fissure limestone.

Development: consists chiefly of 250' of tunnels with 225' of winzes. ported that "The ore found consists of silver, lead and zinc. The ore in ht has not been determined, according to official information." One tunnel aid to show a 3' width of vein with lead-zinc ore. At last accounts work had n resumed and in April a contract let for extending the main tunnel 300'. roperty is a prospect, but not in the "preferred" class.

NTAQUIN KING MINING CO.

UTAH

Letters returned in 1917, from former office Newhouse Bldg., Salt Lake y, Utah. R. B. Young, pres.; Ben C. Rich, sec.-treas.

Inc. 1911, in Utah. **Cap.**, 1,000,000 shares, increased in 1912 to 2,000,000; cts .par. In treasury May, 1916, 242,065 shares stock and \$344. Listed in t Lake City.

Property: 9 unpatented claims, located in Santaquin mining district, 65 es S. E. of Salt Lake City, 7 miles from a railroad, adjoins the Santaquin ef on the north.

Ore: occurrence said to be similar to that of the Santaquin Chief.

Development: in May, 1916, consisted of 350' of tunnels with total under-nd workings of 780' estimated "1,500 tons of commercial ore in sight." orted that "unquestionably they will still be mining there after we have en way to the next generation"; unquestionably they will, if the old saying ds true that "a sucker is born every minute."

RANTON LEASING CO.

UTAH

Address: c/o Wade & Funkel, Scranton mine, Eureka, Utah. Operates ler lease the Scranton mine at North Tintic, Utah. Produces lead and zinc s from new discovery on surface and from Magazine tunnel. Employs 52 1.

In 15 months, to July, 1917, the output was 6,000 tons, containing 20% lead 32% zinc.

RANTON MINING & SMELTING CO.

UTAH

Offices: McIntyre Bldg., Salt Lake City and Scranton, Tooele Co., h.

Officers: T. G. Wolf, pres.; H. A. Knapp, treas., with B. H. Throop, all Scranton, Pa., R. J. Deighton, sec.-mgr., and Wm. H. Bramel, Salt Lake r, directors.

Cap., \$30,000; shares \$1 par.

Property: in the North Tintic district, is an old producer of silver, lead and zinc ores and the stopes were pretty thoroughly worked out. The company operated the mine until 1915. Lessees are now working it; reported in May, 1916, that 1,200 tons of lead and zinc ores, yielding \$23,000 had been shipped during the past two months. About 50 men employed at present.

See Scranton Leasing Co.

SELMA MINES CO.

UTAH

Office: Kearns Bldg., Salt Lake City, Utah.

Mine office: Knightsville, Juab Co.

Officers: C. E. Beers, pres.; S. J. Hawkins v. p.; O. W. Carlson, sec-treas.; with L. C. Peterson, mgr., and G. A. Seequist, directors.

Inc. Dec., 1909, in Utah, as successor of Selma Consolidated Mining Co. **Cap.,** \$50,000; shares 5c par; assessable, except 50,000; 740,000 outstanding. **Statement** made in June, 1917, shows current assets of \$13,655, and current liabilities, \$5,616. Miners have taken half of their wages in shares.

Property: 34 claims, unpatented, near the Lehigh Tintic mine, supposed to carry the northern extension of the mineral zone of the Colorado mine, 2 miles from a railway. The property has a lime-porphry contact, with 3 principal fracture zones carrying silver-lead and copper ores, and has secured small quantities of exceedingly high-grade ore.

Development: by a 3-compartment shaft, and tunnels showing leached ground with occasional bunches of good ore. The old company expended about \$75,000 on development. Workings total 2,650', including a 200' shaft, and tunnels 80, 900, and 1,400' long, opening ground to depth of 1,000'. The shaft is to be deepened to 600'.

Equipment: includes electric power and electric hoist.

Developing: in 1916-'17. Reported in Oct., 1915, "Selma has no high-grade orebodies in sight at present, but all indications point to them at any time"; apparently conditions of "low visibility" prevent the ore from being sighted.

SIoux CONSOLIDATED MINING CO.

UTAH

Succeeded Nov. 30, 1917 by Sioux Mines Co., receiving 493,470 shares for entire assets.

Provo, Utah.

Officers: Reed Smoot, pres.; R. L. Anderberg, sec.

Inc. about 1890, in Utah. **Cap.,** \$1,000,000; outstanding, \$745,387; shares \$1 par. Listed in Salt Lake City. Has paid total dividends of \$872,105; last one of 4 cts. per share, July 25, 1911. No report was issued for 5 years and stock was practically dead on the Exchange, quoted around 3c. In Feb., 1916, it jumped to 24c, attributable to the reported strike of high-grade copper ore at depth in the adjoining Iron Blossom.

Statement of accounts from Jan. 1, 1916 to Sept. 22, 1917, shows balance, Jan. 1, 1916, \$6,257; receipts from ore sales (lessees), \$16,428; stock sales, \$18,157; misc., \$4,045; loans, \$18,000. Expenses totaled \$62,858; profit, \$164.

Property: 6 patented claims at Eureka in Tintic mining district, said to show silver-lead ore. Many years were spent in developing the prospect and then it was allowed to lie idle for a number of years. About 1907 work was resumed and ore found in 1908; this put the mine on a dividend basis for a time. Known ore reserves were exhausted in 1911 and mine closed down in May, 1912, to be worked since in a desulotry way by lessees.

Development: by shaft to the 1,000' level. In April, 1916, the company resumed work; sank the shaft from 600' to 1,000' level. Drifts for about 500' E. on the 800' and 1,000' levels in search of the continuation of the orebody recently found in the Iron Blossom, failed to find commercial ore. Considerable quartz has been found that management believes that ore will be found at

greater depth. As company has no unissued stock and is in debt, it must borrow or reorganize. On Nov. 8, 1917, a meeting was held and sale approved of company's entire assets to the Sioux Mines Co. (to be organized) with 1,000,000 shares capital; 500,000 shares to be issued in payment, balance to be used for working capital and for clearing indebtedness.

SIoux MINES CO.

Address: R. L. Anderberg, sec., Provo, Utah.

Succeeds Sioux Cons. Mng. Co., which see.

SOUTH IRON BLOSSOM MINING CO.**UTAH**

Robinson, Juab Co., Utah. George Jones, pres.; T. L. Schofield, sec.-treas.

Inc. 1908, in Utah. **Cap.**, \$100,000; shares 10c par; assessable; outstanding \$241,000. Listed in Salt Lake City.

Property: 4 claims in the Tintic mining district, showing silver-lead ore.

SOUTHERN SWANSEA MINING CO.**UTAH**

Letters returned in 1917 from 408 South State St., Salt Lake City, Utah.

Mine office: Silver City, Juab Co., Utah.

Officers: Geo. Jones, pres.; Geo. A. Shepard, v. p.; Richard B. Shepard, treas.; Emma C. Shepard, sec.; R. E. Jones, supt.

Inc. July 31, 1907, in Utah. **Cap.**, \$10,000; shares 1 ct. par; issued, \$8,500. An assessment of 1/30 of a cent a share is levied annually. Shares are listed on the Salt Lake Stock Exchange.

Property: 12 claims, unpatented, south of the Swansea mine and supposed to carry an extension of the Swansea vein, showing porphyry, quartzite and lime, with a fissure vein of 12' estimated average width, traceable 1 mile, carrying auriferous and argentiferous oxidized and sulphide ores of copper and lead, developed by a 200' shaft.

SWANSEA CONSOLIDATED MINING CO.**UTAH**

Office: Knight Bldg., Provo, Utah.

Officers: Jesse Knight, pres.; R. E. Allen, sec.-treas.

Inc. in Utah. **Cap.**, \$100,000; shares 10 cts. par; 999,798 outstanding; assessable. Listed in Salt Lake City.

Owens 145 acres in Tintic mining district, said to show silver-lead ore.

Property closed. Lessees are working the dumps.

SWANSEA EXTENSION MINING CO.**UTAH**

Officers: Arthur L. Thomas, pres.; Heber M. Wells, sec. and treas.

Inc. June 12, 1908. **Cap.**, \$100,000; issued \$2,245; shares 10 cts. par. Listed in Salt Lake City. Owns 3 claims in Tintic mining district.

SYNDICATE MINING CO.**UTAH**

Santaquin, Utah Co., Utah. B. H. Bullock, pres.-mgr.; Nora A. Bullock, sec.-treas.

Inc. Jan. 7, 1911, in Utah. **Cap.**, 1,250,000 shares; 2 cts. par. Listed in Salt Lake City.

Property: 10 unpatented claims, near Santaquin, said to show a 20' vein containing ore with gold, silver and copper values. The vein fissures are in limestone and orebodies are expected at vein intersections. Developed by 725' tunnel. Property is a prospect, in which ore in commercial amount has not yet been found, though surface croppings are promising.

TINTIC CO.**UTAH**

Office: 734 Fifth Ave., New York.

Mine office: Bingham Canyon, Salt Lake Co., Utah.

Officers: Grant B. Schley, pres.; Kenneth B. Schley, v. p. and sec.; E. B. Schley, treas.; preceding, with Frederick Strauss, Alfred Jaretski, E. J. Berwind and D. Sullivan, directors.

Inc. 1903, in Maine. **Cap.**, \$2,700,000; shares \$3 par; issued \$2,091,249. Original cap., \$3,000,000; shares \$5 par, increased, 1906, to \$4,000,000, with an outstanding issue of \$8,500,000 stock in 700,000 shares of \$5 par, which was first

reduced 1909, to \$2,100,000, by cutting the par value from \$5 to \$3 and was immediately thereafter increased to present amount of \$2,700,000.

Bonds: \$500,000 authorized, at 6%, convertible into stock, of which \$422,900 is outstanding, this bond issue having been made to liquidate a floating debt. The company is a securities-holding corporation only, and is the parent company of the Tintic Mining & Development Co., Yampa Smelting Co. and West Mountain Tramway Co., properties of which are described under the titles of the two first-named companies.

TINTIC CENTRAL MINING & MILLING CO.

UTAH

Office: Provo, Utah.

Mine address: T. T. Holdaway, Knightsville, Juab Co., Utah. J. T. Farrer, pres.; R. L. Anderberg, sec.-treas.

Inc. June, 1907, in Utah. Cap., \$50,000; shares 5 cts. par; assessable; all issued. Three assessments yearly of one-half cent a share. Stock listed on Salt Lake Exchange.

Property: 20 claims, covering ground adjacent to the Iron Blossom in the Tintic district and supposedly carrying the extension of the ore-bearing fissures of that mine. These fissures are in limestone and are cut by porphyry, carrying irregular but very profitable orebodies.

Development: includes a 1,038' shaft with extensive workings on the 870', 920' and 1,020' levels. In 1914 about 542' of development was done on the 870' level, opening up a fissure of low-grade quartz and a streak of lead-silver ore, running parallel with the fissure. During 1915, work was confined to the 800' level.

Equipped with electric power.

In April, 1917, arrangements were made with the Iron Blossom company to develop the Tintic Central from the former's 1,700' level, by continuing it several hundred feet. In September some lead-silver ore had been opened on the 900' level.

TINTIC COMBINATION MINING CO.

UTAH

Consolidated with Tintic Empire and Bullock companies to form United Tintic mines, now dead, the property passing to the Tintic Tunnel Co.

TINTIC DELAWARE MINING CO.

UTAH

Address: J. F. Rawson, West Tintic, Utah.

Officers: W. D. Rawson, pres.; J. T. Hammond, Jr., v. p.; J. F. Rawson, sec.-treas.; with J. H. Ekker, Albert Ekker and A. Madsen, directors.

Inc. in Utah. Cap., \$100,000; shares 10c par.

Property: 8 claims, in West Tintic, 12 miles from Dunbar, Juab County, Utah, said to carry ore containing 82% lead and 8 oz. silver per ton, opened in Sept., 1917. Shipments to be made.

TINTIC DELMAR MINING CO.

UTAH

Office: Snow Bldg., Provo, Utah. **Mine office:** Eureka, Juab Co., Utah.

Officers: Lewis Merriman, pres.; Andrew Madsen, v. p.; Harvey Cluff, sec.-treas.; with C. W. Reed and T. Boardman, directors.

Inc. March 27, 1909, in Utah. Cap., \$100,000; shares 10 cts. par.

Property: 20 claims, partly patented, in the North Tintic district, on which limestones occur with geologic conditions like those of Centennial Eureka mine.

Development: by 350' tunnel, to be extended to crosscut formation, which shows stringers of quartz carrying ore said to give good assay values in silver, lead and copper where 2 large cross breaks intersect. A 114' winze encountered fissures opened by a drift, 100' below the tunnel, reported to show ore carrying 300 oz. silver, some gold, lead and a little copper in a shoot encased in low-grade ore. Sinking was under way in May, 1917, and a hoist and compressor were installed in August.

Property reported on favorably by C. A. Porter of the Utah Copper Co. and by Prof. J. E. Tallmadge. Is a promising mining gamble.

TINTIC DRAIN TUNNEL CO.**UTAH**

Address: Provo, Juab County, Utah.

Officers: Jesse Knight, pres.; W. L. Mangum, sec.-treas.; with J. S. Smith, E. F. Birch, Henry Barney, and C. W. Reese, directors.

Organized in Sept., 1917, to drive a 5½ mile adit from Goshen valley to a point near Silver City, for drainage of adjacent mines and sale of water for irrigation. Company owns 300 claims along the right-of-way.

TINTIC MILLING CO.**UTAH**

Provo, Utah.

Officers: Jesse Knight, pres.; G. Dern, v. p.-mgr.; W. L. Mangum, sec.-treas.; T. P. Holt, gen. supt.

Inc. in Utah. **Cap.**, 1,000,000 shares, 3 cts. par; assessable. The purpose of the company is to provide a process and a mill for treating low-grade ores of the locality, hitherto found valueless. The mill employs the Holt-Dern and Knight-Christensen roasting furnaces and leaching. Operations began Mar., 1916, the mill treating 200 tons daily in Oct., 1917, mostly from the Iron Blossom and Dragon Consolidated mines. Bullion assays 90% copper and carries from 600 to 2,000 oz. silver per ton.

Briefly the process is: crusher, 4 sets of rolls, 11 roasting furnaces; four 100-ton leaching tanks, and scrap iron precipitating boxes. The charge for roasting is a mixture of oxide and sulphide ores, coal dust, and salt. This process is amenable to the low-grade silver-copper-gold ores of the district.

TINTIC MINING & DEVELOPMENT CO.**UTAH**

Office: 734 Fifth Ave., New York. **Mine office:** Bingham Canyon, Salt Lake Co., Utah.

Officers: Grant B. Schley, pres.; E. B. Schley, v. p.; W. J. Walworth, sec.-treas.; C. G. Raynor, asst. sec.-treas.; preceding, with W. L. Thomas, E. J. Berwind and Kenneth B. Schley, directors.

Inc. Aug., 1896, in West Virginia. **Cap.**, \$3,000,000; shares \$5 par; re-organized Jan., 1906, in Maine. **Cap.**, \$600,000; shares \$1 par. Is a subsidiary of the Tintic Co., and operated as a close corporation, making no public reports. Property was mortgaged 1910, for \$150,000, jointly with the Yampa Smelting Co. and West Mountain Tramway Co., to secure a \$675,000 issue of 8% gold bonds.

Bingham Property: the Yampa mine and a group of 30 claims, 180 acres, on Carr fork, Bingham canyon, near the Ohio mine, and adjoining the Utah Consolidated on the N. and Boston Consolidated on the W. The claims carry a contact or bedded vein, of 10' minimum, 37' average and 200' maximum width, between a quartzite foot and limestone hanging, this being among the largest orebodies in the Bingham district, outside of the properties having disseminated porphyry ores. The deposit carries disseminated chalcocite, covellite and chalcopyrite, said to average 1 to 3% copper, 2 oz. silver and \$1.50 gold per ton, while smelter returns for 1909 were only about 1.7% copper, and probably under \$2 per ton in combined gold and silver values. The ore has a considerable excess of iron, rendering it valuable for smelting the highly silicious ores common to the Bingham district.

At Tintic, Utah, company owns claims near the Mammoth, Grand Central and Centennial-Eureka mines in the Tintic district, having a 300' shaft, with a power plant and air compressor. Heavy expenditures on this property gave indifferent results, and it has been idle several years.

Development: is confined to the Yampa mine, a claim of less than 6 acres, entirely surrounded by the Utah Consolidated, and developed by 2 tunnels and a shaft. The Craig haulage tunnel, on the 1,200' level, is 3,248'

long, intersecting the main vein at about 2,200' from the portal and connecting with the shaft at 2,448'. The upper or Yampa tunnel intersects the shaft at 475' and runs about 1,000' on the vein. The 1,700' shaft has 3 compartments, and is operated in 2 sections, 1 from the 400' level to surface, and 1 from that level to 1,200' level, with balanced hoists. There are 12 levels opened, approximately 128' apart. Ore from the upper workings is sent down the shaft to the Craig tunnel, which has an electric haulage system, with 2 electric locomotives, taking trains of six 3-ton cars.

Equipment: includes an electric hoist, and a power plant near the portal of the Craig tunnel, with steam and electric motors. Power is furnished by the Telluride Power Co. There is a 35-drill Ingersoll-Rand 2-stage air compressor, direct-connected to a 200 h. p. motor. Ore is transported by the West Mountain Tramway Co., controlled by the Tintic Co., which has a 12,270' Leschen aerial tram, the longest in the district, of 700 tons daily rated capacity, having 600-ton ore bins at the upper terminal, connecting with the Yampa smelter at the lower end. The tram line saves about 25c per ton on cost of transporting ore.

Production: 4,069,886 lbs. fine copper in 1905; 4,699,765 lbs. in 1906; 5,001,255 lbs. in 1907; 5,412,850 lbs. in 1908; 6,500,000 lbs. in 1909; 6,172,243 lbs. in 1910; 6,157,175 lbs. in 1911; 1,666,000 lbs. copper, 45,680 oz. silver, and 2,699 oz. gold in 1915; 3,271,249 lbs. copper, 86,875 oz. silver and 4,244 oz. gold in 1916.

The Yampa mine, though small, is considered valuable and the management good.

TINTIC STANDARD MINING CO.

UTAH

Office: 422 Judge Bldg., Salt Lake City, Utah.

Mine office: Eureka, Juab Co., Utah.

Officers: E. J. Raddatz, pres.-treas.-gen. mgr.; W. I. Snyder, v. p.; Geo. F. Busch, sec.; with L. H. Stohr and Ira I. Travis, directors; E. J. Raddatz, gen. mgr.; John Westerdahl, supt.

Inc. Oct. 2, 1907, in Utah. **Cap.**, \$1,300,000; shares 10c par; assessable; issued, 1,175,000. Has levied 19 assessments of $\frac{1}{2}$ c each up to 1916. Stock listed on Salt Lake Exchange. Annual meeting, Sept. 15.

Initial dividend, amounting to \$24,000, paid, June 23, 1917. No. 2 of like amount paid on Oct. 25.

Property: 95 claims, 1,760 acres, of which 15 claims, 300 acres, are patented, $2\frac{1}{2}$ -miles from rail in the East Tintic district.

Geology: mine shows limestone, quartzite, and porphyry, carrying fissure veins with N.-S. strike and dip of 55° E. in limestone.

Ore: carries lead and copper, and is reported to assay from a trace to 50% lead, 1 to 105 oz. silver, and \$1 to \$15 gold per ton. The management reports the main orebody as 200' wide.

Development: one 1,000' ventilating shaft, one 1,300' 3-compartment shaft, and about 8,000' of drifts, etc. Both shafts show shipping ore, present output being 800 to 1,200 tons monthly.

Equipment: includes a 100-h. p. steam plant, with an 80-h. p. double-cylinder hoist, good for 1,500' depth, and a 3-drill air compressor. There are 15 buildings. Also double-drum hoist with 75-h. p. motor and an 800 cu. ft. Chicago Pneumatic compressor with 150-h. p. motor.

TINTIC TUNNEL CO.

UTAH

Letters returned unanswered July, 1917, from Newhouse Bldg., Salt Lake City.

Officers: L. A. Martin, mgr., with F. C. Richmond, D. R. Beebe, S. B. Smith, B. D. Lyon, H. J. Fitzgerald, R. J. Evans, D. F. Davis and C. E. Martin, directors.

Inc. 1916, in Utah. **Cap.**, \$2,000,000.

The company plans to drain the E. and S. ends of the Tintic district by means of a 5-mile tunnel. It has absorbed the holdings of the United Tintic Mines, which was a consolidation of the Tintic Combination, the Tintic Empire and Bullock companies.

Property: 28 claims, about 600 acres, in the Tintic district, near Eureka, said to show 4 parallel veins in an ore zone, or channel, that lies east of the Mammoth-Grand Central and the Centennial-Eureka ore zones. The claims are so located as to give approximately 2 miles on this vein system.

Ore: carries copper, lead, silver and gold values. The veins vary greatly in width, but are generally of small size, the Bullock vein, in which work has been centered, showing a maximum width of about 4'. The ore in this vein runs high in iron and carries about \$20 per ton in copper, lead and silver.

Development: principally on the old Bullock property, includes shafts of 280', 215' and 102' and several old tunnels.

Equipment: includes a small steam plant and hoist.

Plans drifting S. from shaft No. 2 in hopes of finding orebody at intersection of veins. Excess of water and high cost of mining below water level have caused decrease of production.

TINTIC ZINC CO.

UTAH

Address: H. E. Clark, 11 Maple Hill, Saranac Lake, N. Y.

Officers: G. P. Smith, pres.; S. A. Breed, v. p.; H. E. Clark, sec.-treas.; with C. A. Suchen and W. A. Black, directors. G. H. Ryan, supt.

Inc. in Utah. Cap., \$1,000,000; shares \$1 par; non-assessable; 700,000 issued. Income during 1916, \$1,680; expenses, \$1,548; cash on hand at beginning of 1917, \$346.

Property: 12 claims, 240 acres; in North Tintic district, Utah.

Development: by 700 and 60' tunnels; workings to 300' depth total 1,000'. Prospecting for zinc-lead-silver ore.

UNCLE SAM CONSOLIDATED MINING CO.

UTAH

Office: 516 Dooly Block, Salt Lake City, Utah. **Mine office:** Eureka, Juab Co., Utah.

Officers: Hon. John Dern, pres.; M. P. Braffet, v. p.; Frank D. Kimball, treas.; Fred C. Dern, sec.; J. C. Dick, gen. mgr.; C. C. Griggs, supt.

Inc. June 29, 1900, in Utah. Cap., \$750,000; shares \$1 par; assessable; increased, Aug. 21, 1912, from \$500,000; issued, \$550,000, with 1 assessment levied. The company formerly owned a 50% stock interest, 400,000 shares, in the May Day Mining & Milling Co., which stock was distributed 1910, to shareholders, as a stock dividend. The Richmond & Anaconda Mining Co., adjoining, was absorbed 1912, by the Uncle Sam.

Shares are listed on the Salt Lake Exchange. Annual meeting, first Monday in June.

Regular dividend rate was 2 cts. per share monthly, changed June, 1910, to 2 cts. quarterly, with an extra dividend of 3 cts., Dec., 1910, dividends for 1910 having been 19 cts. per share; total dividends to April, 1913, were \$470,000; none since. No. 2 assessment of 1c a share was levied on Nov. 2, 1917.

The annual statement for year ended May 31, 1917, shows: ore sales realized \$4,443, and balance from 1915 was \$8,712, making \$13,155. Expenses totaled \$11,601, leaving \$1,554 cash balance, May 31, 1917.

Property: 4 claims, patented, in Tintic district, including the Humbug mine, which is the principal property, producing mainly auriferous silver-lead ore of both smelting and milling grades. A good orebody was developed, 1911, in the western part of the property.

Equipment: is electrical. Mine worked by 5 lessees in 1916.

Production: in 1916, 25 tons zinc ore and 265 tons lead ore.

Last report states that company expects to do development on west part of the property, with funds derived from royalties. This work will, it is hoped, disclose the southern extension of the Yankee orebody opened in 1916.

UNION CHIEF MINING CO.**UTAH**

Office: Newhouse Bldg., Salt Lake City.

Officers: G. L. Bemis, pres.-mgr., Santaquin, Utah; Geo. Baglin, sec.; A. W. Larson, supt.

Inc. 1903, in Utah. **Cap.**, \$1,000,000; shares \$1 par; assessable. Listed on Salt Lake Exchange.

Property: 18 claims, 6 patented, 370 acres, in Santaquin mining district, shows lead-silver ore in vein reported to be about 6' wide.

Development: over 8,000' of tunnels and drifts. Reported to have found high-grade ore at 550' depth in 1916, but as only picked samples seem to have been assayed, no averages can be given. Equipped with electric power line and compressor.

In October, 1917, a winze was down 400' near a limestone contact, being sunk 1,700' from the tunnel portal and to vertical depth of 1,300'. More or less high-grade lead-silver ore was opened during sinking.

UNITED TINTIC MINING CO.**UTAH**

Office: 422 Judge Bldg., Salt Lake City.

Officers: E. J. Raddatz, pres.; C. E. Martin, sec.; F. Thornburg, supt.

Inc. in Utah. **Cap.**, \$1,000,000; shares 50c par; assessable. Listed on Salt Lake Exchange.

Property: 28 claims in the Tintic mining district. Was sinking shaft in May, 1917.

In July a pool was formed for one year in order to sell treasury shares for development funds. In October, 1917, it was proposed to consolidate with the South Standard Mining Co.

UTAH CONSOLIDATED MINES CO. OF TINTIC**UTAH**

Office: 425 Atlas Bldg., Salt Lake City. T. R. Cutler, pres.; H. J. Fitzgerald, sec.-treas.

Inc. in Utah. **Cap.**, \$1,000,000; shares \$1 par; non-assessable; all issued. Listed in Salt Lake City.

Property: 100 acres in Tintic mining district, shows silver-lead ore. Developing in 1916.

UTAH MINERALS CONCENTRATION CO.**UTAH**

H. Atkinson, mgr., Eureka, Juab Co., Utah. A. W. Parshall, supt.

Owens 250-ton custom concentrating mill for local ores. Milled tungsten ores in 1916.

Company in hands of receiver in 1917.

VICTOR CONSOLIDATED MINING CO.**UTAH**

Letters returned unanswered July, 1917, from P. O. Box 1225, Salt Lake City, Utah. **Mine office:** Eureka, Juab Co., Utah.

Officers: J. S. Wells, pres.; A. W. McCune, v. p.; J. A. Groesbeck, sec.; W. S. McCornick, treas.; with J. H. Brown, directors. Vivian McCune, gen. mgr.

Inc. 1903, in Utah. **Cap.**, \$375,000; shares 50 cts. par; all issued; assessable, with 5 assessments levied and fully paid. Stock is listed on the Salt Lake Exchange.

Property: 5 claims, 38 acres, patented, including the Victor and Boss Tweed mines, carrying gold and lead-silver-bearing copper ore, developed to depth of 800'. The company is idle and the mine has been in the hands of lessees since 1909. Shipments reported to run 7% copper and 8 oz. silver per ton.

VICTORIA GOLD MINING CO.

UTAH

Care Mrs. R. S. Robertson, treas., 1076 E. 2nd South St., Salt Lake City, Utah. Dr. A. A. Kerr, pres.; E. W. Hall, v. p.; M. G. Robertson, sec.

Property: 8 claims, patented, near Gemini mine at Tintic.

Development: 500' incline shaft and 400' tunnel opening up a large body of manganese iron ore carrying lead values. A new tunnel was to be driven in 1916-17 to open a new deposit.

WHITE STAR MINING CO.

UTAH

Mine office: Eureka, Juab Co., Utah.

Officers: C. H. Thompson, pres.; P. A. Sörenson, v. p.; Emma C. Shepard, sec.; Bernard Rich, treas., and Harry Rich, directors.

Inc 1898, in Utah. **Cap.**, \$30,000; shares 10c par; assessable; with several assessments levied.

Property: 4 claims, patented, 80 acres, 3 miles from Eureka, the nearest rail point. The mine has a 100' shaft and 100' tunnel.

Company has apparently acquired a new property in the North Star district, Beaver Co., from which in Aug., 1917, two cars of \$52 ore were shipped and a compressor, hoist and other electrically driven equipment has recently been installed.

The White Star mine in the Silver Island district, Western Tooele Co., is near the Kentucky-Douglas, Western Utah and Gethin Leroy mines, all active.

YANKEE CONSOLIDATED MINING CO.

UTAH

Office: 308 Newhouse Bldg., Salt Lake City, Utah. **Mine office:** Eureka, Juab Co.

Officers: A. W. Vosburg, pres.; G. L. Bemis, v. p.; A. E. Canfield, sec.-gen. mgr. Lew Merriman, supt.

Inc. July 8, 1898, in Utah. **Cap.**, \$1,000,000, increased in 1908 from \$500,000; shares \$1 par; assessable; all issued; listed in Salt Lake City. Has paid dividends of \$192,500; last dividend paid in Feb., 1913, 1c per share.

Property: 134 acres on Godiva Hill, Tintic district, includes the Yankee, Mountainview and Lakeview mines, lying between the Beck Tunnel and Uncle Sam Consolidated on the south and May Day on the north.

Ore: silver-lead-zinc with some gold. Country rock is limestone and porphyry. For geology of Tintic District see U. S. G. S., Folio No. 65.

Development: by tunnels and shafts, deepest 1,700'. Late development is along a strong fissure vein thought to be the May Day showing high-grade silver ore. A drift is also being run on a quartz ledge from the bottom of a 100' winze. Lessees are working part of the property.

Company has not replied to requests for information, but it is reported that rich silver-lead ore was opened in April, 1917, and the company was shipping occasional carloads during the year, receiving up to \$182 per ton net, while lessees produced 44% zinc ore.

ZUMA MINING & MILLING CO.

UTAH

Address: Eureka, Juab Co., Utah.

Officers: P. J. Fennell, pres. and mgr.; Mrs. Mary E. Drescoll, treas.; W. F. Shriver, sec.

Inc. 1907, in Utah. **Cap.**, \$500,000; shares 50c par; 700,000 shares outstanding. Stock listed on Salt Lake Exchange.

Property: 6 claims, 4 patented, in the East Tintic district, near the Crown Point and Iron King mines, said to carry gold-silver-lead zinc ore.

Development: is by a 500' shaft, 1,000' of tunnels and winze. In Oct., 1917, it was reported that on the 500' level 6 to 12" of 55 oz. silver and 30% lead ore had been opened for some distance.

Equipment: including hoist, engine and compressor, claimed to have cost \$24,000.

TOOELE COUNTY

Includes Clifton, or Deep Creek, Dugway, Ophir and other districts, with various scattered mines.

DEEP CREEK DISTRICT

BREWER GOLD & COPPER MINING CO.**UTAH**

Office: 212 Utah Savings & Trust Co. Bldg., Salt Lake City, Utah.

Mine office: Ibapah, Tooele Co., Utah.

Officers: J. P. Gardner, pres.; S. W. Morrison, v. p. and treas.; H. B. Windsor, sec.; John Mortimer, asst. sec.

Inc. Feb. 16, 1907, in Utah. Cap., \$50,000; shares 10c par; assessable; 4 assessments have been levied.

Lands: 11 claims, 6 patented, on Dutch mountain, in the Clifton district, less than 5 miles to loading station on the Deep Creek railroad. In operation, May, 1917.

COPPEROPOLIS MINING CO.**UTAH**

Address: N. A. Dunyon, mgr., Tooele Co., Utah.

Property: 65 claims in Deep Creek district. Shipments of selected ore in Oct., 1917, reported to have returned 60% copper, 65 oz. silver and \$12 gold per ton.

Development: by tunnels.

DEEP CREEK COPPER KING CO.**UTAH**

Address: R. C. Naylor, Gold Hill, Tooele Co., Utah.

Property: 10 claims in Deep Creek district, extending south from the Western Utah Copper claims.

Development: by 100' shaft said to be sunk on copper-silver-lead ore.

DEEP CREEK COPPER M. & M. CO.**UTAH**

Office: 202 Atlas Block, Salt Lake City, Utah.

Officers: R. C. Naylor, pres.; J. Pingree, treas.; A. L. Thomas, Jr., sec.; above with A. Winzell, L. Houskeeper, I. A. Powell and W. T. Smith, directors.

Property: 10 claims, in the Deep Creek district, Tooele Co., Utah, said to show lead-silver-copper ore.

Development: by shallow shaft on the Moonlight claim which is to be sunk 100' on a 2½' vein.

Company raising funds for development work by stock sales, late in 1917.

DUGWAY COPPER MINING & SMELTING CO.**UTAH**

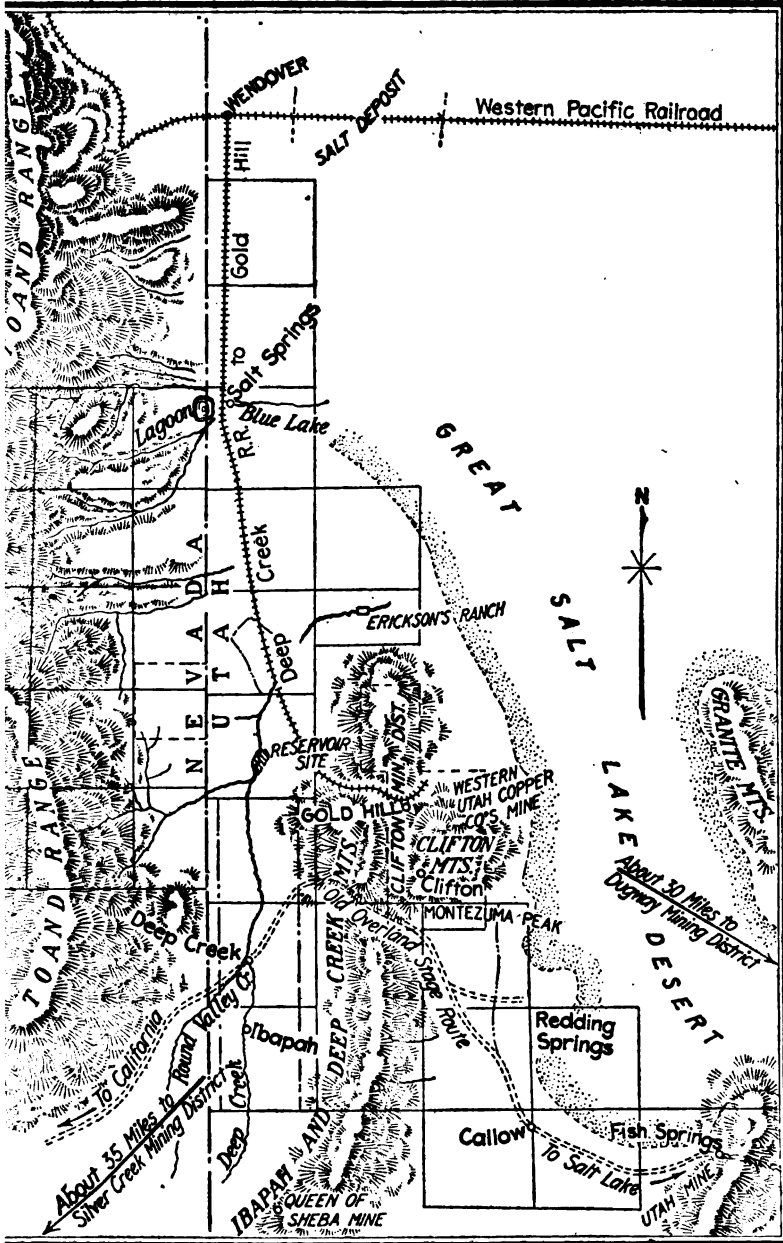
Office: 54 East 4th South St., Salt Lake City, Utah. Mine office: Clover, Tooele Co., Utah.

Officers: O. F. Peterson, pres.-gen. mgr.; P. C. Kittle, v. p.; A. V. Peterson, sec.; O. F. Peterson, treas.; preceding with A. E. H. Peterson and H. B. Windsor, directors.

Inc. June 13, 1902, in Utah. Cap., \$30,000; shares 10c par; assessable; issued, \$22,506. Annual meeting, third Tuesday in July.

Property: 6 claims, patented, 118 acres, in the Dugway district, 4½ miles from a railroad. Shows an ore zone, reported by company, to be 300' long on the 200' level, containing a number of orebodies that carry chalcopryite, bornite and argentiferous galena, giving assays of 1 to 15% copper, up to 30% lead, up to 7% zinc, up to 66 oz. silver, and \$1.60 gold per ton.

Development: by a 333' incline shaft, with about 1,000' of workings, showing considerable ore of good average assay tenor. Mine has no power equipment. Has been idle for several years.



MAP OF CLIFTON (DEEP CREEK) DISTRICT, UTAH

FERBER COPPER CO.**UTAH**

Office: Chas. A. Herzig, mgr. and cons. engr., 515 Dooly Blk., Salt Lake City, Utah. **Mine office:** Ferber, via Wendover, Utah.

Officers: J. C. Dick, pres.; John Dern, v. p.; A. Reeves, sec., with W. W. Armstrong, A. A. Ellis, Jr., Duncan MacVichie and W. H. Clark, directors. John M. Price, supt.

Cap., \$1,000,000; shares \$1 par; 550,000 shares in treasury; 100,000 shares treasury stock offered at 25c per share, April, 1917.

Property: 8 claims and 4 held under bond, in the Deep Creek mining district, about 14 miles W. of Gold Hill. Claims show limestone near a monzonite intrusion, and are said to show a vein, 4-6' wide, carrying ore that assays 5½-7% copper, 3-12 oz. silver and 40c gold per ton.

Development: by two shafts, one 70' deep showing 3' of high-grade copper ore. Recent work is said to have shown 18% copper ore with 11 oz. silver, and at 100' depth in No. 1 shaft there was 25' of oxide ore.

Mr. Herzig is a good judge of a mine, and his management ensures proper development.

GARRISON-MONSTER MINING CO.**UTAH**

Office: Utah Sav. & Trust Co., Salt Lake City, Utah. **Mine near** Gold Hill, Tooele Co., Utah.

Officers: J. P. Gardner, pres.; J. S. Garrison, v. p.; H. B. Windsor, sec.; S. W. Morrison, treas.

Inc. June, 1906, in Nevada. **Cap.,** \$1,000,000; shares \$1 par. Is a merger of the Garrison G. & C. Mng. Co. and the Monster Mng. Co.

Property: 26 claims, patented, on Dutch mountain, in the Deep Creek district, 40 miles from Wendover, on Western Pacific Railroad. A branch line to the district was completed in 1917, reducing transportation costs materially. The Garrison Monster company built a loading station at Garrison station on its spur from the Deep Creek line. Mine has 3,500' of workings and is said to show considerable bodies of silver-lead ore. Work was resumed during June, 1917; 20 men employed.

GETHIN LEROY UNITED MINES CO.**UTAH**

Office: 517 Atlas Blk., Salt Lake City, Utah.

Officers: A. S. Fowler, pres. and treas.; E. P. Hapgood, 72 R St., Salt Lake City, v. p.; Jas. Moffat, sec., with Given Fowler and Loris Pratt, directors.

Cap., \$1,000,000; shares \$1 par; 750,000 issued. Paid a dividend of 1c per share, Nov., 1913.

Property: in Silver Island district, Tooele Co., 15 miles north of Wendover, said to contain silver ore. Company has made several shipments during the past few years. Property was worked by lessees, who are said to have shipped 500 sacks of ore in Jan., 1916.

Property was to be sold in Aug., 1917, to satisfy a judgment for \$3,616 in favor of E. Hanson.

LUCKY STAR COPPER MINING CO.**UTAH**

Address: N. J. Nielson, sec.-treas., Dugway, Tooele Co., Utah.

Officers: G. N. Strike, pres.; J. T. Aydelotte, v. p., with Israel Larson and Peter Sacos, directors.

Cap., \$500,000; shares 10c par; 275,000 in treasury.

Property: Lucky Star mine in Dugway district, adjoining Cannon mine and held on lease and bond, 45 miles from rail at Faust.

Development: by 260' incline shaft with drifts on ore 5' thick, for length of drift, said to assay 9% copper and 15 oz. silver per ton. Eighty ton shipment said to be ready late in October.

POLE STAR COPPER CO.

UTAH

Offices: Vandergrift Bldg., Pittsburgh, Pa., and Newhouse Bldg., Salt Lake City, Utah.

Officers: P. S. Chambers, pres.; D. A. Rees, v. p.; A. E. Custer, 2nd v. p.; F. A. Duerr, treas.

Inc. Nov., 1916, in Delaware. Cap., \$1,500,000; shares \$1 par. Statement rendered Mar. 20, 1917, showed cash on hand and accts. receivable, \$125,402.

Property: 15 claims, 5 patented, about 230 acres, in the Clifton or Deep Creek mining district, Tooele Co., Utah, 167 miles S. W. of Salt Lake City. Gold Hill is the post office address, about 2 miles south.

Geology: country rock is monzonite with porphyry intrusions. East and west veins traverse the claims and are in turn cut by N.-S. dikes, the rich ore occurring at these contacts. Veins are said to be 4-12' wide and ore to average 5-7% copper, 49 oz. silver, \$4.65 gold, with about 12½% bismuth.

Development: by 9 shafts, 5 tunnels, several drifts and open cuts. Main vertical shaft is 300' deep and reported to be all in ore. Tunnel No. 2, about 350' long, is yielding shipping ore.

Equipment: includes 2 gasoline hoists, compressor, etc.

Literature sent out from Pittsburg is suspiciously lurid, though mine may have merit and officers be reputable.

QUEEN OF SHEBA MINE

UTAH

Owned by J. W. Lawton, Chicago, Ill.

Property: in the Deep Creek district, about 29 miles S. W. of Gold Hill, carries free milling gold ore in a quartz vein said to be from 14-25' wide.

Development: by 1,080' tunnel and a 276' raise, driven in 1914.

Equipment: includes 10-stamp mill and 1,700' aerial tramway. The mine is credited with past production of \$150,000. Operated by lessees in 1917.

SEMINOLE COPPER CO.

UTAH

Address: F. L. Wilson, Brooks Arcade Bldg., Salt Lake City, Utah.

Property: adjoining that of Western Utah Copper Co., near Gold Hill, Deep Creek district, Tooele Co., Utah. Ore deposits are numerous and varied in character, but attention in 1917 is being given to tungsten, opened to depth of 135'. Some molybdenite is also being developed. In September a 50-ton mill was nearly complete. Shipments were made by express. Prospects said to be bright for a small but profitable property.

SOFFE SILVER MINING CO.

UTAH

Directors: J. C. Soffe, pres.; W. R. Soffe, v. p.; J. W. McKinnig, sec-treas.; with W. J. Soffe, mgr.; A. J. Shulson.

Inc. May 7, 1916, in Utah. Cap., \$10,000; shares 1c par.

Property: 12 claims, unpatented, in Erickson mining district, Tooele Co., 30 miles west of Faust Station on Salt Lake route. Claims show high-grade silver-gold ore. Letters returned in May, 1917. Probably idle.

TOOELE GOLD HILL M. & M. CO.

UTAH

Address: Peter Clegg, Tooele, Utah.

Officers: Peter Clegg, pres.; C. W. Bailey, v. p.; T. S. Marks, sec-treas., with W. Carder and J. Donovan, directors.

Inc. April 7, 1917, in Utah. Cap., \$50,000; shares 10c par; 222,500 issued.

Property: 6 claims, patented, 110 acres, in Clifton district (Deep Creek), Tooele Co., said to have a contact deposit in granite and limestone. Ore carries gold, silver, copper and lead.

Prospecting in August, 1917.

UTAH-RELIANCE MINING CO.**UTAH**

Office: 408 South State St., Salt Lake City, Utah. **Mine office:** Ibabah. Tooele Co., Utah.

Officers: J. G. Bywater, pres.; D. B. Tripp, v. p.; Richard B. Shepard, sec.-treas. and gen. mgr.; preceding with W. A. Langford and Samuel Divett, directors.

Inc. 1908, in Utah. **Cap.**, \$5,000; shares 1c par; assessable; issued, \$3,000, fully paid.

Property: 8 claims, unpatented, 160 acres, about 45 miles from a railway, showing porphyry and limestone.

Development: by a 175' tunnel and a 100' shaft, latter showing ore assaying up to 16% copper, 4 oz. silver and 40c gold per ton.

Letters returned unanswered, 1917.

WESTERN PACIFIC COPPER CO.**UTAH**

Office: care Wilson Bros., Brooks Arcade, Salt Lake City, Utah. **Mine office:** Callao, Juab Co., Utah.

Officers: E. J. Yard, pres.; Jackson H. McChrystal, v. p. and gen. mgr.; Elroy M. Clark, sec.-treas.

Property: 320 acres, adjoin the Western Utah Copper Co., in the Willow Springs division of Deep Creek district, Tooele county, just over the Juab county line.

Development: by a shaft and 2 tunnels, 400' and 1,200' long, developing ore averaging about 13% copper, 23% lead and 22% iron, with small silver and gold content. In 1914 a rich strike was reported in a south drift run from the bottom of the 250' shaft. The vein is said to be 15' wide and a 100-ton sample ran 24.4% copper. Occasional small shipments of ore have been made.

Equipment: includes steam plant and air compressor.

WESTERN UTAH COPPER CO.**UTAH**

Office: 1604 Walker Bank Bldg., Salt Lake City, Utah. **Mine office:** Gold Hill, Tooele county, Utah.

Officers: Harold R. Smoot, pres.; Duncan MacVichie, v. p.-gen. mgr.; Edwin T. Jones, sec.-treas.; with Imer Pett, Frank Fisher, H. H. Green and Senator Reed Smoot, directors. R. E. Phelan, mgr.

Inc. 1906, in Nevada. **Cap.**, \$2,500,000; shares \$5 par; fully paid and non-assessable; 499,500 issued.

Property: 5 groups of claims and 360 acres ranch land, a total of 716 acres, comprising the Gold Hill, Yellow Hammer, Calaveras, Tuolumne, and Ochre Springs groups; also the Redding Springs ranch, valuable for water for reduction purposes.

The properties are situated in the Clifton district, Tooele county, reached by the Western Pacific and Deep Creek railroads, about 167 miles S. W. of Salt Lake City. Examined in 1917 by F. W. Weeks.

Geology: predominant rocks are granite and limestone. The deposits are replacements in limestone.

The Gold Hill group has about 200,000 tons of ore that averages 4.6% copper, 3.58 oz. silver, and 0.023 oz. gold per ton. In addition to this there is said to be a large tonnage of silver-lead ore under development and partly blocked out, averaging 9% lead and 12 oz. silver per ton.

The Deep Creek railroad from Wendover, Utah, to Gold Hill, Utah, was completed March, 1917, and ore shipments began on March 3 from the Gold Hill mine, averaging 200 tons of copper ore per day.

The Calaveras and Yellow Hammer groups commenced shipping about July 1. The product from these groups is gold-copper-silver ore.

WESTERN UTAH EXTENSION COPPER CO.**UTAH**

Address: A. E. Custer, mgr., Newhouse Bldg., Salt Lake City, Utah, or Gold Hill, Utah. P. S. Chambers, pres.

Inc. in Delaware. **Cap.**, \$2,500,000.

Property: 15 claims, adjoining the Western Utah Copper mine, in the Clifton district, Tooele Co., Utah. Examined in 1917 by F. W. Weeks.

Property is said to contain a well defined fissure in limestone and granite, over 5,000' long. In September a shaft was being sunk. Ore opened in a tunnel is said to assay \$3.20 gold, 19.4 oz. silver, and 17.4 copper, evidently picked ore.

Company banks on developing an extension of its neighbor's orebody.

WILSON CONSOLIDATED MINING CO.**UTAH**

Offices: 208 Brooks Arcade Bldg., Salt Lake City, Utah, and Wendover, Tooele Co., Utah. Clyde H. Wilson, pres.; Frank L. Wilson, sec.-treas.

Property: located in the Clifton district, Deep Creek district, Tooele Co., 45 miles from Wendover, was the only mine in the U. S. which shipped bismuth ore in 1914. Reported to have shipped one 25-ton lot of 8% bismuth ore carrying gold and silver. Ore was hand jigged to bring shipment up to 20%.

Reported in July, 1917, that tungsten was found on the property and that 200,000 tons of ore had been blocked out; of which class or value was not specified.

WOODMAN MINING CO.**UTAH**

Address: Gold Hill, Tooele Co., Utah.

E. F. Woodman, pres.; Geo. E. Woodman, v. p.-sec.-treas.

Property: the Frankie group, 2¼ miles S. of Gold Hill, said to show low-grade copper ore opened up for 72' in a 200' tunnel, Nov., 1917.

Ore: occurs in a granite-limestone contact, and the ore will, it is said, average 2% copper, \$1.20 gold, 2 oz. silver, but a 3' streak on the wall carries 15-20% copper.

Shipments reported to be 100 tons weekly.

Company also owns the Cane Springs mine S. W. of Gold Hill, and the Alverado group E. of the town. In both groups a gold-bearing calcite vein occurs in the granite-limestone contact. The two mines have, it is said, produced \$270,000. Seven men are employed at the Cane Springs mine.

*OPHIR DISTRICT***CARBONATE KING MINING CO.****UTAH**

Officers: M. J. Dooley, pres.; J. F. Free, v. p.; F. E. Harding, sec.-treas.; of Salt Lake City.

Cap., 1,000,000 shares; 10c par; 400,000 in treasury.

Property: in Ophir camp, near Hidden Treasure mine. Company has acquired the Hetty Green, Schindler, Ethelwin and Pinky claims.

Development: 200' inclined shaft on Hetty Green vein. Some drifting has been done. Property is still in prospective state.

CLIFF MINING CO.**UTAH**

First Nat'l Bank Bldg., Milwaukee, Wis. **Operating office:** 414 Judge Bldg., Salt Lake City, Utah. **Mine office:** Ophir, Tooele Co., Utah.

Officers: A. G. Kern, pres.; Grant Snyder, v. p.-mgr.; J. A. Stewart, sec.-treas., with A. D. Thompson, Frank Adams, Geo. Swift and E. McVicker, directors. A. H. Williams, supt.

Inc. May 31, 1906, in Maine. **Cap.**, \$3,000,000; shares \$10 par, all outstanding. **Dividends:** to 1916, \$90,000.

Property: in the Ophir district, contains silver-lead-zinc ore as replacement deposits in limestone.

Development: by tunnels, with several miles of underground workings.

Equipment: includes electric power and one-mile aerial tram.

DRY CANYON CONSOLIDATED MINING CO. UTAH

Gisborn, Tooele Co., Utah.

Officers: C. J. Garber, pres.-treas.; L. L. Travis, v. p.; J. E. Darmer, sec., with V. C. Anderson and Violet S. Scribner, directors.

Inc. 1900, in Utah. **Cap.**, \$100,000; shares 5c par; assessable; 1,800,000 shares outstanding. Annual meeting Jan. 15.

Property: 29 claims, 12 patented, 400 acres, in Dry Canyon, Ophir mining district, Tooele Co., Utah, said to show gold, silver, copper, lead and zinc ore, but not in commercial quantity at present. Miners said to have produced a little ore before present company acquired it.

Development: by tunnels with a total of 8,000' underground workings.

Production: shipped two cars of ore, 1916, netting about \$2,000. Company is shipping some ore while doing development work, 1917.

EUREKA OPHIR MINE UTAH

At Dry Canyon camp, via Stockton, in Rush Valley district, Tooele Co., Utah, on the S. P. L. A. & S. L. R. R.

Property shows veins with replacement orebodies in Paleozoic limestones at and near dike contact and was shipping 50 tons a month from the 200' and 375' levels, averaging 8% copper, 15 oz. silver, 10% lead, in 1913.

Property idle in 1914, but reported operated under bond and lease by Mineral Development Co., in 1915, and shipping \$26.92 ore from the 200' level. Plans sinking main shaft to 400' level. No recent returns.

FEDERAL MINING & MILLING CO. UTAH

Stateline, Iron Co., Utah. I. C. Clark, mgr. Company owns the Ophir mine and a mill in Rice canyon. Reported to have taken a working option on the Blue Jay group in Washington mining district, Beaver county, in 1916. Is a private corporation.

GOLD BOND MINING & MILLING CO. UTAH

Office: 27 Latimer Block, Salt Lake City, Utah.

Officers: A. A. Crome, pres.; Walter Crome, v. p.; Wm. Crome, sec.-treas., with W. C. Howe and C. F. Stanley, directors.

Inc. 1898, in Utah. **Cap.**, \$25,000; shares 5c par; assessable; 200,000 shares outstanding.

Property: 2 unpatented claims, 4 miles from a railroad, Tooele Co., Utah, shows a contact fissure vein, traceable on surface and carrying streaks of copper, gold, silver in limestone formation. Assays average 4% copper. Is merely a prospect reported to have good showings. Developed by a shallow shaft and 120' tunnel, with about 300' of workings. Tunnel being driven to cut orebody. Four men employed.

LION HILL CONSOLIDATED MINES CO. UTAH

Office: 50 Congress St., Boston, Mass. **Mine office:** Ophir, Utah.

Officers: E. W. Clark, pres.; Ed. A. Fordyce, sec.-treas.

Inc. Sept., 1910., in Maine. **Cap.**, \$1,000,000; shares \$1 par; fully paid; 431,347 issued.

Property: 640 acres in the Ophir camp, Tintic mining district, Tooele Co., reported to show high-grade silver-lead ore in fissure veins in limestone formation.

Development: by 5,000' of shafts, tunnel and drifts. Operated by leases, and zinc-silver-lead ore mined, 1915-16.

MONO DEVELOPMENT CO.

UTAH

Address: J. H. Cook, pres., or Matt Gisborn, Salt Lake City, Utah. Mine at Dry Canyon, near Ophir, Salt Lake Co., Utah. Stock assessed $\frac{1}{4}$ c a share.

Property: a group of claims, 300 acres, noted in 1872-3 for its high-grade silver ore. Claims are near the following producing mines: Mono Brooklyn, Thad Stevens, Kearsage and Eureka Ophir. A new wagon road built Oct., 1917, from Dry Canyon to the railway gives a new impetus to work, as heretofore ore was hauled 9 miles to Stockton.

Developed: by 2,500' tunnel.

NEW STOCKTON MINING CO.

UTAH

Office: Mankato, S. D. Mine at Stockton, Utah.

Officers: F. M. Currier, pres.; R. A. Dunham, v. p.; W. Z. Harrison, sec.-treas., Hess Bldg., Salt Lake City. W. A. Wilson, cons. engr., 406 Dooly Block, Salt Lake City; C. B. Kennedy, W. D. Kimball and M. M. Ferguson, directors.

Property: the old Ben Harrison mine at Stockton showing a vein with one to two feet of ore, which averages 10% to 45% lead, 5 to 40 oz. silver and 60c to \$7 gold per ton.

Development: by shaft with main work on 200' and 500' levels.

Production: \$70,000 in 1913-1914. As shipped the ore has averaged \$12 to \$15 per ton with silver-gold-lead values.

In 1917 lessees were shipping ore averaging 45% lead and 35 oz. silver per ton.

OPHIR HILL CONSOLIDATED MINING CO.

UTAH

Office: Miner Bldg., Butte, Mont. Mine office: Ophir, Tooele Co., Utah.

Officers: Wm. A. Clark, pres.; W. C. Siderfin, sec.; E. W. Clark, treas. and gen. mgr.; preceded with Chas W. Clark, directors. A. G. Swanson, mine supt.; R. H. Dunstan, mill supt.; E. Bowman, engr. Company is managed as a close corporation.

Property: one-half mile north of Ophir, carries the 5' Top-vein, the 20' Big vein, the Middle vein 10', the Copper vein 8', and the Blue vein 6' thick, and from 10'-100' wide.

Ore: contains argentiferous galena, with pyrite, averaging 8% lead and 10 oz. silver per ton; also some copper and zinc ores. Ores occur as replacements in argillaceous limestone and shale, in 3 clearly defined shoots, known as the Wild Delirium, Miner's Delight and Western Stope.

Development: an 1,800 incline shaft, with the usual levels and stopes, also a transportation tunnel nearly 1 mile long, through which all ore is taken. This tunnel intersected the vein on the 1,300' level; it also drains the mine at depth.

Equipment: includes a steam plant, not operating, and a hoist; there is a gravity tramway from the mine to the 200-ton mill.

Production: averages about 100 tons daily of lead-silver ore, with a little gold and 2 $\frac{1}{2}$ % copper. Concentrates run about 10-12 oz. silver and 10-12% lead per ton. The property is an excellent one. A branch line of the Salt Lake Route was built to the property in 1912.

OPHIR KING GOLD MINING CO.

UTAH

Mine near Ophir, Tooele Co., Utah.

Inc. Nov., 1907, in Utah. Cap., \$10,000; shares 2c par, assessable.

Lands: 30 acres, patented, 9 miles from railroad, adjoining the Ophir Hill and Cliff Mining Co.'s properties and carry auriferous and argentiferous copper and lead ores. Mine has 400' tunnel, with some crosscutting and several shallow shafts. Property worked under lease in 1913. Prop-

erty and equipment were sold at sheriff's sale in Nov., 1914, to John B. Holmes, for \$1,750, to satisfy a judgment obtained by Holmes.

OPHIR QUEEN MINING CO.

UTAH

S. Crawford, Cedar River, Mich., controls property.

OPHIR-UTAH MINING CO.

UTAH

Idle. **Office:** Salt Lake City, Utah. Mine near Ophir, Tooele Co., Utah. G. G. Schliep, pres.; C. L. Olson, sec.-treas.

Inc. Feb. 13, 1909, in Utah. **Cap.**, \$250,000; shares 25c par; non-assessable.

Lands: 7 claims, 9 miles from railroad, show copper and lead ores. Has several buildings and a hoist.

STOCKTON STANDARD MINING CO.

UTAH

Address: W. N. Grundy, 523 Atlas Blk., Salt Lake City.

Officers: A. P. Davidson, pres.; D. J. Lemmon, v. p.; W. N. Gundry, sec.-treas., with H. Roy Allen, Hon. A. C. Smoot, E. V. Anderson and Carl F. Beuhner, directors.

Inc. in Utah. **Cap.**, \$10,000; shares 1c par.

Property: 10 claims, 5 patented, 170 acres, said to show a vein of silver-lead ore in a 70' shaft.

Development: by 200' shaft, with 450' drift in which a N.-S. fissure has been cut showing ore for 60'. Drifting N. on fissure for E.-W. contact in September, 1917.

WEST MERCUR MINING CO.

UTAH

Office: 11 Broadway, New York. J. Macnamara, sec. **Mine office:** Ole Strom, supt., Ophir, Utah.

Company is operating a mine on the western dip of the Camp Floyd district, and has been developing only, in 1917.

Equipment: includes a 150-ton mill.

*OTHER DISTRICTS IN TOOELE COUNTY***KENTUCKY-DOUGLAS MINING CO.**

UTAH

Address: care Roger Traweek, sec., 62 W. 3d St. N., Salt Lake City.

Officers: E. S. Holt, pres.-treas.; Thos. E. Brooks, v. p., with T. S. Fowler, directors.

Inc. 1916, in Utah. **Cap.**, \$1,000,000; shares \$1 par; 600,000 paid for property, 400,000 in treasury.

Property: 10 claims, in Silver mining district, western Tooele Co., Utah, said to show silver-lead ore in veins and deposits in limestone, at and near porphyry contacts.

Development: 150' crosscut tunnel, expected to cut vein at 250'. Is a prospect.

O. K. SILVER M. & M. CO.

UTAH

David Keith, gen. mgr., Kearns Bldg., Sale Lake City, Utah. Thos. Kearns, pres.; W. G. Lamb, sec.-treas.

Inc. 1909, in Utah. **Cap.**, \$100,000; shares 10c par, assessable; assessment No. 14 of 3c per share levied May, 1917.

Property: 33 claims in Erickson mining district, Indian Springs (near Tintic Jn.), Tooele Co., Utah.

Development: by a 280' incline shaft, reported all in ore running better than 186 oz. silver and \$4.70 gold per ton.

Production: in 1916, 5 cars of ore shipped netted \$30,000.

Doing mostly development work, 1917.

WASHINGTON COUNTY

(Includes Goldstrike district.)

ADAH COPPER CO.**UTAH**

Address: St. George, Washington Co., Utah.

Officers: A. H. Dahle, pres.; Geo. A. Axelrad, sec.-treas.; A. B. Harris, mgr.

Inc. 1916, in Utah. Cap., 600,000 shares; 2c par.

Property: the Burg mine, in Harrisburg district, Washington county, 10 miles E. of St. George, said to be a regular shipper of copper-gold-silver ore. Management plans erecting a 40-ton leaching plant in 1917.

BEE BEE MINING CO.**UTAH**

Office: 409 Kearns Bldg., Salt Lake City, Utah. Mine office: Goldstrike, Washington Co., Utah.

Officers: H. G. Snyder, pres.; John A. Bryson, v. p.; Robt. L. Judd, sec.-treas.; with E. J. Lund and Thos. Marioneaux, directors; S. F. Snyder, supt.

Inc. April 13, 1915. Cap., \$100,000; shares 10c par, issued \$70,000. Assessment of 4/10c per share levied, Aug., 1916.

Property: 3 claims, unpatented, in the Goldstrike mining district, Washington Co.

Development: in July, 1915, claimed to show 20,000 tons of \$10 to \$35 free milling ore in fissure vein. Employed 3 men at last accounts.

BULL VALLEY GOLD MINES CO.**UTAH**

Office: 410 Felt Bldg., Salt Lake City, Utah.

Officers: M. R. Evans, pres.; Willard Snowcroft, v. p.; N. A. Robertson, sec.-treas., with M. P. Braffet and R. G. McQuarrie, directors.

Inc. 1913. Cap., \$100,000; shares 10c par.

Property: 16 patented lode claims, 295 acres, 1 millsite, and one placer claim, 35 acres in Goldstrike district, near Enterprisè, about 40 miles from Modena in Salt Lake Route.

Ore: free milling gold quartz found in fissure veins, 3' wide, along porphyry dike in lime, quartz, andesite and rhyolite formation, is said to run as high as \$50 per ton.

Development: 2,247' of workings, including 2 tunnels, 500' and 705' long.

Ore reserves: estimated at 10,000 tons milling ore in sight, valued at \$20 per ton.

Equipment: 3-stamp, 10-ton mill.

Production: consisted of several high-grade shipments in 1915. Plan erecting reduction plant.

BULL VALLEY HASSIAMPIE GOLD MINING CO.**UTAH**

Goldstrike, Washington Co., Utah.

Officers: J. D. Alsop, pres.; Ren Bryson, v. p. and supt.; J. A. Bryson, sec.-treas., with H. J. Burgess, A. B. Hemenway, A. F. Miles, W. E. Ayer, directors.

Inc. July 28, 1913, in Utah. Cap., \$100,000; shares 10c par; outstanding. \$70,500. Annual meeting 1st Monday in July.

Property: 3 claims, 60 acres, unpatented, adjoining Bull Valley Gold Mines Co., in the Goldstrike mining district, covers a large belt of porphyry and quartzite.

Ore: gold in fissure vein, 17' wide, with 80° dip, said to assay from \$1.20 to \$14.60 per ton.

Development: 150' incline shaft, with 165' of drifting on the 100' level and 65' on the 150' level. Plans sinking to the 300' level. Another shaft.

on quartzite and porphyry contact, has been sunk to depth of 50'. There is a 105' tunnel on the vein.

Property is still in the development stage..

GOLDSTRIKE BONANZA MINING CO.

UTAH

Officers: H. G. Snyder, pres.; C. J. Price, v. p.; Rolla E. Clapp, sec.-treas., 603 Newhouse Bldg., Salt Lake City; with B. N. C. Stott and C. A. Peet, directors.

Inc. May 25, 1915. **Cap.**, \$100,000; \$65,000 issued.

Property: 2 groups, 11 lode claims, in the Goldstrike district, about 1 mile W. of Hamburg, and 36 miles from Modena on the S. L. R. R.

Ore: oxide occurs in fissure veins in porphyry, said to be from 2' to 4' wide and to average better than \$20 per ton. Ore is free milling and carries manganese.

Development: 35' shaft, tunnel and crosscuts. Reported sacking high-grade ore at last accounts.

GOLDSTRIKE CONSOLIDATED MINING CO.

UTAH

Office: 603 Newhouse Bldg., Salt Lake City, and Goldstrike, Utah.

Officers: Rolla E. Clapp, pres.-gen. mgr.; Bishop Geo. A. Holt, v. p.; F. A. Johnson, mgr. and supt.; with Thos. Marionaux and P. P. Canfield, directors; J. S. Farrington, sec.-treas.

Inc. May, 1915, in Utah. **Cap.**, \$160,000; shares 10c par; assessable. **Transfer office:** 605 Newhouse Bldg.

Property: 16 unpatented claims, in Goldstrike mining district, about 38 miles S. of Modena on the Salt Lake Route.

Ore: gold occurs in fissures in limestone and quartz porphyry dikes traversing the limestone formation. Assays taken from shaft showed from \$3.65 to \$31 per ton in gold and silver.

Development: 100' shaft, crosscut and surface cuts. Property is a prospect.

GOLDSTRIKE MINING & LEASING CO.

UTAH

Office: 603 Newhouse Bldg., Salt Lake City, Utah.

Officers: H. G. Snyder, pres.; E. J. Lund, v. p.; Rolla E. Clapp, sec.-treas.; with Clyde McQuarrie, Louis R. Lund and H. A. McQuarrie, directors.

Inc. April 16, 1915. **Cap.**, \$100,000; shares 10c par.

Property: lease Nos. 1 and 2 on Hamburg claim of Bull Valley Gold Mines Co., 3 claims of the Herd Girl group, Last Chance and Cripple Creek groups in Goldstrike district, Washington Co., Utah. Said to show gold ore occurring in fissure vein, 4' wide and averaging from \$7 to \$20 per ton.

Development: 500' adit, at depth of 300' with several winzes, drifts and upraises.

Equipment: two 3-stamp mills of 20 tons daily capacity, 20 h. p. engine and compressor.

Ore reserves: 10,000 tons blocked out, according to published reports. Employs 15 men.

LA VORE GOLD MINES CO.

UTAH

St. George, Utah.

Officers: Willard Snowcroft, pres.; R. G. McQuarrie, v. p.; D. H. Morris, sec.-treas., with Irvine McQuarrie and Herrick McQuarrie, directors.

Inc. 1915, in Utah. **Cap.**, \$100,000; shares 10c par; 60,000 issued.

Property: 10 claims in the Goldstrike district, Washington Co., Utah, said to show a vein 11' wide, averaging \$5 gold per ton.

Letters returned, 1917. Probably closed down.

VERMONT

ORANGE COUNTY COPPER MINE**VERMONT**

Strafford, Orange Co., Vt. J. B. Reynolds, mgr. and principal owner, 54 No. Main St., Rutland, Vt. Lovat Fraser, engr.

Lands: 900 acres, held under deed of mining rights, are near the Elizabeth mine, 13 miles from the Boston & Maine railway. Property carries a lenticular orebody, conforming to dip of the country rocks, which include gneiss, under garnetiferous mica-schist and above hornblende-schist, with strike of west of north, and average dip of about 45°. The lens, of 40' extreme width, but not mineralized for the full width, is traceable 4,000' on the property. Ore carries chalcopyrite, disseminated in massive pyrrhotite, averaging 2% copper.

Development: by 110' incline shaft, with about 70' of laterals on the 100' level.

Equipment: includes steam boilers, a 8-drill air compressor and several mine buildings. Geology is described, Bull. 455, U. S. Geol. Survey. Owner writes that "mine is in transition state—new development anticipated."

PIKE HILL MINES**VERMONT**

Address: Corinth, Orange Co., Vt.

Officers: John H. Allen, pres.; John J. Coakley, sec.-treas.; preceding, with C. A. Andrews, George Marshall and D. S. Conant, directors; H. G. Hunter, mgr.

Inc. Jan. 9, 1906, in Vermont. **Cap.**, \$200,000; shares \$100 par; outstanding, \$160,300.

Property: 101 acres, freehold, in the Corinth district, 14 miles from the Boston & Maine railway, shows mica-schist carrying lenses of chalcopyrite disseminated in pyrrhotite, of 2% estimated average copper tenor. The mine was worked in a small way at intervals during the nineteenth century.

Equipment: hydro-electric power and 100-ton flotation plant being installed, 1917.

Production: 131,911 lbs.; fine copper in 1905; 304,377 lbs. copper and 1,698 oz. silver in 1906; 425,367 lbs. copper and 2,292 oz. silver in 1907. Inactive from Nov., 1907, until Oct., 1915, when experiments with the flotation process were started. Shipments from Oct., 1915, to Jan., 1916, about 210 tons, claimed to run 10% copper and 1 oz. silver per ton.

VERMONT COPPER CO.**VERMONT**

Office: 576 Fifth Ave., New York. **Mine office:** South Strafford, Orange Co., Vt. G. E. Parks, sec.; G. M. Heckscher, mgr.

Inc. 1906, in Arizona, as successor of Elizabeth Copper Co. **Cap.**, \$1,000,000, and since has taken over the Strafford Mining Co. and the Sharon Power Co.

Property: 12 miles from Pompanoosue, the nearest rail station, includes the old Elizabeth mine, opened 1793, for magnetic pyrites, and operated early in the nineteenth century by the Vermont Copperas Co., which is said to have made, at one time, about 6,000,000 lbs. of copper yearly, beginning a small incidental production of copper about 1830, when it was found that the mine carried an average of about 3 per cent copper, in the form of chalcopyrite disseminated in pyrrhotite.

Geology: the orebody is a thin lens of pyritic ore in foliated mica-schist, wedging out at the bottom. The lens has been mined for 700' in length and is reported, by the management to have been opened up for more than 2,000' in length, ranging from 50 to 100' in width, of which 8 to

10' is ore. Management estimates upwards of 1,000,000 tons of pyritic ore in sight, consisting of pyrrhotite and pyrite with small amounts of chalcopyrite. Diamond-drill borings, made 1909, have shown ore to continue for 200' depth below the present workings.

Development: by a 1,340' tunnel with back of 225', and a 200' incline blind shaft. The dumps carry about 50,000 tons of discarded ore, of which large portions are estimated by the management to average 1.75 per cent copper.

A hydro-electric power station on the White river, equipped for 500 h. p., formerly transmitted current 9 miles to the mine and works. There also is a small steam plant and an air compressor at the mine.

The reduction plant at the mine included a mill and smelter, the former using the Rowland magnetic separation process. The smelter has a 300-ton blast furnace in which semi-pyritic smelting was tried, but abandoned 1908, for heap roasting.

After an idleness of several years, operations reported to have been resumed June, 1916, under management of Professor George Guess of the University of Toronto.

In September, 1917, it was reported that a Boston syndicate had bought the 300,000 tons, more or less, of dump ores and erected a 250-ton flotation plant to treat the material. Rich ore is also said to have been opened recently.

VIRGINIA

ALLEGHANY ORE & IRON CO.

VIRGINIA

Address: Care H. B. Spackman, pres., Buena Vista, Va.

Property: iron ore mines at Oriskany, Va., having an annual output of 225,000 tons.

AMERICAN RUTILE CO.

VIRGINIA

Address: Pacific Bldg., Washington, D. C. W. M. Slater, pres.; Albert Harper, sec.-treas.; H. Wanke, supt.

Inc. in Virginia. Cap., \$100,000; shares \$100 par; issued \$97,500.

Property: 5 claims at Roseland, Nelson Co. Rutile, containing 96% titanium oxide, is mined from open-cut workings. Equipment includes steam hoist, pump, a 2,500' aerial train, and a 10-stamp mill. The mill, with a daily capacity of three tons, is equipped with Wilfley tables, and a Wetherill magnetic separator. Gross earnings for 1914-1915 were \$70,000, with operating expenses of \$25,000. Production amounted to 250 tons of rutile, with ilmenite as a by-product.

No recent figures obtainable.

ARMINIUS CHEMICAL CO., INC.

VIRGINIA

Office: 44 Pine St., New York. **Cap.,** \$10,000. J. Frederic Kernochan, pres.; T. McGovern, mgr., Mineral, Louisa Co., Va.

Property: shows a large lens of pyrite in ancient schistose rocks, worked for iron pyrite. Mine worked by shafts. Equipped with steam-hoists, Ingersoll compressors, and output is concentrated in a 350-ton mill.

CABIN BRANCH MINING CO.

VIRGINIA

Office and mine: Dumfries, Prince William Co., Va. Is controlled by the Virginia-Carolina Chemical Co.

Property has a large lenticular body of iron pyrites carrying up to three-fourths of 1% copper recovered as a by-product after roasting.

Development: by shaft, equipment, including a steam hoist and air compressor. Mine employed 50 men at last accounts.

CRIMORA MANGANESE CORPORATION

VIRGINIA

Office: 30 E. 42nd St., New York, and Crimora, Augusta Co., Va.

Directors: Presidency vacant in Sept., 1917; John D. Brooks, v. p.; John H. Hulbutt, sec.-treas. Wm. L. Hogg, mgr., Crimora.

Inc. Sept. 29, 1914, in Va. **Cap.**, \$1,000,000; shares \$100 par; all outstanding. **Transfer office:** Security Transfer & Registrar Co., New York. Annual meeting, last Monday in Sept.

Bonds: authorized and issued \$500,000 1st mtge. 6% sinking fund gold bonds, due 1929.

Property: 946 acres, including the Crimora mine, 2 miles east of Crimora station, on the Norfolk & Western R. R. The mine was first opened in 1867 and acquired by present company in 1914. Deposit consists of manganese-ore masses of various sizes scattered through a clay basin, $\frac{1}{2}$ mile long, several hundred yards wide and 200' deep. The ore is hard and consists of psilomelane and pyrolusite. Percentage of ore to clay varies considerably, from 2 to 20% of ore to the clay, by volume. Ore assays 42 to 48% manganese. See U. S. G. S. Bull., No. 427, pp. 58-61, pp. 101, 270.

Development: by open pits using a drag line excavator; formerly done by underground workings. Management claims 1,000,000 tons ore proven, with probable reserves of 3,000,000 tons.

Equipment: electric power, and a 200-ton mill, which started operating in June, 1916. Management anticipates a yearly production of 15,000 to 25,000 tons ore.

DURGY MINE

VIRGINIA

Being operated by T. G. Pool and associates of Virgilina, Va.

Property: 1,500 acres in Person county, North Carolina, shows copper ore occurring as chalcocite and bornite in a fissure in greenstone schist.

Development: by 515' shaft is reported to have blocked out 100,000 tons of 2% copper ore.

Equipment: includes hoist, compressor and pump with steam, air and electric power. Company planned to install a 100-ton flotation mill in 1917.

GOONEY MANOR COPPER CO., INC.

VIRGINIA

Front Royal, Warren Co., Va.

Officers: Hugh E. Naylor, pres., gen. mgr. and purch. agt.; Lewis F. Cooper, v. p.; S. M. Chiles, sec.; Geo. H. Bowman, treas.; preceding officers, H. C. Sheetz, N. S. Waller, S. M. Chiles, S. R. Millar, J. S. West, A. J. Sager, H. R. Kern, directors.

Inc. July 12, 1909, in Virginia. **Cap.**, \$500,000; shares \$100 par; issued 3,763. Annual meeting third Thursday in July.

Property: 84 acres, 5 miles south of Front Royal, reported to carry a fissure vein in porphyry and contact deposits between limestone and porphyry, with generally N. E.-S. W. strike and dip of about 55°. Main orebody is reported to average 7' width, and to be traceable 800', carrying a little malachite near surface, with chalcopyrite at depth, averaging 5% copper, 1 to 6 oz. silver and \$2.50 gold per ton. Orebodies apparently are lenticular.

Development: by a 40' open cut, a 65' tunnel and by shafts of 250 and 228' without laterals, estimated by the company to show 35,000 tons of ore.

Equipment: includes a 150 h. p. steam plant, with a 50 h. p. hoist good for 800' depth, and a 1-drill Rand air compressor. Buildings include a smithy, engine house, tool house and dwelling.

A 120-ton mill for crushing alumina was erected in 1917, running regularly since Jan. 1. Equipped with Buchanan and Sturtevant crushers and 4 screens. Another 150 h. p. steam hoist installed, $\frac{1}{2}$ mile standard railroad, 3 complete quarry plants and pumps for water supply. Employs 20 to 50 men. Product regularly shipped.

HIGH TOP MINING CORPORATION

VIRGINIA

Walter Hall, supt., Elkton, Rockingham Co., Va.

Inc. 1909, in Arizona. Cap., \$10,000,000; shares \$10 par. Is a reconstruction of the High Top Copper Mining Co.

Property: about 1,000 acres in Greene Co., Virginia, 10 miles from Elkton, on the Norfolk & Western railway, said to show ore zone 600' wide carrying sulphide ores, claimed to give average assays of 6% copper, 10 oz. silver and \$15 gold per ton, which figures are entirely too high.

Development: by shaft 130' deep, with a 30' crosscut said to show 8' of rock spotted with bornite and chalcocite, giving sample assays of 10% copper. There also is a 55' shaft and several shallow pits and open cuts, tracing the outcrop of the entire length of the property. A report formerly circulated by the company states that there are 70,000,000 tons of commercial ore discovered, which is a statement worthy of Baron Munchausen. Property does show occasional spots and bunches of copper ore and a few tons of selected ore have been shipped, but the mineralized rock as a whole is altogether too lean to work at a profit. Company is believed to have no chance to succeed, its officers to be self-deceived and stock is considered valueless. The property has been visited by various geologists and described in official government reports and the guarded warning given therein should be heeded.

At the request of the financial house backing the company, this office sent Geo. Herbert Morgan, E. M., to look over the property and see if above statements were incorrect. His examination confirms what has been said and throws serious doubt on the judgment, to say the least, of the retired army officer, who is acting as the company's advisor and engineer.

HOLLOWAY MINE.

VIRGINIA

Idle. Owned by Wm. M. Pannebaker estate. Virgilina, Va.

Property: the old Holloway or Eustis mine, 3½ miles S. of Virginia, Halifax Co., Va., on a spur of the Southern railway. Has a 460' shaft, and produced ore from 75', 150', 200' and 300' levels. The vein is strong, persistent and 3 to 33' wide, owing to lenticular expansions. The ore is chalcocite in quartz, with epidote. Is described in detail by Weed in Bull. 455, U. S. Geol. Survey, p. 79. Produced 6,000 tons of 12% ore about 1902.

KAY MINE SMELTING CO.

VIRGINIA

Address: Mountainair, New Mexico.

Officers: Z. L. Kay, pres. and gen. mgr.; J. R. Wilbourne, v. p.; H. P. Wilder, sec.; H. J. Watkins, treas., and Jas. S. Sebree, directors.

Inc. Aug. 8, 1905, in South Dakota. Cap., \$1,000,000; shares \$1 par; 525,000 shares paid Z. L. Kay for property; 200,000 issued.

Property: 261 acres, comprising the Kay farm at the N. end of the Virgilina district, 9 miles from South Boston, in Halifax county, Virginia. The tract shows lenticular quartz veins enclosed in schistose rocks formed from old volcanic tuffs and andesite of the type characteristic of the Virgilina district. Veins consist of white quartz and carry primary copper glance below the water level with carbonates, oxides and some native copper in the oxidized zone. One vein varies from 3 to 6' in width and is said to be traceable 1 mile. A recent report tells of 2 veins 10' wide. The future of the entire district, including this property, depends upon the use of some cheap method of concentration, which flotation apparently supplies.

Company recently acquired some copper claims near Scholle, N. M. In July, 1917, 9 tons sent to Pueblo, Colo., carried 8% copper.

NORFOLK SMELTING CO.

VIRGINIA

A New York corporation; operates under lease on a royalty basis, the smelting department of Virginia Smelting Co.'s works, which see.

SEABOARD COPPER CO.

VIRGINIA

Idle. Office: 77 South Market St., Boston, Mass. Mine office: Virgilina, Halifax Co., Va.

Officers: Geo. R. Leghorn, pres.; Edward L. Pond, sec.

Inc. July, 1902, in New Jersey. Cap., \$300,000; shares \$1 par.

Property: the Dorothy and Bailey mines, 135 acres, in the Virgilina district, 3 miles from the Southern railroad, shows an 8' fissure vein in schist, carrying bornite ore, estimated to average 3 to 4% copper, with combined gold and silver values of \$1 to \$1.20 per ton.

Development: by shafts of 30', 265' and 115', and by 2 tunnels, of 165' each, with a total of 840' of underground workings. The ore occurs in well-defined shoots: the proportion of shipping ore is small but mine might be profitably worked if flotation is used.

Equipment: includes a 275-h. p. steam plant, with a 25-h. p. Lidgerwood hoist, good for 500' depth, and a 5-drill compressor. There is a 100-ton mill, and buildings include an engine house, bunkhouse and office. Company inactive since 1904, but still alive.

SULPHUR MINING & RAILROAD CO.

VIRGINIA

Office: 11 S. 12th St., Richmond, Va.

Officers: S. D. Crenshaw, pres.; A. R. Ellerson, v. p.; Thos. Armstrong, sec.-treas.; P. H. Haskell, supt.; Mineral, Louisa Co., Va.

Property: a pyrite mine whose ore carries low copper content. Has 600' shaft with steam power, compressor, etc. Ore treated in 500-ton concentration mill. Company makes cement copper from its mine and seepage waters, but is primarily a producer of pyrite for sulphuric acid plants. Is controlled by Virginia-Carolina Chemical Co.

UNITED STATES MANGANESE CO.

VIRGINIA

Office: 74 Broadway, New York. Mine address: Elkton, Va. Fred Berger, supt.

Property: a tract of several hundred acres S. E. of Elkton, shows 5' of manganese ore mostly psilomelane and pyrolusite, occurring disseminated and massive in yellow clay overlying quartzite. Recent development indicates a large deposit of commercial ore. Mine has washer and concentrating tables.

VIRGINIA-CAROLINA CHEMICAL CO.

VIRGINIA

General office: Richmond, Va. Corporate office: Jersey City, N. J.

Officers: S. T. Morgan, pres.; E. B. Addison, 1st v. p.; S. D. Crenshaw, v. p.-sec., with C. G. Wilson, N. S. Meldrum, Henry Walters, Harry Bronner, B. Cutler, A. J. Hemphill, Alvin W. Krech, C. I. Stralem, S. H. Miller, and Geo. W. Wetts, directors. S. W. Travers, treas.; E. T. Orgain, aud.

Inc. Sept. 12, 1895, in New Jersey. Cap., authorized, \$98,000,000 com. and \$30,000,000 8% cumulative pfd.; increased May 12, 1914, from \$20,000,000; shares \$100 par; outstanding \$27,984,400 com. and \$20,012,255 pfd. The \$9,988,200 unissued pfd. stock is reserved to provide for conversion of the 10-year 6% debentures. Annual meeting, first Wednesday in Sept. New York Trust Co., New York, transfer agent. Guaranty Trust Co., New York, registrar. Listed on New York and Richmond Stock Exchanges.

Bonded debt: \$12,600,000; first gold 5's dated Nov. 2, 1908; due Dec. 1, 1923; \$4,734,505 10-year 6% convertible gold debentures dated May 15, 1914, due May 15, 1924.

Balance sheet: year ending May 31, 1917, showed assets: \$94,476,148, which included current assets of \$40,135,303, compared with \$34,719,690 the previous year. Current liabilities were \$13,192,158, compared with \$7,437,833 the previous year.

Income account for fiscal year ending May 31, 1917, showed net earnings of \$5,905,250, compared with \$5,427,467 the previous year. Dividends absorbed \$2,020,710. The surplus May 31, 1917, was \$15,608,135, against \$13,175,376 on May 31, 1916.

Company was formed to consolidate a number of manufacturers of fertilizers, acids, chemicals, and kindred products. It owns and operates large pyrite mines, producing a large portion of the pyrite used by it in manufacturing sulphuric acid; in addition it has foreign potash, sulphur, and other properties. Controls the Sulphur Mining & Railroad Co. (which see), which owns pyrite mines in United States, and sulphur deposits in Mexico.

Also the Charleston, S. C., Mining & Manufacturing Co., which owns and mines phosphate rock in Florida, Tennessee, South Carolina, and Kentucky.

VIRGINIA CONSOLIDATED CHEMICAL CORPORATION VA.

Office: 100 Broadway, New York; **Works offices:** Brinton, Bristol and Norfolk, Va. J. T. Williams, pres.

Operates the properties formerly owned by the Virginia Zinc & Chemical Corporation, which has retired from business. While primarily a manufacturer of chemicals used in the paint, paper and rubber business the company also mines considerable raw material from its properties in the different Southern States.

VIRGINIA COPPER MINE. VIRGINIA

Office: care Richard Lamb, 90 West St., New York. **Mine address:** High Hill, Halifax Co., Va. -

Property: the High Hill mine, 617 acres, in the Virgilina district, developed by 8 shafts of 140 to 340' depth, with about ½ mile of workings. Mine shows 2 veins giving assays up to 5.9% copper, 2 oz. silver and 80c gold per ton. Ores are highly silicious, the gangue containing about 87% silica, which precludes smelting and wet process concentrating. Property was formerly operated by the Virginia Copper Co., Ltd.

Equipment: includes a 350-h. p. steam plant. Idle several years, but plans resuming operations in 1917.

VIRGINIA LEAD & ZINC CORPORATION. VIRGINIA

Address: J. H. Batcheller, mgr., Mineral, Va.

Officers: Berkeley Williams, pres.; W. M. Cary, v. p.; Norwood Bentley, sec.-treas.

Inc. Nov. 30, 1915, in Virginia. **Cap.**, \$600,000, including \$200,000 10% cumulative pfd. \$5 shares, and \$400,00 com. \$5 shares. Debentures \$200,000 3-year 6% convertible gold notes.

Property: 1,200 acres; the Valznico mine in Spotsylvania Co. and the Valcooper mine in Louisa Co., Va., under development during 1916.

The Valznico mine has a fissure vein in schist, dipping 75° S. E. and pitching N. 40° E. The ore is a complex sulphide, containing 4% lead, 12% zinc and silver, copper, gold and iron.

Development: by 250' vertical shaft and 2,400' of workings.

Equipment: Lidgerwood hoist, Sullivan compressor, Cameron pump, steam plant and 50-ton concentrating mill.

Production: in 1916 was 2,300 tons of ore, averaging 4% lead and 12% zinc.

VIRGINIA MINING CO. VIRGINIA

Controlled through stock ownership by General Chemical Co. Operates the Gossan pyrite mine at Monarat, Carroll Co., Va.

VIRGINIA SMELTING CO.**VIRGINIA**

Office: 131 State St., Boston, Mass. Works office: West Norfolk, Norfolk Co., Va.

Officers: W. E. C. Eustis, pres.; A. H. Eustis, v. p.; F. A. Eustis, sec.-treas.

Inc. Nov. 10, 1909, in Maine, as successor of Eustis Smelting Works. Cap., \$1,000,000; shares \$100 par; nonassessable; in \$500,000 preferred and \$500,000 common stock. Annual meeting, first Tuesday in October.

Company owns the Eustis Smelting Works, or Norfolk smelter, on tide water, near Norfolk, with railroad facilities to all points. The situation is favorable for custom smelting, as more coal is shipped from this vicinity than from any other center in North America and traffic commands favorable freight rates on return cargoes. The location also insures the best coke for metallurgical use, on advantageous terms. Ore received by vessel is unloaded by machinery into standard railway cars, with facilities to set aside any desired portion into a sample car, standing on a separate track. The unloader has a maximum capacity of 1,000 tons in 24 hours. Railroad cars containing ore are hauled by locomotives upon trestles, whence ore and coke are dumped into storage bins having capacity for 25,000 tons of ore, and if necessary, the works can store 50,000 tons of ore.

The smelter has a single water-jacket blast furnace of 600 tons daily capacity, using sea water for the jackets. The plant does a general custom business, treating ore from Sherbrooke, Quebec, and ore from El Cobre mine of the Cuba Copper Co., the iron in the Sherbrooke ore fluxing the silicious Cuban ore. The works contain 2 Dwight-Lloyd sintering machines; one operates on copper material in connection with the blast furnace, the other treats the leached residue and pyrite cinder to produce sinter, which is shipped to pig iron blast furnaces. The leaching department contains a Ramen-Beskow chloridizing furnace; two Holt-Dern chloridizing furnaces; a precipitating plant, and a large gas washing plant.

The smelting department of the works is operated under a lease on a royalty basis, by the Norfolk Smelting Co., a New York corporation.

VIRGINIA ZINC & CHEMICAL CORPORATION, LTD. VIRGINIA

In liquidation. Properties acquired by the Virginia Consolidated Chemical Corporation, which see.

WASHINGTON

Spokane is the natural center for the mining districts of eastern Washington, as well as the Coeur d'Alene region, and Seattle for western Washington, but the descriptions are arranged geographically by counties, because this seems the most convenient grouping for quick reference.

CHELAN COUNTY

Includes Wenatchee, Bridge Creek, or Stehekin, Entiat, Horseshoe basin, or Pershall, Lakeside, Leavenworth, Peshastin, or Blewett, and Railroad Creek districts.

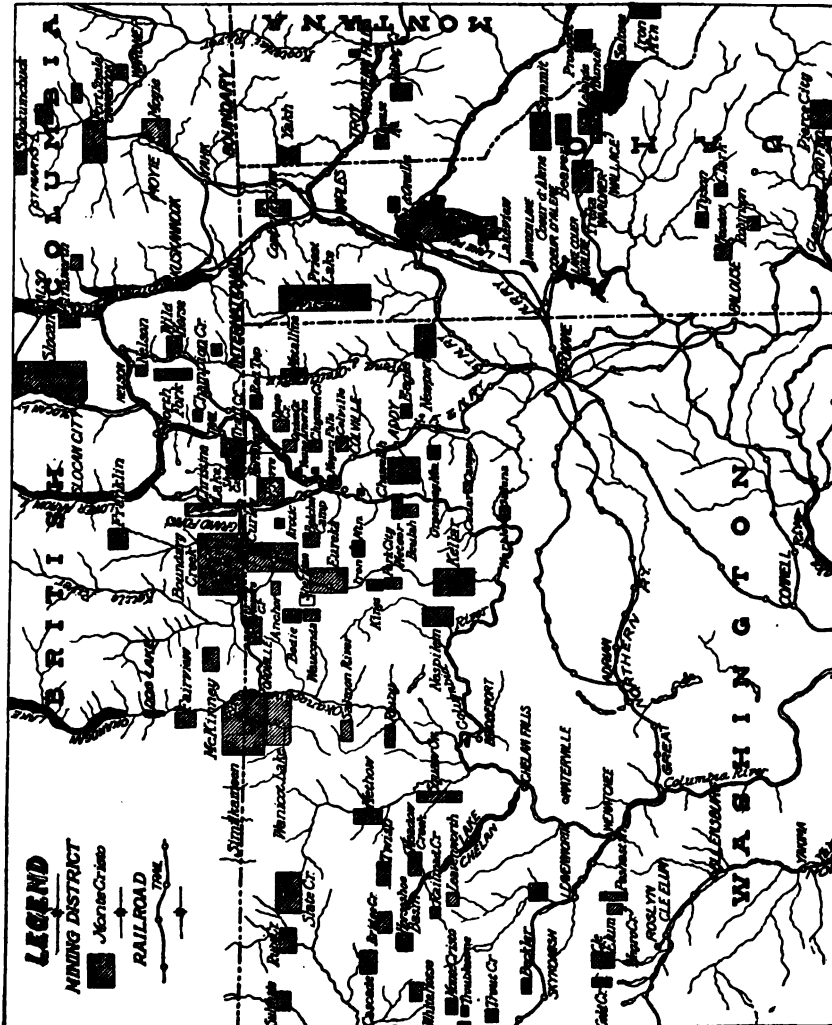
AURELIA CROWN CO.**WASHINGTON**

Office: P. O. Box 187, Seattle, Wash. O. Robert Dahl, pres., treas. and gen. mgr.; A. E. Coxhead, v. p.; H. M. Dahl, sec.; preceding officers, Geo. C. Whipple and L. A. Sherman, trustees.

Inc. in Washington. Cap., \$10,000,000; shares \$10 par; nonassessable; issued \$8,137,600.

Lands: 36 claims, 730 acres and 2 mill sites of about 10 acres, 16 miles

west of Lucerne, Chelan Co., Wash. Property includes gold, copper, silver-lead and molybdenite mines, having 8 tunnels, of about 1,300' aggregate length, and several open cuts. The Crown Point molybdenum mine has 8 tunnels, said to develop 2,000 tons ore. The Silver Trail silver-lead mine has a 6' fissure vein. Tunnel No. 3, on the copper vein, shows 4 ore shoots,



MINING DISTRICTS OF NORTHEASTERN WASHINGTON, NORTHERN IDAHO AND BRITISH COLUMBIA

of 4 to 8' width, carrying ore said to give average assays of 15.5% copper and \$8.65 gold and silver per ton.

Geology described, Min. Technology 15, Bull. 111, p. 79.

Equipment: includes a hydraulic plant, with 2 Pelton wheels and 832' of 10" and 11" and 472' of 6" double-riveted steel hydraulic pipe. There is

an air compressor. Buildings include a machine shop, engine house, sawmill, warehouse and 3 cabins. The mill has 2 crushers, rolls and a Schull concentrator. Has an aerial tram.

Company makes claims of large annual profits to be earned from the operation of its mines, sawmill, water power plant and in water and rail transportation, but the railroad is yet to be built, the mines are only slightly developed and the tonnages which would make annual earnings of \$2,800,000 possible, are neither blocked out nor reasonably assured. The total expenditure on the property to Jan. 1, 1913, is \$86,552, a small sum compared with the amount of stock issued. The company's circulars considered misleading and not liked. Company fails to answer letters, possibly because of the comments given above.

CHELAN CONSOLIDATED COPPER CO. WASHINGTON

Michael J. Cocoran, asst. sec.-treas, 180 Broadway, New York.

Operating office: 811 Lowman Bldg., Seattle, Wash. **Mine office:** Leavenworth, Chelan Co., Wash.

Officers: F. D. Wilsey, v. p.; Thos. J. Higgins, sec.-treas.; preceding officers, Henry D. Bristol, Edw. W. Kuhn, A. T. La Vallette, J. L. Jurey and Louis Arndt Stein, trustees.

Inc. May, 1906, in Wash. **Cap.**, \$12,000,000, shares \$10 par, nonassessable; issued, \$5,779,140. Guaranty Trust Co., New York, registrar. Annual meeting first Tuesday in June. Company absorbed the Red Mountain Gold & Reduction Co., the North Star Mng. Co. and a large number of individual mining properties.

Property: 14 claims at Index, Snohomish Co., and 130 claims at Red Mountain, Chelan Co., Wash., 50 miles north of Leavenworth.

Property: the Index mine, between the Ethel and Bunker Hill Sullivan mines, has a 4' vein, opened by tunnels of 600' and 700', with about 2,000' of workings, showing a 6" paystreak of high-grade bornite and chalcopyrite ore.

The Red Mountain lands, unpatented, 4 miles west of Phelps creek, include 67 claims owned outright, and 58 additional claims held through the North Star Mining Co., which is controlled through stock ownership.

Development: by 2,000' main tunnel, supplemented by 600' of diamond-drill borings, showing a 5' vein carrying values in copper and gold, and 2 smaller veins.

Equipment: includes gasoline power and an Ingersoll air compressor, and there are 6 or 7 buildings.

Company is inactive, as ore is too low-grade and in too small quantity to operate profitably.

CHEROKEE MINING CO. WASHINGTON

Incorporators: Wm. Rakestraw, M. E. Bennett, Lloyd Harris, C. G. Edwards, all of Wilbur, Wash., and I. Toner, of Spokane.

Inc. 1917 in Washington. **Cap.**, \$1,500,000. Will develop the Cherokee group of claims.

HOLDEN GOLD & COPPER MINING CO. WASHINGTON

Mine near Lucerne, Chelan Co., Wash.

Officers: J. H. Holden, pres.-mgr., Chelan, Wash.; A. W. Lachapelle, v. p.; O. A. Hoag, sec.-treas.; above with Chas. N. Boon, directors.

Cap., \$250,000. Company has no debts and no earnings to date.

Property: 3 claims, 60 acres, on Railroad creek, near Lake Chelan, 87 miles N. of Wenatchee on the G. N. R. R., shows gneiss and schist cut by granite with a vein of 40' average and 185' claimed maximum width.

Development: by 6 tunnels, Nos. 2 and 3 being connected by a blind shaft with about 2,000' of workings on 3 levels. There also are numerous

open cuts. Mine shows ore said to assay from 7 to 10% copper, 2 oz. silver and \$5 to \$10 gold per ton. Idle, except for annual assessment work.

KING SOLOMON MINE. WASHINGTON

S. J. Gray, owner, Lakeside, Wash.

Property: near Lucerne, Chelan Co., Wash., consists of 3 patented claims, developed by 1,500' of tunnels said to show fissure veins in gneiss porphyry, carrying gold-silver-copper values.

CLARKE COUNTY

Includes the southwesternmost districts of the state, near Portland, Oregon.

WASHOUGAL GOLD & COPPER MINING CO. WASHINGTON

Address: Washougal, Clarke Co., Wash.

Officers: F. A. Mabee, pres.; John Scharboarer, v.-p.; J. B. Jordan and T. A. Altman, secretaries; Dr. Otta Sutter, treas., at last accounts.

Inc. 1902 in South Dakota. **Cap.**, \$1,000,000, shares \$1 par.

Property: 560 acres, held on a 30-year lease, from the State, near Mt. St. Helens, in the Bald Mountain district, on the upper Washougal river. Several vertical fissure veins are in granite, one of which, averaging 6' thick, is developed by an 1,800' tunnel exposing ore, estimated to average 5% copper, 15% lead and zinc, 2 to 70 oz. silver and \$1 to \$15 gold per ton.

Equipment: includes gasoline hoists and a 3-drill Sullivan air compressor. Had a 25-ton concentrating mill working in 1916, but no information available.

Described in Mining and Scientific Press, 1916, by F. Brinsmade.

FERRY COUNTY

Includes Belcher, Columbia river placers, Danville, Lone Star, Meteor, or Covada, Republic and San Poil districts.

ALLIANCE MINING CO. WASHINGTON

Address: 622 Old National Bank Bldg., Spokane.

Officers: M. O. Hunter, pres.; F. H. Hunter, v. p.; W. W. Gifford, sec.-treas.; preceding officers, J. M. Lloyd and C. M. Hansen, directors.

Inc. Sept. 9, 1913, in Wash. **Cap.**, \$1,500,000, shares \$1 par, outstanding \$1,303,288; assessable, not exceeding 5 assessments of 5 mills each year. Bonds authorized \$100,000, outstanding \$32,400. In 1914 the company took over for \$171,000 the property of the Anaconda Gold Mng. & Reduction Co., paying \$120,000 in Alliance stock, and assuming an indebtedness of \$51,000 for the remainder.

Property: 7 claims, 5 patented, 100 acres, in the Eureka mining district, Republic, Wash., adjoining the property of the Republic mine, cover 3,500' along the strike of the Republic vein, 12' to 30' wide, and the Princess vein, 2' to 10' wide.

Early development of the properties was done when only high grade ore was shipped, and the Alliance Co. acquired the holdings of 4 different companies for the purpose of mining and milling the low grade ore. The veins are developed to a depth of 600' by means of a 385' tunnel and a 400' winze, with total workings of 5,000'. No development work has been done since organization, but operations are to be resumed in the near future.

Equipment: includes gasoline hoist and a 3-drill compressor.

AMERICAN REDUCTION CO. WASHINGTON

Address: Republic, Ferry Co., Wash.

Inc. in 1915 by F. R. Clark, of Spokane; P. N. Clark and G. W. Sommer. The property of the North Wash. Power & Reduction Co., which had

been held by a receiver for 2 years, was purchased together with adjoining holdings.

Equipment: includes concentrator, mill, and power plant. No returns available.

BEECHER GOLD MINING CO.

WASHINGTON

Address: Orient, Wash. Alex. A. Anderson, mgr.

Property: near Orient, Ferry Co., Wash., has the Beecher mine on it in which gold-quartz ore occurs in stringers.

Idle, 1917.

BELCHER MINING CO.

WASHINGTON

Mine office: Republic, Ferry Co., Wash. Jos. A. Anderson, pres. and mgr.

Property: the Belcher claim shows irregular replacement deposits of pyrite associated with garnet, epidote, tremolite and magnetite in marble and interbedded shale, etc., intruded and metamorphosed by monzonite porphyry dikes and sheets.

Development: by 3 tunnels showing sulphide orebody 5'-20' thick, on dip plane (see Bull. 550 U. S. G. S. 1914, pp. 167, 175, 179).

A 1,000' aerial tram connects the tunnels with ore bins on the railroad. Water, brought 2,000' from Lambert creek, through a steel pipe, generates electric power, supplemented by a gasoline auxiliary plant.

Equipment: includes an air compressor and power drills.

Property was reopened May, 1911, and shipped low-grade gold-bearing pyritic copper ore to Granby smelter. Mine reported, 1914, to have opened up lenses of low-grade ore on the lower level. No recent returns.

BEN HUR LEASING CO.

WASHINGTON

Mine office: formerly at Republic, Ferry Co., Wash.

Dissolved: company was a co-partnership formed to operate the Ben Hur mine at Republic, Ferry Co., Wash., under lease.

Property: the Little King and Queen claims on Gold Hill, developed by 800' shaft, showing gold, silver and copper ore. Equipped with steam power, compressor, etc. New plant installed 1913. Property was intermittently worked, 1911-12, and drifting done on the 200' and 400' levels. Mine was operated under lease by Cons. Mining & Smelting Co. of Canada, Ltd., during 1914-15, but given up early in 1916. See Vol. X. of the Copper Handbook.

COPPER BUTTE MINING CO.

WASHINGTON

Orient, Ferry Co., Wash. J. D. Gumpper, pres.; H. J. Miller, sec.; Willis Townsend, gen. mgr.

Inc. Dec., 1905, in Washington. **Cap., \$1,000,000;** shares \$1 par.

Property: 4 claims, patented, in the Pierre Lake district, south of Orient, shows 2 veins in open cuts, 14' and 15' wide, respectively.

Development: by 300' shaft with drifts on the 100' level shows copper-gold ores, but not in commercial quantity. During 1916-'17, a 1,000' tunnel was driven. It has a vertical depth of 430', and is expected to cut the ledge within a few feet.

FIRST THOUGHT MINING CO.

WASHINGTON

Idle. Orient, Wash. Patrick Burns and Blake Wilson, of Calgary, owners. Alexander Sharp, mgr., Vancouver, B. C. Property produced \$750,000 prior to 1909, idle since. Company won a suit against Stevens County assessor, June, 1916, and court ordered valuation reduced to \$10,000.

GWINN MINING CO.

WASHINGTON

Idle. **Address:** Meteor, Ferry Co., Wash. Peter Proff, mgr. at last accounts.

Company owns a group of claims in the Meteor, or Covada district, wing fissure veins in sedimentary rocks cut by diorite and carrying complex ore said to average about \$16 per ton in gold, silver, copper and lead.

Development: by shafts and tunnels, said to have blocked out considerable low-grade ore which is being treated in a 50-ton concentrator. Company is also erecting a dam on Hall creek for its hydro-electric plant.

INOIS COPPER & SILVER MINING CO. WASHINGTON

Idle. Letters to Pittsfield, Ill., neither answered nor returned. Mine Keller, Ferry Co., Wash. J. C. Davis, pres. and gen. mgr.; J. D. Night, v. p.; A. Hamilton, supt.; W. S. Clapp, sec.; J. D. Hess, treas., at last counts.

Inc. in Washington. **Cap.**, \$2,000,000; shares \$1 par, nonassessable, in 90,000 preferred and \$1,000,000 common stock.

Owns 9 claims, in the San Poil district. The Columbia group of 4 ms, 3½ miles from Keller, shows auriferous and argentiferous copper. The Oregon group has 300' of workings, developing a vein claimed to be 2' wide, showing low-grade ore, carrying some zinc.

Not favorably regarded.

INTERNATIONAL GOLD MINING CO. WASHINGTON

Head office: Empire State Bldg., Spokane, Wash. **Mine office:** Rock-Ferry Co., Wash.

Officers: Peter Reid, pres.; D. F. Kizer, v. p. and atty.; G. H. Walters, v. p.; C. L. Russell, treas.; above with H. L. Williams, directors.

Cap., \$1,000,000; shares, \$1 par.

Property: 6 claims in the Orient district, developed by tunnels and opened sufficiently for a small mine.

Knob Hill Mining Co. WASHINGTON

Office: 622 Old National Bldg., Spokane. **Mine office:** Republic, Wash.

Officers: John Byrne, pres.; Chester Shoudy, v. p.; J. W. Cloyd, gen. mgr., with T. A. White, H. V. Chamberlain, H. Kreyski, and F. Gorrecht, directors. O. A. Broyles, sec.-treas.

Cap., \$1,000,000; shares \$1 par; all issued. Stock listed on Spokane Exchange. Annual meeting Jan. 12th.

Dividends: resumed in March, 1917, after a 3 years' lapse, and to July, 1917, \$100,000 has been paid, making \$100,000 to date.

Mining costs, 1916, were \$21,716; freight and treatment, \$32,037; general expenses taxes, insurance, \$13,870; leaving a profit of \$33,802. Cash on hand at end of 1916 was \$5,209, also \$23,593 of ore in transit. Balance of \$100,000 was paid on the Alpine claim. In June, 1917, there was a reserve of \$100,000.

Property: the Knob Hill and Mud Lake mines at Republic, Ferry Co., Wash. The Knob Hill is developed by shafts and crosscuts. A vein 4-7' thick, opened on No. 2 level at a vertical depth of 250', gave assays of \$27 per ton. On the intermediate level a 4' vein carrying values up to \$50 in value is being developed; on the 3rd or lower level recent development work has opened up a 7' vein of \$15 ore.

Shipments: to Trail smelter during 1916 amounted to 6,905 tons of ore, valued at \$101,425.

Company purchased the Alpine claim, adjoining the Knob Hill on the west for \$20,000. It is believed to carry the extension of the Knob Hill vein. A 100' shaft is to be sunk on the Alpine, which will give a depth of about 100' on the dip of the vein and crosscuts will be driven to reach the Knob Hill orebody. About \$8,000 is being spent on equipment at this shaft.

Prospects of company are much brighter than for some time, and should be fairly profitable in a small way.

LAKINA COPPER CO.**WASHINGTON**

See same title under Idaho mines.

Laurier Mining Co.**WASHINGTON****Office:** 410 Columbia Blk., Spokane, Wash. **Mine office:** Laurier, Ferry Co., Wash.**Officers:** Dayton H. Stewart, pres.-mgr.; Grant A. Stewart, v. p.-supt.; E. K. Erwin, sec.-treas.; with J. S. Talkington and Guy P. Linville, directors. G. A. Stewart, supt.**Inc.** Oct. 22, 1908, in Wash. **Cap.**, \$1,000,000, increased later to \$1,500,000; shares \$1 par; all issued.**Property:** 7 claims unpatented, about 120 acres, in the Curlew district, 9 miles from Grand Forks, B. C., and 127 miles N. W. of Spokane. Developed by 140' shaft and several tunnels, showing a vein of pyrrhotite ore said to show copper, silver and gold values.**Equipment:** includes a 2,900' aerial tramway connecting the mine with a railroad siding, constructed in 1915, one drill, gasoline compressor.**Shipments:** commenced in 1915, were sent to the Granby smelter; about 500 tons of copper-silver ore from development work averaged 4.16-7.66% copper and 2 oz. silver, netting \$30 per ton.

In 1916, 1,200 tons shipped reported to have averaged 4% copper and 3 oz. silver per ton, netting \$30 per ton.

LONE PINE-SURPRISE CONS. MNG. CO.**WASHINGTON****C. P. Robbins**, pres.-mgr., Wolverton Block, Spokane, Wash.; **G. C. Taylor**, supt.**Property:** Last Chance mine, formerly owned by the Republic Cons. Mines Corp., at Republic, Ferry Co., Wash., and said to show a 5' vein carrying \$13 ore. Developed by a 500' two-compartment shaft and tunnel. Equipped with a 514 cu. ft. compressor, hoist and boiler.**MANILA MINING & MILLING CO.****WASHINGTON**

Idle and probably defunct. Keller, Ferry Co., Wash.

Property: the Manila mine, 4 claims, with 20-acre reservoir and mill site, well timbered, in the San Poil district, 7 miles from the Columbia river and 4 miles W. of Ferry, the nearest rail station. The Manila mine is on the summit of a mountain and shows a large deposit of disseminated chalcocopyrite ore, traceable 1,000'.**Development:** by tunnels, the oldest 100' below the apex, another 150' lower. Said to be diamond drilling, 1916. Mine was under option for \$60,000 to the Keller Indiana Co., now bankrupt, which put up a smelter in 1906, but failed to develop mine and property supposedly reverted to Farr Bros. Has 20,000' sawmill.

No recent information.

NATIONAL LEAD-SILVER CO.**WASHINGTON****Office:** Hutton Bldg., Spokane, Wash.**Officers:** C. D. Muxen, pres.; E. D. Weller, v. p.; E. H. Pattison, sec.-treas. and mgr. trustee; J. E. Orr, asst. sec., and G. F. Ingraham, directors.**Inc.** 1915, in Wash., as successor to the Phoenix G. & C. M. & M. Co. **Cap.**, 2,000,000 shares; 5c par; assessable. Annual meeting, third Tuesday in Nov.**Property:** 9 claims, known as the Panama group, and mineral rights to 159 acres, about 2 miles N. of Curlew, Ferry Co., said to show 4 veins carrying gold-silver-lead-copper-iron. Ore occurs as replacement deposits, in veins carrying quartz, lime and iron carbonate. The country rock is fine grained syenite with large dikes of porphyry with strata of lime lying parallel, running nearly N. and S., with dip of 80° W. Ore was encountered on 3 different contacts in the first 500' of the tunnel. The first vein, about 40'

wide was intersected 600' from the portal of the tunnel. A second vein cut 820' proved to be 5' wide.

Development: consists of 1,200' main lower tunnel, 225' Panama, and several shorter tunnels, numerous open cuts and prospect shafts. Property favorably reported on by G. Cleveland Taylor in 1914.

NORTHWEST MINES DEVELOPMENT CO. WASHINGTON

Office: 204 Paulsen Bldg., Spokane, Wash. **Mine office:** Keller, Wash.

Officers: Wm. E. Johnson, pres.-supt.; H. J. Lefevre, v. p.; Harry J. Neely, sec.-treas.; Wm. E. Malm, mgr. Keller; preceding, with Henry Osterman, H. J. Earnest, directors.

Inc. Dec. 15, 1915, in Wash. **Cap.** \$200,000; shares \$100 par; 500 outstanding. Authorized bond issue, \$300,000; none issued. Annual meeting, 2nd Monday in January.

Property: 17 claims, 330 acres, surveyed for patent, 12 claims in Okanogan county and 5 in Ferry county, said to show zinc, gold, silver and lead ore in fissure veins and disseminations in granite.

Development: by 2,000' of tunnels and diamond drilling, 140' vertical shaft with 480' of underground workings, of which 435' are claimed to be in ore averaging 1.83% copper, and 33' in copper-zinc ore, assaying 14% zinc for 10'.

Equipment: includes electric power and 150-ton smelter at Keller. Only meagre development done to date. Secretary reports, 1916, "Ore reserves unknown, but immense."

ORIENT GOLD MINES, LTD. WASHINGTON

Company had financial troubles in 1914 and was sold in Nov., 1915, to settle labor liens. Reorganized as Orient Gold Rock Mng. Co.

ORIENT GOLDEN ROCK MINING CO. WASHINGTON

Office: 205 Hyde Block, Spokane, Wash. **Mine at Orient, Ferry Co., Wash.**

Officers: C. E. Gray, pres. and gen. mgr.; Thos. R. L. Harris, v. p.-treas.; C. E. Ficks, sec.

Inc. 1917. **Cap.** \$1,500,000; shares \$1 par.

Property: the White Elephant mine with 6 claims, located 3 miles south of the Canadian border, and an equal distance from Rock Cut. The mine is a gold producer, but contains gray copper ore. The mineral zone, 75' wide, lies between diorite and andesite.

Development: by a 225' incline shaft sunk on the vein with a dip of 70° E. Workings on the 100' level show disseminated pyrite ore carrying from \$3 to \$6 per ton, with occasional shoots of copper ore.

Equipment: includes steam plant, compressor, sawmill, etc.

Property reported taken over by a Spokane syndicate, March, 1916, and cyanide plant to be erected.

PHOENIX GOLD & COPPER MNG. & MILLING CO. WASHINGTON

Curlwe Ferry Co., Wash.

Succeeded by National Lead-Silver Co., which see.

QUILP GOLD MINING CO. WASHINGTON

E. L. Tate, sec.-treas.-gen.-mgr., Hyde Bldg., Spokane, Wash.

Cap. \$1,500,000; shares \$1 par; 67,500 shares outstanding.

Property: the Quilp mine at Republic, Ferry county, located in 1896 and operated intermittently by several companies, has paid five dividends, totaling \$67,500; last payment in 1912. Mine was reopened in 1914 under present management, after lengthy litigation with the defunct Republic Mines Corporation.

Development: by 1½ mile of workings to depth of 500'.

REPUBLIC CONS. MINES CORPORATION**WASHINGTON**

Republic, Ferry Co., Wash.

Officers: A. B. Willard, pres.; A. J. Langhan, sec.; J. P. Burson, treas.; Geo. S. Bailey, gen. mgr. Is a reconstruction of Republic Mines Corporation

Inc. in 1914 to take over the Lone Pine, Surprise and Pearl claims in the Eureka mining district in Ferry county; these claims were worked in 1910-13 by the Republic Mines Corp., which is said to have produced over \$2,000,000 in gold and silver during the last 2 years it operated and before it went into bankruptcy in 1913. The Republic Cons. optioned the property in 1914 to a new company, the Western Union Mines Co., which operated for a short time and passed tranquilly away in 1915; this company was soon succeeded by another new company, the West Virginia Mining Co., which purchased some new machinery, operated a few months, and, like its predecessor, suffered a painless death, in Oct., 1915. The property reverted to the Republic Cons. Mines Co.

In July, 1916, the property was reported as shipping 200 tons daily to Trail, B. C., and planning to sink a 2-compartment shaft to a depth of 1,000'. The property is said to have merit and could be operated profitably under competent management. For geology, see U. S. G. S. Bull. 550, pp. 150-162. Employs 40 men.

In July, 1916, Geo. S. Bailey, trustee in bankruptcy of the Republic Mines Corp., gave a deed to the 3 claims named above, receiving \$82,000 in final payment. At the same time, the Republic Cons. Corp. gave a mortgage on the claims to Jerome J. Day of Wallace, Idaho, to secure a loan of \$93,000, payable July 17, 1917. This mortgage gives the Day Bros. control of mining operations.

SILVER CREEK MINING & MILLING CO.**WASHINGTON**

Company dead and property sold for taxes. Now owned by Gold Cord Mining & Milling Co., Keller, Wash.

WALLA WALLA COPPER MINING CO.**WASHINGTON**

Office: Walla Walla, Wash. **Mine office:** Keller, Ferry Co., Wash. Jasper King, supt.

Property: 1 mile N. E. of Keller, in the southern half of the old Colville Indian reservation, shows a vein of 30' estimated width, partially mineralized with gold-copper ore of fair assay value. Developed by an open-cut shaft and tunnel. Reported in 1916, that company had struck a large body of high-grade copper ore.

WEST HILL MINING CO.**WASHINGTON**

Out of business, having forfeited the bond on the San Poil mine in the Republic district. Former organization embraced J. W. Turner, pres., Spokane, Wash.; Thos. Neill, v. p.; Ralston McCaig, sec.-treas., Spokane; Jerome Drumheller and C. M. Hansen, directors.

Property: taken on a \$150,000 bond and lease from the receiver of the defunct San Poil Mng. & Milling Co., a well known gold producer, whose ores carry \$7 to \$15 per ton.

Mine has 400' shaft and extensive levels, said to block out 30,000 tons of ore above the 300' level.

There is a 75-ton cyanide mill on the ground.

LEWIS COUNTY

Including the Mineral and St. Helens districts (see Skamania county)

CASCADIA MINING & DEVELOPMENT CO.**WASHINGTON**

Mine office: Toledo, Wash.

Officers: E. A. Sessions, pres., 106 W. 6th St., Vancouver, Wash.; W. A. Gray, v. p.; W. D. Scott, sec.-treas.; J. F. Hartley, asst. sec.; preceding with M. A. Poppleton, J. P. Finley, Geo. S. Reid, W. H. Bennett, directors.
Inc. March 12, 1887, in Washington. **Cap.**, \$6,000,000; shares \$1 par; \$1,164,615 in treasury.

Property: 108 claims, 2,170 acres; 330 patented in St. Helens mining district on the divide at the head of the Toutle river in Cowlitz, Lewis and Skamania counties, includes the Polar Star and Minnie Lee groups. Properties show fissure veins in grano-diorite, running N. E.-S. W. and dipping 40'-60'. The copper ore which carries gold and silver values, occurs in shoots, 2'-12' thick and 20'-100' long. This ore is said to average 17.9% copper, 24.85% iron, 10.75% silica, 4% aluminum, 1.2% lime, 34.5% sulphur, 5.68% antimony, 0.8% zinc and 0.05% nickel.

Development: 5,000' of work including 300' to 700' tunnels with about 1,500' on ore. About 100,000 tons of shipping ore has been mined and put on the dump. Production has been deferred waiting for cheaper transportation. The mines are 16 miles from a railroad over a heavy grade, but a new line 48 miles long to Castle Rock, Wash., is planned. Property has been under development in a small way for 19 years past. Property has been examined and reported on by Prof. F. L. Barker, State Metallurgist, Eugene, Oregon; Robt. E. Hanley and G. B. Wilson.

LINCOLN COUNTY

(Crystal District)

NEW CRYSTAL MINING CO.

WASHINGTON

Office: 3-4 Fall City Blk., Spokane, Wash. **Mine office:** Miles, Lincoln Co., Wash.

Officers: John O'Connor, pres.; Fred J. Becker, v. p.; C. L. Colby, sec.-treas., with John Gray, C. G. Lantey, directors. M. H. O'Connell, supt.

Inc. in Washington. **Cap.**, \$1,500,000; shares \$1 par; assessable; 1,000,000 shares outstanding. Annual meeting May 12.

Operating expenses in 1916 amounted to \$1,620.

Property: 4 patented claims, 80 acres, near Miles, an old-time producer, in the Deer Trail district.

Development: by shaft to 181' depth, with 1,200' of workings, shows a fissure-vein 6' wide in limestone. Shoots are 28" wide. Ore carries lead, silver and zinc, the latter veins being 75' from the former.

Ore reserves: estimated at 48,000 tons blocked out, and 1,000 tons on the dumps.

Equipment: includes 35 h. p. hoist, compressor, pump, steam plant, etc. A 100-ton mill is contemplated.

MASON COUNTY

Includes the Olympia mountain region west of the southern end of Puget Sound.

UNION MINES CO.

WASHINGTON

Union, Wash.

Company owns a group of claims carrying veins with silver-lead ore, said to average \$25-\$45 per ton.

Development: by 200' shaft with a level at 190'. Twenty-five men are employed and shipments made occasionally. Company planned sinking shaft to depth of 400'.

OKANOGAN COUNTY

Includes Conconully, or Ruby, Chesaw, or Myers Creek, Nespelem, or Moses, Nighthawk, Oroville, or Osoyoos Lake, Palmer Mountain (also known as Loomis and Wannacut Lake), Methow, or Squaw Creek, Twisp, Upper Methow and Wauconda districts.

ALDER GROUP MINING & SMELTING CO. WASHINGTON

Idle. Mine near Twisp, Okanogan Co., Wash. Lands, about 3 miles from Twisp, have 3 tunnels, of 3,000' aggregate length, longest said to show a 60' vein, claimed in the press, to be solid ore, without any waste. Mine is said to have blocked out a considerable amount of silicious ore, mainly auriferous chalcopryrite. Company awaiting construction of railroad up the Columbia river from Pateros to Twisp.

APEX MINING CO. WASHINGTON

James P. Blaine, superintendent, Chesaw, Okanogan Co., Wash.

Property: the Ben Harrison mine, showing fissure veins carrying gold-silver-copper ores. Developed by a shaft with gasoline hoist. Mine intermittently operated.

COPPER WORLD EXTENSION MINING CO. WASHINGTON

Idle. Loomis, Okanogan Co., Wash. Walter A. Boyle, pres.; Edw. H. Caylor, v. p.; Alfred F. Carman, sec.-treas.; R. J. Thomas, supt., at last accounts.

Inc. Jan. 11, 1904, in Washington. **Cap.**, \$1,500,000; shares \$1 par.

Property: 8 claims, 160 acres, on Palmer mountain, in the Wannacut lake district, shows an orebody about 25 to 30' wide, opened by a 300' 2-compartment shaft, with crosscut on 210' level said to show 17' vein of chalcopryrite, assaying 8% copper, 4 oz. silver and \$1.40 gold per ton.

Equipment: includes steam plant, with 2 small hoists and 5-drill air compressor.

COPPER WORLD GOLD MG. & SM. CO. WASHINGTON

Idle. **Office:** 401 Columbia Bldg., Spokane, Wash. **Mine office:** Loomis, Okanogan Co., Wash. Jerome L. Drumheller, pres. and mgr.; John Wentworth, v. p. and supt.; S. A. Child, sec.-treas.

Inc. in Washington. **Cap.**, \$3,000,000; shares \$1 par, non-assessable.

Property: 2 claims, patented, lying between the Copper World Extension on the east and the Leadville mine on the west, on Palmer mountain, 4 to 5 miles N. E. of Loomis. Claims show a gossan of 100' width, traceable 2,000'. The mine has several short tunnels and shallow shafts, and a 135' two-compartment incline shaft, having a 125' crosscut, reported to be in ore, without reaching the hanging wall, ore being reported to give average assays of 4.5% copper, 2 oz. silver and \$1 gold per ton, with excess of iron.

CRESCENT MINING CO., LTD. WASHINGTON

Office: 201 Lindsey Bldg., Winnipeg, Manitoba, Can. **Mine office:** Twisp, Okanogan Co., Wash.

Officers: D. C. McFee, pres.; C. H. McNaughton, v. p.; J. H. Sutherland, sec.-treas., with F. J. Carr, D. C. McFee, D. D. Young and D. Munroe, directors. G. B. Creighton, mgr.

Cap., \$3,000,000; unsubscribed stock, \$1,291,786; shares \$1 par; non-assessable. Company is a reorganization of the Crescent C. Mng. Co.

Property: 48 claims, about 960 acres, and a mill-site on the east side of Cascade Range, in Okanogan Co., about 100 miles S. W. of the Granby. Ore occurs in fissure veins, carrying chalcopryrite, bornite and quartz. Main development by tunnel 822' long. A good deal of graphite is mixed with ore.

Equipment: includes a Samson turbine, electric plant, air drill, saw-mine buildings and miners' lodgings. A compressor and hydro-electric plant will be installed. Exploration in 1916 cost \$8,127, and for 1917, \$100 is required.

DOUBLE HEADER MINING CO.

WASHINGTON

Main office: 505 Railway Exchange Bldg., Seattle. **Mine office:** Ed. Moore, supt., Nespelem, Okanogan county, Wash.

Officers: H. P. Dickinson, pres.; W. R. Gay, v. p.; C. C. Lacey, sec., with Jay Benn, Ed. Moore, H. L. Mayberry and F. M. D'Camp, directors.

Inc. 1914, in Washington. Cap., \$1,500,000; shares \$1 par; non-assessable; 1,174,326 issued. Annual meeting first Tuesday in June.

Property: 7 claims, 120 acres, 1½ miles S. of Nespelem, Wash. Examined by A. O. Ingalls and others.

Geology: claims cover a quartz vein in granite, dipping 40° N. E. with W.-S. E. course. An ore shoot said to exceed 400' in length and 5' in thickness, carries ore expected by management to average not less than 25 oz. silver and 0.1 oz. gold per ton.

Development: by 80' vertical and 125' incline shafts, workings totaling 300'. Blocked out reserves are estimated at 35,000 tons, which is going to be used for the meagre work done.

A custom plant is to be erected by a syndicate near Nespelem, to treat the company's ore.

The president states that the Double Header has been grossly mismanaged for many years. Previous management's aim was to mine ore of sufficient grade to stand a 40-mile haul, plus rail freight and treatment charges. The mine is now considered a comparatively low-grade property, requiring ore treatment at the mine. Shareholders were fed upon unwarranted promises, but this sort of thing has been eliminated.

FAVORITE GOLD & COPPER MINING CO.

WASHINGTON

Probably dead. See Vol. XII.

Mine at Nighthawk, Okanogan Co., Wash.

RANT CONSOLIDATED COPPER MINING CO.

WASHINGTON

Chesaw, Okanogan Co., Wash. Geo. A. McLeod, mgr.; A. D. McHee, supt., at last accounts.

Inc. 1907, in Washington. Cap., \$1,650,000.

Property: 14 claims, on Copper mountain, near Chesaw, developed by an open cut and tunnel planned to be driven 1,500', cutting 2 strong veins carrying medium-grade chalcopryrite in considerable quantities. Shipments said to have returned about 6% copper and \$3 gold per ton.

Equipment: includes two 80 h. p. boilers and an air compressor. Letters neither answered nor returned.

VANHOE MINING CO.

WASHINGTON

W. B. McChesney, mgr., Oroville, Wash.

Property: on Palmer Mtn., 7 miles from Oroville, Okanogan county, developed by a 4,400' tunnel to a vertical depth of 1,559', at which depth the main orebody was intersected. No recent returns.

METHOW GOLD & COPPER MINING CO.

WASHINGTON

Office: 419 C. of C. Bldg., Spokane, Wash.

Officers: W. D. Scott, pres. and mgr.; J. N. Tewinkel, sec.-treas., with F. S. Dow, W. G. Traub and N. O. Baldwin, directors.

Inc. 1899, in Washington. Cap., \$2,500,000; shares \$1 par; 2,400,000 issued; non-assessable.

Property: 8 patented claims 20 miles from Twisp, on west fork of Methow river, Methow valley, Okanogan Co., Wash., said to show fissure

veins in Algonkian rocks. Ore (sulphide) carries copper, silver and gold values.

Development: includes 3 tunnels, longest 600' with openings of 1,200' to depth of 500'. Has available water power and timber. Idle, except for annual assessment work, on account of lack of transportation.

MULTNOMAH MINING, MILLING & DEV. CO. WASHINGTON

Idle. **Office:** 405 Kuhn Bldg., Spokane, Wash.

Officers: M. J. Hills, v. p. and sec.; Dr. F. O. Hudnutt, asst. sec. and gen. mgr.

Inc. 1901, in Washington. **Cap.**, \$2,000,000; shares \$1 par.

Property: about 600 acres, in 4 groups, including the River group of 260 acres, patented, carrying placer gold; the Mineral Hill group of 100 acres, 3 miles west of Nespelem, Okanogan Co.; the Ramsey group of 60 acres, adjoining the Nespelem Central Mining Co., 5 miles west of Nespelem, and the Multnomah group of 180 acres, 4 miles west of Nespelem, with a tunnel of about 1,100', said to cut a 15' vein, showing argentiferous lead ore. There are 5 buildings, and a dam built across the Nespelem river.

PYRRARGYRITE MINING CO.

WASHINGTON

Successor to Ruby Mining Co.

Mine and home office: Nighthawk, Okanogan Co., Wash. **Eastern office:** Mansfield, Ohio.

Officers: Monroe Harman, pres. and gen. mgr.; Jas. A. Hower, v. p.; Chas. B. Bushnell, sec.-treas.; preceding with Dr. S. P. Ecki and M. L. Branyan, directors.

Inc. Nov. 5, 1902, in Washington. **Cap.**, \$1,500,000; shares \$1 par; non-assessable; issued, \$1,175,000. **Bonds:** \$100,000 authorized, at 7% maturing 1915; issued, \$35,100. Annual meeting, second Tuesday in June.

Property: 5 claims, patented, 80 acres, with 46 acres miscellaneous freehold lands, on Mt. Chopaca, near the Similkameen river, 3 miles south of the international boundary and within 600' of the Great Northern railroad.

Geology: claims show syenite, cut by veins containing lenticular ore-bodies running N. W.-S. E. and dipping at 47°. The vein under development is about 4' thick, traceable for 1,000', and carries cupriferous ore stated by management to assay 0.5 to 10% copper, 1.5% lead, 2.5% zinc, 5 to 2,800 oz. silver, and from a trace to \$4 gold per ton.

Development: by 3 crosscut tunnels with drifts on the vein. The main working tunnel, 300' below the old workings and about 350' below the outcrop, is 1,110' long, and has 550' of drifting on the vein and an equal amount of drifting run from a 100' upraise. An inclined shaft sunk on the vein from the lower tunnel has short levels at 100' and 200' depth.

Ore reserves: estimated at 135,000 tons of ore blocked out, carrying 30 oz. silver besides copper and gold values and which it is believed can be profitably mined and milled.

Equipment: includes a 15 h. p. electric hoist and 5 buildings. Company's report shows a total expenditure at the mine from beginning of work to April 28, 1913, of \$118,000, of which ore sales furnished \$17,062, bonds \$35,100 and stockholders (175,000 shares) \$65,838.

In 1917 company expected to erect a mill including flotation, which process is expected to save at least 90% of the metal contents.

Property promises to make a good small mine.

Q. S. COPPER CO.

WASHINGTON

Office: 229 North Division St., Spokane, Wash. **Mine office:** Q. S. Ranch, Cuess, via Loomis, Wash.

Officers: M. E. Jesseph, pres.; A. M. Dewey, v. p.-gen. mgr.; J. P. Heckert, sec.; A. F. Suksdorf, treas.; preceding with Wm. F. Harrah, Niles, Mich., trustees.

Inc. April 10, 1914, in Washington. **Cap.**, \$2,000,000; shares \$1 par. Is successor of the Q. S. Mining Co., which corporation was sold out by a receiver appointed by the Washington courts. Property was purchased by the new corporation, which paid all the debts, amounting to more than \$25,000, and issued stock at 2c a share to the old stockholders; forfeited stock was left in the treasury, which gave the corporation a majority of the stock. Bad management in 1912 wrecked the former company and led to a receivership, no annual meeting being held that year. Property was sold for taxes, but sale set aside by the courts when the receiver was appointed. Litigation involving ownership pending, Sept., 1917.

Property: 13 claims, with 10 acres of mill sites, and water rights on Sinlahekin creek, about midway between Loomis and Conconully, along the flank and crest of Æneas mountain, in the Salmon River district. The property shows fissure veins in diorite carrying mainly low-grade copper ores. The company claims an orebody 300' wide at surface, which has been crosscut for 238' at a depth of 800' below the outcrop without reaching the wall, and traced by stripping for 6,000' on surface, showing a ledge of 212' width at the north, 300' in the middle and 285' at the southern end of the property.

Development: begun 1897, is by 2 open cuts at either end, a pit of 50x 150' in the middle, and a tunnel 1,063' long cutting the vein at depth of 800', with another tunnel, intended for the main avenue of extraction, 540' long, planned to cut the orebody at depth of 2,000'. One tunnel shows chalcocopyrite ore said to give assays of 11.4% copper and estimated to average 2 to 4% copper, with small and variable silver values and about \$1 gold per ton. The company claims an average ore value of \$14 per ton from several hundred assays.

Assessment work only has been done since new company came into control.

Q. S. MINING CO.

WASHINGTON

Succeeded by Q. S. Copper Co., which see.

RUBY MINING CO.

WASHINGTON

Nighthawk Okanogan Co. Succeeded by the Pyrrargyrite Mining Co., which see.

SHIPPER GOLD MINING CO.

WASHINGTON

J. P. Blaine, pres.-mgr., Chesaw, Wash.

Officers: H. L. Mooney, v. p.; A. C. Blaine, sec.; W. A. Harry, treas. **Inc.** May 31, 1916, in Wash. **Cap.**, \$1,000,000; \$1 par; 600,000 issued.

Property: 3 claims, unpatented, 56 acres, located one-fourth mile north of Chesaw, Wash., contains a 3½' flat quartz vein running E.-W., with 22° dip.

Ore: contains gold values with pyrite, and is said to average \$20 per ton.

Development: 700' of work, including 110' shaft, connected with 380' tunnel, blocking out 1,000 tons of \$20 ore.

Production: 1,200 tons of \$40 ore. Company owns 25-ton mill with rolls and vanners, etc., and expected to remodel same, develop mine and mill ore in 1917.

TILLICUM DEVELOPMENT CO.

WASHINGTON

Probably dead as letters sent company in May, 1917, have been returned.

Mine at Loomis, Okanogan Co., Wash.

Is the successor of the Palmer Mountain Tunnel Co., inc. Aug., 1912, in Washington.

Cap., \$300,000; shares \$1 par; 50,000 preferred, 250,000 ordinary; issued, 30,000. Debentures, \$19,000, 6%, none issued.

Property: 15 claims, 250 acres, in the Loomis (Palmer Mt. or Wannacut Lake) district, 12 miles from the Great Northern railroad. The Summit claim shows a N. W.-S. E. fissure vein in diorite, averaging 8' wide and proven to depth of 115'.

Development: 3 tunnels, all on the vein, said to show ore of commercial grade in small amounts. Vein averages 5' between walls and gives indications of opening up an orebody of profitable size. Ore reported to average \$40 gold and 10 oz. silver with traces of copper. Company has 750 h. p. water power and 450 k. w. electric plant, transmission line and machinery, as well as 100-stamp mill and sawmill.

Company's original plan of tunneling Palmer Mountain appears to have been abandoned. This crosscut is reported to be 5,993' long. Presumably idle.

TRINIDAD MINING & SMELTING CO.

WASHINGTON

Office: Tonasket, Wash.

Officers: Jos. Coleman, pres.-mgr.; T. W. Brown, v. p.-sec.; E. H. Twhight, treas.; T. W. Brown, supt.

Inc. Dec. 1, 1911, in Washington. Cap., \$1,000,000; shares \$1 par; 703,700 issued.

Property: the Central group, 16 unpatented claims, 320 acres in the Galena mining district, Okanogan Co., shows gold and silver-bearing lead-copper ores, occurring as a dissemination in andesite.

Development: to depth of 150', consists of shaft, tunnel, trenchings and open cuts, with a total of 700' of underground workings. Average assays said to run from \$12 to \$30 for shipping ores and from \$2 to \$8 for low-grade ore. Property is owned and operated by the officers of the company, who consider it has a large low-grade deposit. One of the recent troubles has been due to the Land Office allowing homestead filings on parts of the property.

PEND OREILLE COUNTY

(Includes the Metaline district; also see Stevens County)

BEAD LAKE GOLD-COPPER MINING CO.

WASHINGTON

Officers: G. C. Geisler, pres., E. 1111 Augusta Ave., Spokane, Wash.; G. W. Whittaker, v. p.; W. E. Allen, sec.-treas.

Property: 20 claims, about 400 acres, in Newport mining district, Pend Oreille Co., Wash. Ore contains silver, lead and copper values.

Development: by about 5,000' of tunnel work and 600' of shaft work which, it is claimed, has opened up sufficient ore to justify installation of a concentrator, preparations for which were being made, 1917.

LEAD & ZINC CO.

WASHINGTON

Controlled by L. P. Larsen and Jens Jensen, of Metaline Falls, Wash. **Property:** the Josephine mine, at Metaline Falls, Pend Oreille district, one of the biggest zinc producers in the State.

Equipped: with 250-ton ball concentrating mill, 1,000' compressor, 75-h. p. electric hoist and aerial tram. Flotation is being installed, 1917.

Production: shipping regularly. To Aug., 1917, 80 carloads of zinc concentrates were shipped.

METALINE ORIOLE MINING CO.**WASHINGTON**

Metaline, Pend Oreille Co., Wash. Fred N. Davis, pres. and gen. mgr.;
 la M. Davis, sec.; Joseph Lancaster, mg. eng.

Inc. Dec. 30, 1910, in Washington. **Cap.**, \$2,000,000; shares \$1 par, assess-
 Total calls to end of 1916, \$37,500.

Lands: 5 claims, 100 acres, and a 5-acre mill site, unpatented. Property
 a fissure vein in quartzite 6 to 8' wide, carrying about 1% copper, 12%
 , 25% zinc, with silver and gold values.

Development: by 200' shaft and tunnels of 50', 400' and 750'. A 100'
 ne shaft sunk on the vein from the lower tunnel shows ore throughout
 ' drift.

Equipment: includes steam power, with small hoist and 3-drill air com-
 sor. Company planning to erect a 50-ton mill in 1917.

PIERCE COUNTY**(Includes Carbon River District)****BRITISH-AMERICAN COPPER MNG. & SM. CO.** **WASHINGTON**

Office: 510 White Bldg., Seattle, Wash.

Incorporators: Arthur Bernstein, Norman Herman, Adam Beeler, J. J.
 ivan, and E. M. Kennard.

Inc. in 1917 in Washington. **Cap.**, \$2,000,000. Company plans to de-
 p copper mines in British Columbia.

BLE PEAK COPPER MINING CO.**WASHINGTON**

No recent returns. **Mine office:** Longmire, Pierce Co., Wash. **Main**
ce: Tacoma, Wash.

Officers: R. H. Wheelock, pres., Ashford, Wash.; Bakier Long, v. p.-
 ; M. A. Long, sec.-treas.; preceding, with G. W. Anderson and Chas.
 zler, directors.

Inc. 1908 in Washington. **Cap.**, \$150,000; shares \$1 par, fully paid and
 assessable; issued, 130,000. Annual meeting, April 21. -

Property: 2 claims, 40 acres in Cascade mining district, 14 miles from
 oad, in the heart of the Tatoosh range, near Mt. Tacoma. Claims show
 re veins in granite with ore carrying bornite and chalcocite and said to
 age 17% copper, \$4 in gold and some silver.

Development: by shaft and tunnel.

Equipment: includes 25-h. p. power plant, air compressor and 4 build-

DEMPTION GOLD CO.**WASHINGTON**

Office: 734 New York Block, Seattle, Wash.

Officers: Benj. P. Tuggle, pres.; Clifton G. Stapleton, v. p.; Clifford M.
 dy, sec.; John Kendall, treas. Clinton F. Blaine, cons. engr.

TACOMA SMELTING CO.**WASHINGTON**

Office: 120 Broadway, New York. **Works office:** Tacoma, Pierce Co.,
 sh.

Officers: F. H. Brownell, pres.; Edw. Brush, v. p.; L. D. Craig, sec.;
 Y. Walker, gen. mgr.

Inc. in Nevada. **Cap.**, \$500,000; shares \$1 par. Is a subsidiary of the
 erican Smelters Securities Co.

Property: a smelting plant with a 52-acre site, 6 miles from Tacoma,
 Puget Sound. Property is well located for receipt and dispatch of ma-
 ils, and has extensive wharves, with ore bunkers and automatic devices
 unloading cargoes.

The smelter has 2,500 tons daily capacity, and treats copper, silver,

gold ores and concentrates, from the entire western coast of North America, and a considerable tonnage of South American ores.

Equipment: 2 blast and 1 reverberatory furnaces. The converter department has a capacity of 300 tons of blister copper daily.

The electrolytic plant capacity is 8,500 tons per month.

Electric power is received at 40,000 volts and stepped down to 100 volts for use, the works requiring about 6,000 h. p. Fuel is petroleum, brought in tank steamers from the oil fields of southern California.

The Tacoma smelter is one of the most important custom plants on the Pacific coast, the management is progressive, and the metallurgical practice excellent.

TENAS MINING CO.

WASHINGTON

Idle. Office: 320 California Bldg., Tacoma, Pierce Co., Wash. Mine near Keller, Ferry Co., Wash.

Officers: J. R. Turner, pres.; P. J. Sweener, v. p.; C. E. Peterson, sec.; D. McPherson, treas.; preceding, with Otto B. Roeder and F. W. Heide, directors, all of Tacoma, Wash.

Inc. Sept., 1910, in Washington, succeeding the Iconoclast Consolidated Mines Co., whose property was sold for debt. Cap., \$10,000; shares \$1 par; fully paid and assessable up to 25% per year; issued, 3,448. Assessments to 1916, 71 cents per share.

Property: 5 claims, 95 acres, relocated 1912, 2 miles N. of Keller, shows 3 contact deposits with an orebody 30' in maximum width, giving average assays of 3.6% copper and 2 oz. silver per ton with some gold.

Development: by a 325' main shaft and 3 tunnels with claimed total length of 514'. Annual assessment work only has been done since 1908. Company is a holding corporation, awaiting an opportunity to sell or bond the property.

SKAGIT COUNTY

(Includes Bald Mountain and Thunder Creek dsstricts)

SILVER TIP MINING & POWER CO.

WASHINGTON

Office: J. H. Beattie, 718 Green Bldg., Seattle, Wash.

Officers: A. Julian, pres.; G. B. Gilfillan, v. p.; J. H. Ferguson, J. J. McLean, P. D. Roberts and H. R. Sanderson, directors. M. S. Davys, engr.

Inc. Jan. 15, 1910, in Washington. Cap., \$1,000,000; shares \$1 par; 615,862 issued. Bonds, \$700,000 of 7%.

Property: the Lake Side mines, 557 acres, Skagit Co., Wash.; also the Hewitt and Lorna Doone mines in Slocan district, B. C.

SKAMANIA COUNTY

(Also see Lewis County)

MOUNT ST. HELENS CONS. MINING CO.

WASHINGTON

Office: 516 Selling Bldg., Portland, Ore. Mine office: Spirit Lake, Skamania Co., Wash.

Officers: Thos. Prince, pres.; J. P. Tamiesie, v. p.; J. M. Bell, sec.; Dr. Henry Waldo Coe, principal shareholder, treas.; Andrew Olson, supt.; Geo. W. Lilly, engr.

Inc. 1902, in Oregon. Cap., \$1,800,000; shares \$1 par.

Property: 65 claims, patented, 1,300 acres, estimated to carry 45,000,000' of standing timber, on the North fork of the Toutle river and on the shores of Spirit Lake, 50 miles from Portland. It includes the former holdings of the Sweden Copper Co., Calumet Copper Mng. Co., Bronze

Monarch Mng. Co., Chicago Mng. Co., Yellow Metal Mng. Co., Earl Mng. Co. and Cascade Copper Mng. Co. The company also owns a three-fourths interest in the United mines. In addition to copper ores the tract contains gold veins, an ochre bed, a granite quarry and a deposit of pumice stone.

Claims are said to show syenite, diorite and slate with fissure veins carrying about 20 orebodies ranging from 5 to 100' in estimated width. The ores carry chalcocite, bornite and chalcopyrite and vary from 2 to 25% copper, some lead, 2 to 50 oz. silver and \$1 to \$40 gold per ton.

Development: by 5 tunnels, longest 2,300', and 50' shaft, with about 5,500' of workings, estimated by the management to show 125,000 tons of medium and high-grade ores with a greater tonnage of milling ore.

Lands are owned outright and the company has no bonds or debts, but the property has been practically idle for some years awaiting the construction of a much-needed railway. Mines fully described Vol. XI, Copper Handbook.

SNOHOMISH COUNTY

Includes Darrington, Granite Falls, Index, Monte Cristo, Silver Creek and Silverton, or Stillaguamish districts.

ALASKAN COPPER RIVER MINING CO. WASHINGTON

Address: Everett, Snohomish Co., Wash.

Inc. in 1917. Cap., \$2,000,000. Will develop gold mines in Alaska.

Incorporators: E. B. McGill, T. M. Williams and Dr. C. A. Mead.

BOSTON-AMERICAN MINING CO. WASHINGTON

Office: 217 Commerce Bldg., Everett, Wash. **Mine office:** Monte Cristo, Snohomish Co., Wash.

Officers: H. D. Cowden, pres.; C. A. Riddle, v. p.; L. E. Engel, sec.; F. W. Boston, treas.; preceding with J. H. Adams, P. E. Low, E. Garber and H. B. Cowden, directors. D. R. Kyes, supt.

Company is not a reorganization of the United Mining Co. (which see), but stockholders of the United Mining Co., with few exceptions, have more than an equal proportional holding in the Boston-American Mng. Co.

Inc. in 1913, in Washington. Cap., \$2,000,000; shares \$1 par; non-assessable; 1,600,000 common, 400,000 preferred; 1,344,200 com. and 293,450 pfd. issued.

Financial statement, Jan. 1, 1917, shows: receipts for 1916, \$107,678; expenditures, \$68,928; balance on hand, \$38,750.

Property: 88 claims, 26 patented, and 4 patented mill sites, at Monte Cristo, Wash., said to show a dike of low-grade ore 300' wide, containing fissure veins with streaks of ore from a few inches to 4' in width. Ore said to contain gold, silver, copper, zinc and arsenic. Mineralized zone said to have been proven by workings over a length of 750' and to show for 5,000' on surface.

Development: 14 tunnels, the longest, 1,850' in Dec., 1915, is 1,400' below the next higher tunnel. Total underground workings about 19,600'. This work is claimed to have proven up five distinct ledges at depths from the surface to 2,000' the ledges being regular, well defined, true fissure veins. Management claims to have 120,000 tons ore blocked out and to have shipped 18 carloads ore that assayed \$29 per ton in gold, silver and copper, 8% arsenic and 2½% zinc.

Management plans the construction of a mill because the Tacoma smelter does not offer as favorable a treatment charge as formerly.

The mine was examined by I. H. White, of Butte, Mont., who is quoted as having reported that there is more than enough ore blocked out to warrant the construction of a 200-ton mill.

Company's former literature considered grossly misleading and has created an unfavorable impression which can only be removed by frank statements of operations and economical development.

BUNKER HILL MINING & SMELTING CO. WASHINGTON

Office: 1123 Broadway, New York. Mine office and works: Reiter, Snohomish Co., Washington.

Officers: Chas. G. Reiter, pres.; John D. Campbell, sec.; LeRoy B. Sherman, treas.; preceding officers, J. E. Bowman, A. W. Avery, Wilbur Morris, Eric T. Christensen and Manfred Rockefeller, directors.

Inc. Oct. 24, 1902, in Maine. Cap., \$3,000,000; shares \$1 par; reduced, March 23, 1908, to \$1,500,000, and afterward increased to \$2,000,000; shares \$1 par, in \$1,500,000 common stock and \$500,000 cumulative 8% preferred stock, latter to provide for payment of bonds, second mortgage notes and script notes; outstanding Jan., 1917, 1,497,000 common shares and 420,000 preferred shares. Annual meeting, last Tuesday in October. Was the successor of Bunker Hill-Sullivan Copper Mining Co.

Mining property and other assets were purchased by the Western Copper Mining Co. in June, 1917, and the mine is described under that title.

DUTCH MILLER MINING & SMELTING CO. WASHINGTON

Inactive. H. P. Fogh, pres. and agent for majority stockholders, 1403 Howell St., Seattle, Wash. Geo. H. Law, sec.-treas.

Cap., \$2,000,000; shares \$1 par; all issued; 1,000,000 shares in estrow for 5 years. Majority of stock is held by an ore contract association, which made a 5-year contract for output, the Dutch Miller to get 40% of earnings as royalty, one-half to apply to payment on 500,500 shares optioned to the ore contract association.

Property: 2 patented claims, on summit of range, 12 miles south of Skykomish, Wash., formerly worked by the Seattle-Boston Copper Co. Claims show an ore body in a vein in granodiorite. Ore is chalcopyrite with tourmaline and quartz and is high-grade. Mine lacks transportation facilities and rope tramway must be installed to get ore to the wagon road.

ECLIPSE CONS. MG. & INVESTMENT CO. WASHINGTON

Address: John E. Newell, supt., Silverton, Snohomish Co., Wash. O. Robert Dahl, pres., Seattle, Wash.; S. Hilmar Dahl, y. p.; H. M. Dahl, sec.; preceding officers, Andrew Chilberg and John E. Newell, directors.

Inc. 1906, in Washington. Cap., \$3,000,000; shares \$1 par; non-assessable; giving \$2,000,000 in stock for the property.

Lands: 10 claims, unpatented, and a mill site, in 2 groups, including the mill and claims on the Stillaguamish river, formerly held by Copper Independent Consolidated Mining Co.

Mine has 5 tunnels, longest 1,100', on a fissure vein in slate, carrying a little copper, but mainly gold and silver values. Water power from the Stillaguamish river develops 830 h. p. by turbine. The concentrator, rated at 300 tons daily capacity, has tank room for cyanide treatment. A compressor of 1,000 cu. ft. capacity to be installed. No 1917 returns.

FLORENCE-RAE COPPER CO. WASHINGTON

Index, Snohomish Co., Wash. N. Rudebeck, mgr.; Fred Booth, supt.

Property: on Copper mountain, about 4 miles E. of Index, has a tunnel showing a 10' paystreak of chalcopyrite in the Margurite vein and an

assay of 400 lbs. taken across 6' of the vein averages 12 oz. silver, 18.5% copper, 29.6% iron, 7.2% silica and 35.8% sulphur.

Development: hindered 1913-14 by litigation among opposing factions of stockholders. Presumably idle since.

NEW YORK-SEATTLE COPPER MINING CO. WASHINGTON

Probably dead. Mine near Index, Wash. Described in Copper Handbook, Vol. XI.

PUGET SOUND REDUCTION CO. WASHINGTON

Everett, Snohomish Co., Wash. Is controlled, through stock ownership, by American Smelters Securities Co. The works have three 30x180' blast furnaces, 1 running on copper ores, making a 50% matte, which is blown up to blister copper in a reverberatory furnace and shipped east for electrolytic refining. Also includes an arsenic plant.

SEATTLE-BOSTON COPPER CO. WASHINGTON

Idle. Company owns water rights of 40,000 est. h. p. and a charter for a railway to open large timber tracts and reach the Dutch Miller mine, described under title of Dutch Miller M. & S. Co. The former mine holdings of the Seattle-Boston C. Co. are described in Vol. VIII, Copper Handbook.

WASHINGTON-IOWA COPPER MINING CO. WASHINGTON

Idle. **Property:** on the eastern fork of Silver creek, 2 miles above Mineral and 14 miles N. W. of Index, adjoin the Edison Mining & Development Co., and both properties are worked under one management. Claims are said to show 5 veins, carrying complex ore, consisting of chalcopyrite, galena, sphalerite and pyrite, with quartz gangue.

Development: by the 1,200' Bonanza crosscut tunnel.

WESTERN COPPER MINING CO. WASHINGTON

Office: 1123 Broadway, New York. **Mine office:** Reiter, Wash.

Officers: C. G. Reiter, pres.; Leroy B. Sherman, v. p.; J. J. O'Brien, sec.; J. D. Campbell, treas., with W. D. Schwarzwaelder, E. J. Wright, E. T. Christensen, Manfred Rockefeller and T. A. Meed, directors. C. Hendricks, mgr.; V. V. Clark, cons. engr.

Inc. April 25, 1917, in Maine. **Cap.**, \$2,000,000; shares \$1 par; non-assessable; 1,125,000 issued. Annual meeting, first Tuesday in April.

On June 6, 1917, company purchased assets of the Bunker Hill Mining & Smelting Co. for a stock consideration and assumed B. H. debts of \$84,973, consisting of bonds and notes.

Property: 20 claims, 15 patented and 1 millsite, patented, 371 acres at Reiter, Snohomish Co., Wash. Examined by Cory Wright, T. E. Brown, E. M. Simonds and V. V. Clark. Claims said to show fissures in granite, syenite and diorite, dipping 45°, with N. 46° E course.

Ore: is mainly chalcopyrite, associated with magnetite. On account of this latter mineral, the consulting engineer considered that prospecting with a dipping needle should find additional copper deposits. The Bell shoot has been followed to 500' depth and the Jumbo to 100'.

Development: by incline shafts, 86 and 500' deep and tunnels, the longest 2,600'. To depth of 1,200' workings total 6,100'. Diamond drilling cut a parallel body to the Bell at 497 to 526', assaying 6.99% copper. This hole is to be followed by a shaft. Exploration cost \$112,927 to the end of 1916.

Equipment: to Dec., 1916, cost \$72,195, covering 300-h. p. hydro-electric plant, 100-ton concentrator, 50-ton smelter, compressor, tramway, diamond drill, steam engine, hoist, etc.

Property is well equipped for production if ore is developed and has a large asset in over 50,000,000' of standing timber.

STEVENS COUNTY

Includes Bossburg, Chewelah, Colville, Deep Creek, Deer Park, Deer Trail, Metaline, Meyers Falls, Northport, Old Dominion, Orient and Silver Queen districts.

ADMIRAL MINING CO.**WASHINGTON**

Mine: in Colville district, near Valley, Stevens Co., Wash.

Officers: T. H. Greenway, pres.; T. R. Tate, v. p.; Mrs. T. R. Tate, treas., Chas. Warsth, sec.

Inc. 1914, in Washington. **Cap.**, \$1,500,000; shares \$1 par.

Property: .65 acres, patented, developed by 3 tunnels. Reported to have opened up a silver-copper vein 18"-8' wide, assaying from \$30-\$100 per ton. In April, 1916, the property was optioned to J. R. Brown and W. Everett of Spokane for \$30,000 and development work started. Shipments scheduled for the summer of 1917.

AICHAN BEE SILVER-LEAD MINING CO.**WASHINGTON**

Office: 401 Jamieson Bldg., Spokane, Wash.

Officers: H. M. Howard, pres.-mgr.; Emma S. Stephan, v. p.; Dr. B. F. Blosser, sec.-treas., with H. G. Twomey and A. P. Witherspoon, directors. J. Currie, supt., Fruitland, Wash.

Inc. August 1, 1916 in Wash. **Cap.**, \$10,000; shares 1 cent par; 600,000 shares outstanding.

Property: 8 patented claims, 160 acres, in Deertrail district, Stevens county.

Ore: occurs as a contact deposit in granite. Three veins under development said to give average assays of \$52 in silver-lead and \$3.72 in gold.

Development: by tunnels to depth of 150'. Management plans erecting 5-stamp mill and extending tunnels in 1917 with returns from stock sales.

AMERICAN MINERALS PRODUCTION CO.**WASHINGTON**

Address: Thos. W. Cole, mgr., Valley, Wash.

Property: 3 claims, 2,000 acres, in Stevens county, Wash., said to carry a large deposit of magnesite. Shipping in 1917.

A 16-mile standard gauge road being built Oct., 1917, from Valley to the property.

AMERICAN TUNGSTEN CONS. CORP'N**WASHINGTON**

Address: Hutton Bldg., Spokane. Wm. Sheck, gen. mgr.; Henry Becker, supt., at last account.

Company a reorganization, 1912, of the Germania Mng Co. **Cap.**, \$1,000,000, shares \$1 par.

The Germania Co., composed principally of German investors, was organized 12 years ago to develop the Roselle mine, 25 miles west of Springdale, Stevens Co. It is said that \$500,000 was spent in driving tunnels, in the concentrator and buildings. In 1911 the company became involved in litigation, later going into bankruptcy.

In Jan., 1916, eastern interests, represented by F. T. Hamshaw, of Seattle, obtained a lease and bond on the properties held by the Corporation and started operations. Holdings include the Germania and Roselle mines. Development, consisting of a 200' shaft and 3 tunnels with 3,000' of work, is said to have exposed a considerable tonnage of ore.

ARK GROUP MINING & MILLING CO., LTD.**WASHINGTON**

Office: Kettle Falls, Wash. J. J. Budd pres. and gen. mgr.; D. E. Grobe, v. p.; O. L. Budd, sec.-treas.; preceding officers are the directors.

Cap., \$250,000; shares 25c par, 20c paid, 5c assessable; issued 437,595; assessments to date \$3,000. Annual meeting Oct. 1.

Property: 12 claims, partly patented, in the Kootenai district, British Columbia, and the Silver Queen group, 3 miles S. of Kettle Falls, Stevens Co.

Wash. Ore occurs in contact between granite and lime with S. W. strike and dip of 45°. Vein reported to be from 90 to 60' wide, traceable for three-fourths of a mile and proven to depth of 150' and carries 10 to 20% copper with good silver values.

Developed by 3 shafts and 3 tunnels, longest being 800'. Equipped with steam power, 1 air compressor and 2 air drills. The Washington property has been under development for several years.

AURORA COPPER MINING CO.

WASHINGTON

Probably dead. See Vol. XII.

BONANZA MINE.

WASHINGTON

Property: 200 acres, located 3 miles from Bossburg, Stevens Co., Wash. The mine, an old-time producer, said to have had an output of \$1,000,000, and idle for 15 years, was reopened in 1915 by lessees who started shipping silver-lead ore to the Trail smelter.

Developed: by incline shaft with 6 levels, and a total of 3,000' underground workings. See U. S. G. S. Bull. 550, p. 63.

BUTTE-CHEWELAH COPPER CO.

WASHINGTON

J. O. Gillice, pres., Paulsen Bldg., Spokane, Wash.; F. M. Bell, v. p.; P. L. Eberhardt, sec.-treas.; preceding officers, G. B. Harrington and R. J. Davis, directors; R. J. Davis, gen. mgr.

Inc. March, 1913, in Washington. **Cap., \$1,000,000;** shares \$1 par; fully paid and non-assessable; 500,000 issued.

Property: 4 claims, 75 acres, in the Valley mining district, Washington. Shows vein in sedimentaries close to a diabase intrusion; average strike N. 25° E., and dip 60°. Ore occurs as mixed sulphides, mainly chalcopyrite and gray copper in a gangue of quartz, calcite and spathic iron. At 100' in depth the vein is said to be 6' wide and the ore to average 2 to 5% copper 1 to 5 oz. in silver and 50 cents to \$1 in gold per ton.

The property is developed by 100' winze, reported all in ore, a 300' shaft and 125' tunnel. Equipment includes a hoist and air compressor, installed in Sept., 1913.

CHEWELAH COPPER KING MINING CO.

WASHINGTON

Office: 115 Wall St., Spokane, Wash. **Mine office:** Chewelah, Stevens Co., Wash.

Officers: S. P. Domer, pres. and gen. mgr.; H. H. Hebert, v. p.; J. Grier Long, sec.-treas.; preceding, with E. W. Shively and F. M. Jarvis, directors.

Inc. 1898 in Washington. **Cap., \$100,000,** shares 10 cts. par, changed 1909 to \$1,000,000, shares \$1 par, and increased March, 1912, to \$1,250,000; issued 1,136,230 shares. Bonds \$30,000 authorized at 8%; issued \$10,360. Annual meeting, third Thursday in May.

Property: 4 claims, 1 fractional, 47 acres, patented, and a 3-acre mill site, with 80 acres miscellaneous lands, 6 miles east of Chewelah, shows 4 orebodies, estimated widths of 8 to 56', carrying mainly chalcopyrite and gray copper, with estimated values of 3 to 5% copper, 2 to 6 oz. silver and \$1 to \$2 gold per ton.

Development: 300' shaft, and tunnels of 1,200' and 1,350', estimated by management to show 300,000 tons of ore.

Equipment: includes 100-ton smelter. Operations were suspended for lack of funds and receivership asked by creditors December, 1915.

CHEWELAH GREY COPPER MINING CO.

WASHINGTON

Company reported out of existence, July, 1917. Formerly at Chewelah, Stevens Co., Wash. See Vol. XII.

COLUMBIA COPPER CO.

WASHINGTON

Chewelah, Wash. **Officers:** C. M. Carroll, pres., Spokane, Wash.; Alex Robinson, v. p.-mgr.; Oscar Olson, sec.-treas. T. J. Vaughan Rhys, cons. engr.

Property: a 10 year lease and bond, for \$100,000 on the High-grade Mining

Co. property in Deertrail Mining district, formerly owned by Carson Bros. of Reardon, Wash. Claims said to show 9' of ore from which shipments have been made.

CONSOLIDATED COPPER CO.**WASHINGTON**

Office: 906 Paulsen Bldg., Spokane and Turk, Stevens Co., Wash. Mine at Springdale, Stevens Co., Wash.

Officers: W. H. Stowell, pres.; Geo. C. Gates, v. p.; V. W. Brasch, sec.-gen. mgr.; preceding and Chas. A. Libby and E. R. Traeger, directors.

Inc. 1913 in Washington. **Cap.**, \$1,500,000; shares \$1 par, assessable; total assessments to Dec., 1915, 16 mills. Annual meeting, Jan. Company is a re-organization of the Togo Mining & Smelting Co.

Property: about 240 acres, 160 patented, in Cedar Canyon district. Ore occurs principally as copper pyrites in slate, serpentines and quartzite with a N.-S. strike and 40 to 60° dip. One orebody, developed by tunnels, with about 2,000' of workings, is reported by management to average 3 to 5' in width, in upper levels, and to carry 8% copper, 3½ to 5 oz. silver and a trace of .02 oz. gold per ton. Upper levels said to show bornite, copper glance and a little native copper. A 1,000' crosscut tunnel is said to cut several veins, undeveloped at last reports.

Equipment: includes gasoline engine and hoist. The mine has been closed down for several years, but management expects to begin operations in 1917.

COPPER CLIFF COPPER MINING CO.**WASHINGTON**

Inactive. **Office:** 724 Peyton Blk., Spokane, Wash. **Mine office:** Chewelah, Stevens Co., Wash.

Officers: T. F. Wilson, pres., treas. and gen. mgr.; J. O. Blair, v. p.; L. C. Dougherty, sec.; L. K. Armstrong, mng. engr.

Inc. Feb. 24, 1912, in Washington. **Cap.**, \$1,000,000; shares \$1 par: issued, \$62,000.

Property: 60 acres and 40 acres timber lands, held under bond and lease, in the Chewelah district, shows contact deposits between altered granite and limestone. Ores are mainly copper, with small silver values.

Development: by shafts of 332' and 730', and by tunnels, longest 600', giving depth of 1,000'.

COPPER HOARD MINING CO.**WASHINGTON**

Property: the Lookout claim has been bonded to the Chewelah Grey Copper Mng. Co.

COPPER QUEEN MINING CO.**WASHINGTON**

Property taken over by Copper King Mining Co. and a new company organized under title of King Mining Co., which see.

ELECTRIC POINT MINING CO.**WASHINGTON**

Address: Roy A. Young, pres.-gen. mgr., Northport, Wash. Dan Dodds, supt., Cummins, Wash. **Directors:** J. E. Yoder, v.-p.; F. A. Turner, sec.; W. B. McGregor, treas., with L. C. Jesseph, R. A. Young and F. T. McCollough, directors.

Cap., \$1,000,000; \$1 par 793,500 issued. No bonds. One quarter interest owned by Walter J. Nicholls. Paid 1c dividend on Jan. 31, 1916, 2c in March, 1917 and 3c in June, 1917, a total of \$47,810. Profits for 1916 were \$93,753. Balance Jan. 1, 1917 was \$68,184.

Property: 13 claims, 245 acres, unpatented, 20 miles E. of Northport and 13 miles from Boundary, the shipping point. Mine is on top of a mountain 4,000' to 5,000' high with surface showing three ore "chimneys"; No. 1 ore chimney was opened by a glory hole, exposed a body of ore 25' wide containing carbonates in which boulders of galena were imbedded.

A 250' shaft with drifts and cross-cuts has proved chimney No 1 to main-

tain the same size and grade at this depth. This one chimney is estimated to contain over 11,000 tons of ore. The second and third chimneys have been cut by drifts. No. 2 chimney is 33' wide at 225'; No. 3 chimney from which much galena ore has been mined, is now practically exhausted. There are several other ore bodies reported to exist on the property.

Ore: galena which appears to be a replacement in dolomitic limestone. Shipments run from 25% to 75% lead.

Development: by 250' shaft and 900' tunnel.

Production: to Jan. 30, 1917 was 11,000 tons of ore.

Mining costs reported at \$6 a ton which does not include development or haulage.

GALENA FARM MINING CO.

WASHINGTON

Inc. in Spokane to develop silver-lead claims near Colville, Stevens Co., Wash. Similarity of name with a property in British Columbia has led to confusion at times.

GERMANIA MINE

WASHINGTON

Property near Springdale, Stevens Co., Wash. W. von Scheck, mgr. Formerly owned by Germania Mng. Company. Litigation over title kept mine closed for years. Regarded as a promising tungsten producer. Development work and 200-ton mill (dismantled in 1916) cost \$500,000.

GLADSTONE MOUNTAIN MINING CO.

WASHINGTON

Address: J. M. Hall, sec., 201 Sherwood Bldg., Spokane, Wash. W. J. Nicholls, mgr.

Officers: F. T. McCollough, pres.; T. S. Lane, v.-p.; W. J. Nicholls, treas.; preceding and J. A. Welch, R. W. Nuzum, directors; E. H. Brang, supt. at Cummins; A. G. Larson and A. Lakes, Jr., cons. engrs.

Inc. Aug., 1916, in Wash. Cap., 1,500,000 shares, 10c par; non-assessable; 1,082,000 outstanding; 100,000 shares treasury stock offered the public, November, 1917, at 15c per share.

Ore sales in 1916, \$601. Operating expenses to July 1st, 1917, \$26,400. Cash on hand \$2,000, also ore worth \$10,000 in bins.

Property: 16 claims, 11 surveyed for patent, 289.9 acres, situated 20 miles E. of Northport, Wash. and but 900' from Electric Point mine, the claims almost surrounding that property.

Geology: vertical chamber or so called "chimney" deposits in limestone. Ore contains lead as carbonate, 1 oz. silver, trace of gold.

Development: by Setting Sun shaft 275' with drifts at 50, 100, 200 and 260', total underground openings 450'. Shaft and drifts show pay-shoot 120' long with workable width, of carbonate lead ore. Also has 120' Lone Star shaft with ore.

Ore reserves: 1,000 tons, assaying 20% lead. Grade shipped in 1916 was 14.6%. Total output to 1917 was 440 tons. Proposed work is extension of drifts from shaft, driving tunnel and surface exploration. In July, 1917, a drift on 260' level cut a chimney of 6 to 8% ore, with rich pockets.

Equipment: Fairbanks-Morse 15 h. p. gasoline hoist.

In 1917 shipped 15 cars of 13% to 16% lead ore netting \$9,327. Employs 18 men and four 4-horse teams. The monthly expenses are about \$3,500. Shipments average 20 tons per day.

Shaft is to be sunk to 600' and output increased to 50 tons per day, early in 1918.

HALL CREEK MINING & MILLING CO.

WASHINGTON

Daisy, Stevens Co., Wash. Herman Camerer, supt.

Property: the Gwin mine and group of claims, shows a fissure vein carrying gold-copper ore, developed by 400' shaft.

Equipment: includes steam plant and water power, hoist and 4-drill Fairbanks compressor. Has a 75-ton concentration mill, driven by electric power.

No recent returns.

HECLA COPPER-SILVER MNG. & MLG. CO. WASHINGTON

Chewelah, Wash.

Officers: J. C. Argall, pres.; Howard McPhee, v. p.; Robt. A. Wilson, sec. treas.; Fred F. Foster, supt.; preceding, with C. W. Linscott and Chas. Kliner, directors.

Property: 11 claims $3\frac{1}{2}$ miles N. E. of Chewelah and S. of the United Copper Co. holdings. Claims show 4 ledges, the main vein varying from 6 to 14' wide, traceable by cuts and pits for nearly a mile and averaging 5.4% copper, \$1 in gold and \$1.80 in silver.

Developed: by a 75' tunnel and a 150' vertical shaft. **Equipment:** includes a 50-h. p hoist and a 4-drill compressor. Company plans sinking the shaft to 500'.

HIGH GRADE SILVER & COPPER MINING CO. WASHINGTON

Office: Chewelah, Wash. **Officers:** T. F. Hertzell, pres.-gen. mgr.; L. E. Hertzell, v. p.; W. W. Dicksen, sec.-treas.

Inc. July, 1909. **Cap.**, 1,500,000 shares, assessments of 9 mills levied to date.

Property: 3 claims, about 3 miles N. E. of Chewelah, Stevens Co., Wash., shows a granite intrusion in lime with development along contact. **Ore:** high-grade copper with silver-lead values.

Development: by 125' shaft and a new 60' shaft being sunk on a body of oxidized iron ore. **Equipment:** includes hoist, boiler, pump, etc.

Has produced only a few tons of ore since 1909 and if development proceeds as rapidly in the next eight years as in the past, the mine may be a profitable one in our lifetime.

Property taken over July, 1916, by Columbia Copper Co, which see.

JUNE COPPER CO. WASHINGTON

H. S. Spedden, supt., Chewelah, Stevens Co., Wash.

Inc. June, 1913, in Washington, by R. C. Toole, L. B. Cottingham and W. L. Hanson.

Presumably owns the June-Echo mine near Chewelah, where a 40-h. p gasoline hoist has been installed and a 200' shaft sunk. Vein shows copper-silver ore. Reported under lease to J. W. Douglas, 60 Wall St., New York, in May, 1915.

No 1916 returns.

KING MINING CO. WASHINGTON

Officers: V. D. Williamson, pres., Empire St. Bldg., Spokane, Wash.; J. W. Douglas, v. p.-gen. mgr.

Inc. in 1916, to take over the Copper King and Copper Queen mines at Chewelah, Stevens Co., Wash.

The Copper King shows 4 veins carrying grey copper and chalcopryrite ore and is developed by 1,200' tunnel. A 4' ledge of high-grade ore was cut on the 500' level. Equipped with 100-ton oil-burning smelter, which was completed by former management. The mine was bid in at receiver's sale for \$125,000, July, 1915.

The Copper Queen property, 6 claims, is developed by 200' tunnel and cross-cuts. An 8' vein showing silver and copper ore was intercepted 50' from the portal of the tunnel, at a depth of 70'.

No recent information available.

LIBERTY COPPER MINING CO. WASHINGTON

Office: Spokane, Wash. **Mine office:** Bluecreek, Wash.

Officers: J. H. Reser, pres.; C. Oldfather, v. p.; A. Haas, sec.; S. G. Neff, treas. and gen. mgr.; R. E. McVicar, trustee.

Inc. in Wash. **Cap.**, \$1,000,000; shares \$1 par.

Property: 6 claims, well watered and timbered, on Blue creek, about

1½ miles from Blue creek station, and 6 miles N. W. of Chewelah. The main vein, developed by 4,000' of tunnels, is about 18" wide, carrying auriferous and argentiferous copper and lead ores.

Equipment: includes a Fairbanks-Morse steam hoist, 100-h. p boiler and an air compressor. The mine has been under steady development since 1906, and made its first carload shipment March, 1909, to the Northport smelter. Management is said to plan a concentrator.

LONE STAR COPPER MINING CO.

WASHINGTON

Officers: Oscar De Camp, pres.; Wm. S. Thyng, sec. and engr., and R. C. Rimertsen, directors.

Inc: April, 1910, in Washington, practically as a reconstruction of the Copper Hill & Milling Co. **Cap.**, \$1,500,000; shares \$1 par. Owns sundry claims, including the Copper Hill mine near Newport, Stevens Co., Wash., developed by several shallow shafts and tunnels. Mine has an 18' vein, carrying chalcopryrite, disseminated in phyrrotite. There is no machinery. Idle several years, except for annual assessment work.

LOON LAKE COPPER CO.

WASHINGTON

Office: 408 Columbia Bldg., Spokane, Wash. **Officers:** Judge Geo. Turner, pres.; A. W. Kemp, v. p.; Frank Crane, sec.-treas.; Evan Morgan, managing director, with A. De Voto and E. K. Erwin, directors.

Inc. 1915. **Cap.**, \$375,000; shares 25c par. Surplus, July, 1917, was \$50,000, with \$25,000 worth of ore in bins. **Dividends:** 1c a share monthly declared July, 1917.

Property: the Kemp-Komar and O. K. mines, 310 acres on Grouse creek, 6 miles N. of Loon Lake, Stevens Co., on the Great Northern R. R., said to carry a well-defined fissure vein, 20' wide, running E.-W. which gave returns of from 24-30% copper when formerly worked.

Development: by 500' incline shaft. A level at 200' goes E. on the vein for 325' cutting 2 orebodies, one of chalcocite ore from which nearly \$100,000 worth of ore was shipped, 1916. The second vein carries milling ore. Both veins have been cut on the 300' level, and management is now sinking to get under them at depth.

Equipment: includes hoist and pump.

Property resumed shipments, 1916, after 15 years' idleness and is shipping regularly, 1917.

NEW CURRENCY MINING CO.

WASHINGTON

Organized to take over the property of the Jay Gould Mining Co., at Chewelah, Stevens Co., Wash., said to show copper-lead-silver ore.

NORMAN MINES CO.

WASHINGTON

Offices: 1300 Old National Bank Bldg., Spokane, Wash.; and Northport, Wash.

Officers: J. A. Welch, pres.; H. R. Welch, v. p.; Sidney Norman, gen. mgr., sec.-treas., with O. C. Moore and J. W. McBride, directors.

Inc. 1914. **Cap.**, \$100,000; shares 10c par; assessable after treasury stock is sold; 900,000 shares issued. Company reported a cash surplus of \$6,000, May, 1916.

In Oct., 1916, all ore had been extracted and work was stopped. Zinc carbonate worth \$25,000 was shipped in 1916. For description see Vol. XII.

Property: 5 claims, about 100 acres, 7 miles S. E. of Northport, Stevens Co., Wash. Claims show a shear zone of lead-zinc carbonate ore in altered limestone, said to average 30% zinc, 13% lead, 4.6% lime, 1.1% sulphur, 5.5% iron, 2% insoluble.

Development: mainly on the Great Western orebody; with strike N. E. and dip 50° N. W., reported to measure 200'x150'x5' in width. The Empire vein,

25' at surface, has not yet been found in the lower workings. The Great Western group is developed by 325' tunnel and winze sunk to 200'.

Equipment: consists of a 2,000' aerial tramway at the Last Chance and a 600' surface railroad. Twenty men employed.

NORTHPORT SMELTING & REFINING CO. WASHINGTON

Northport, Stevens Co., Washington. **Officers:** J. J. Day, pres.; E. R. Day, sec.; with Edw. Boyce, E. H. Knight and F. M. Rothrock, directors; R. W. Marston, mgr.

Cap., \$1,000,000; shares \$1 par. Company owns the Northport smelter, built on the site of the old Le Roi Mining Co.'s plant. The new \$500,000 plant was blown in March 7, 1916.

Equipment: 3 lead furnaces, 42" wide and 16' long, of 300 tons daily capacity, are now in operation. Company is treating ores from the Hercules and Tamarack & Custer. In Aug., 1917, a Cottrell electric fume-precipitator, costing \$100,000, was erected.

O-LO-LIM COPPER CO. WASHINGTON

Office: 414 Kuhn Block, Spokane, Wash.

Officers: Jas. Keeth, pres.-mgr.; F. T. McCormick, v. p.; D. R. Riegel, sec. Inc. May 11, 1917, in Wash. **Cap.**, \$100,000; shares 10c par; assessable; 500,000 outstanding. Annual meeting, 1st. Tuesday in Dec.

Property: 160 acres in the Spokane Indian Reservation, Stevens Co., Wash., leased for 25 years from the Government; 10% of net smelter returns to be paid the Government. Lands were opened to leasers in May, 1916, and work started on company's ground in Jan., 1917.

Ore: copper occurs in contact in shale and granite. Ore is high-grade but its extent is still to be determined.

Development: by 60' shaft and tunnel from which 40 tons of ore have been shipped averaging 8-9% copper.

Tunnel and shaft work in progress, 1917.

REDWOOD COPPER MINING CO. WASHINGTON

Dead. Mine at Chewelah, Stevens Co., Wash. Developed by 400' tunnel with several hundred feet of raises and winzes expected to expose copper at greater depth. Operations ceased in April, 1912, and property was lost under foreclosure of mortgage. Present owners are Chas. Stevens and others of Robinson Straus & Co., St. Paul, Minn.

ROYAL COPPER MINING & MILLING CO. WASHINGTON

L. J. Winslow, pres. **Mine address:** Chewelah, Stevens Co., Wash.

Property: 7 claims said to show 3 parallel ledges having slate and granite contacts.

Development: by 400' tunnel said to show values in copper, lead, silver and gold. Property is a silver-lead mine with small amounts of copper. Company probably dormant as letters were returned in May, 1917.

SECURITY COPPER CO. WASHINGTON

Address: 720 Peyton Bldg., Spokane, Wash. **Mine office:** Chewelah, Stevens county, Wash.

Officers: J. F. McGinnis, pres.; M. C. Hunter, v. p.; A. H. Syverson, sec.-treas.; with L. K. Armstrong, gen. mgr.; G. E. Hyatt, supt.

Inc. 1913, in Washington. **Cap.**, \$1,000,000; shares \$1 par. Reorganized 1917 with 1,500,000 shares of which 1,200,000 shares are outstanding; shares assessable.

Operating expenses in 1916 were \$20,000, making total of \$100,000 to end of that year.

Property: 9 claims, 200 acres, includes the Matterhorn and Van Slyke groups, adjoining the Standard-Chewelah, and the June-Echo mines. Shows fissure veins in shales and schists. Ore carries copper and silver.

Development: by about 1150' of underground work on a series of six veins by 550' shaft, levels, and tunnel.

Equipment includes a gasoline hoist and a 3-drill air compressor.

SHARP MINING CO., BYRON E. WASHINGTON

Owns Cleveland group of 10 claims, north of Springdale, Stevens Co., Wash., an old property closed down because the silver-lead ore was zinciferous; 15,000 tons reported on dumps and blocked out.

A 50-ton mill was to be erected in 1916.

SILVER BELL MINING CO. WASHINGTON

Address: E. H. Belden, 1208 Old National Bank Bldg., Spokane, Wash.

Officers: E. H. Belden, pres.; R. F. Blackwell, v. p.; with H. N. Metzger, J. M. Fitzpatrick and J. C. Broad, directors; E. F. McCabe, sec.-treas.

Inc. Nov., 1916, in Washington. **Cap.,** \$1,500,000; shares \$1 par; non-assessable; 1,000,000 issued.

Property: 8 claims, 160 acres, 5 miles S. E. of Loon Lake, and 35 miles N. W. of Spokane, Wash.

Development: by 125' shaft, shows 4½' quartz vein in granite. Ore said to contain 25 oz. silver per ton, with gold up to \$4. Sinking is to be continued to 250'.

Equipment: 16 h. p. gasoline hoist. Is a silver prospect.

SILVER QUEEN MINING CO. WASHINGTON

Out of business. Property operated by Ark Group M. & M. Co., which see.

SILVER TRAIL MINING CO. WASHINGTON

Office: care J. Richard Brown, W. 1619 Clark St., Spokane, Wash.

Officers: J. R. Brown, pres.; A. L. Hooper, sec.; W. S. Haish, treas.; with Robert Bell, A. J. Bell, Peter Reid and M. S. Peters, directors.

Inc. 1915 in Washington. **Cap.,** \$125,000; shares 10c par.

Property: the old Clungstone mine, 8 miles E. of Evans in Colville mining district, opened in early '90s by Col. I. N. Peyton.

Development: tunnels, the lower one 700', with 400' drift on a 2'-6' vein of silver-lead ore. Shipments made to Trail, 1916.

It is reported that the mine shows enough ore opened to keep a 50-ton mill operating a year.

SPOKANE COPPER CO. WASHINGTON

Address: C. H. Harvey Co., 618 Paulsen Bldg., Spokane, Wash.

Officers: B. Mabry, pres.; D. K. McDonald, v. p.; E. A. Moye, sec.-treas.; with J. S. Ramage and J. Dillard, directors.

Inc. 1917 in Washington. **Cap.,** \$100,000; shares 10c par; 600,000 issued.

Property: in Loon Lake district, Stevens Co., Wash.; 46 miles from Spokane. Examined by C. A. Low in August, 1917.

Development: by 100' shaft and small opencut. In latter at depth of 4', a 27' orebody is said to have been uncovered, 8' on the footwall showing leached carbonate ore.

Company's backers seem to bank on conditions in adjoining mines, and in the company's literature these conditions constitute the burden of the song.

UNITED COPPER MINING CO. WASHINGTON

Office: 300 Title Bldg., Spokane, Wash. **Mine office:** Chewelah, Stevens Co., Wash.

Officers: Conrad Wolfe, pres.-gen. mgr.; W. G. Collins, v. p.; M. E. Poole, sec.-treas.; with Daniel Hoch, J. H. Griffith and E. C. Blanchard, directors. E. A. Wolfe, supt.

Inc. in July, 1906, in Washington. **Cap.,** \$1,000,000; shares \$1 par; fully issued; assessable by majority vote. Last assessment Sept., 1914, ½ cent a share. Annual meeting, Jan. 28. Company and Guaranty Trust Co., New York, trans-

fer agents; Registrar & Transfer Co. and Spokane & East Trust Co., Wash., registrars. Listed on New York Curb, May 1, 1917.

Revenue in 1916 was \$372,296, of which \$121,581 was profit. No. 5 dividend absorbed \$10,000. Cash on hand at end of year was \$7,867, and indebtedness \$18,446.

Dividends: \$130,000 to Aug. 15, 1917.

Property: 16 claims, patented, 103 acres, 4½ miles N. E. of Chewelah, the nearest rail point.

Geology: shale and schist, and a vein with an orebody of 6' estimated average width, carrying malachite, chalcopryrite and tetrahedrite, reported by the company to have been proven to average 2.5% copper, 5 oz. silver and 40c gold per ton. Ore is mainly chalcopryrite, with streaks of gray copper ore on both walls, latter carrying up to 24% copper, 400 oz. silver and \$2 gold per ton. In July, 1917, a persistent diorite dike on the main 1,000' level crosscut, was cut by 6' of ore, which also appeared persistent.

Development: by shafts 250' below 1,000' level, and 5,000' tunnel, giving depth of 1,250'. Considerable development work was done in 1914-15; diamond drilling reported to prove the orebodies to depth of 1,400'. The mine has over 40,000' of workings. In June, 1917, reserves were worth \$2,000,000.

Equipment: includes 2 hoists, air compressors, capacity 1,200 cu. ft., 11 power drills, 2 pumps, and an electric light plant. Electric power is obtained from the Meyers Falls Power & Light Co. There are several mine buildings, including a 15x24' frame machine shop.

Has 500-ton concentrator, and an oil flotation plant, in which Gen. Naval Stores oils are used. Recovery to date has been from 77% to 80%. Ore and concentrates are shipped to the Cons. Mng. & Sm. Co., at Trail, B. C.

Production: for 1915, 650,995 lbs. copper, 103,195 oz. silver, and 8 oz. gold. In 1916, 1,179,178 lbs. copper and 159,271 oz. silver were extracted. Yield for 1917 is expected to be 3,500,000 lbs.

UNITED STATES COPPER-GOLD MINE

WASHINGTON

Prospect about 3 miles N. E. of Chewelah, Stevens Co., Wash., shows small quartz veins in limestone. Ore is chalcopryrite, pyrite with some malachite and azurite. Developed by 340' and 100' tunnels.

VALLEY MAGNESITE CO.

WASHINGTON

Office: Old National Bank Bldg., Spokane, Wash. **Mine office:** Valley, Wash.

Officers: F. M. Handy, pres.; B. E. Kehler, v. p.; W. J. Matthews, sec.; Robert Carnochan, treas. and Irving Whitehouse, asst. sec.-treas.; also directors. Inc. in Washington. **Cap.,** \$1,500,000; shares \$5 par; 213,000 issued.

Anticipated earnings based on an estimated output of 150 tons per day, sold at \$32.50 per ton, less \$12 per ton, cost of calcined product, approximate \$3,000 daily.

Property: 1,080 acres at Valley, Stevens Co., Wash.

Development: to 100' depth, is estimated to expose 1,000,000 tons of magnesite, one exposure being 75 by 200'. Mining is being done by quarry methods. The ore is a gray, coarsely crystalline magnesite, containing 0.5% lime and 2.7% silica, which is well within market requirements. Mining costs \$1 per ton.

Equipment: 10 kilns with accessories. Capable of making 150 tons daily of calcined magnesite.

Production: 40 tons of calcined ore daily shipped to the Harbison-Walker Refractories Co., Pittsburgh, Pa.

This unusual deposit of magnesite may prove to be the main source of supply in the United States.

VALLEY MINING CO.**WASHINGTON****Address:** J. B. Tuttle, mgr.; Valley, Wash.**Property:** the Edna mine, 9 miles from Valley, has been idle for 12 years.**Development:** In Sept., 1917, the mine was unwatered to 400', and levels driven at 100, 200 and 300' in depth. Copper silver ore exposed is said to have a value of \$600,000.**VULCAN MINING CO.****WASHINGTON****Office:** 2025 West 3rd Ave., Spokane, Wash. Mine at Orient, Stevens Co., Wash.**Officers:** H. M. Gibson, pres.; P. Lewis, v. p.; A. O. Stuberg, sec.; P. Larsen, treas; preceding with J. D. Grimes, directors.**Inc. July, 1914, in Wash. Cap., \$1,500,000; shares \$1 par; assessable.****Property:** 7 claims, 4 miles N. E. of Rock Cut at 3,850' elevation, shows 3 northwest veins with gold ore; also some silver.**Development:** on No. 1, a gold-silver vein, includes a 148' shaft, with 42' crosscut, 53' shaft and 570' tunnel, 300' below the surface. Crosscutting in 1916 on the 570' tunnel level to tap the main orebody. A 50' crosscut in the 570' tunnel was expected to reach the ore about midyear 1917. No. 2 vein is developed by 4 prospect shafts, a 37' tunnel and 100' incline. The third vein is opened by a 75' shaft.

Present owners have spent over \$20,000 on development.

WHATCOM COUNTY

(Includes Mount Baker and Barron, or Slate Creek districts)

BOUNDARY RED MOUNTAIN MINING CO.**WASHINGTON****R. J. Bonnemort, supt., Sardis, B. C. Control purchased June, 1916, by George Wingfield and associates of Goldfield, Nev.****Property:** in Whatcom county, Wash., shows a fissure vein containing an oreshoot developed for 600' and averaging 4' in width, of \$20 ore.**Development:** carried on intermittently since 1889, is by tunnels, the second or 700' level, showing high-grade ore.**Equipment:** includes a hydro-electric plant and a 10-stamp mill.**HAMMOND MINING CO.****WASHINGTON****Officers:** F. C. Hammond, Bellingham, Wash., pres.; Hugh Eldridge, v. p.; Geo. C. Fisher, sec.-treas.; with Frank Wright, Fred J. Wood, directors.**Inc. 1914. Cap., paid up, \$500,000.****Property:** 32 claims, 600 acres in T. 39 N., R. 8 E., in Sec. 5, 6, 7 & 8 of Whatcom Co., Wash., includes the Great Excelsior mine.**Ore:** gold-silver, said to average \$4 per ton, occurs in formation of slate, sandstone and andesite.**Developed:** by 2,500' of underground workings.**Equipment:** includes a 100-ton 20-stamp mill. **Production:** said to be 10,000 tons of ore, with net returns of \$20,276, to 1915.

Company was building a 150-ton cyanide plant in 1915.

No recent returns secured, and property reported early in 1917 as closed and plant being sold.

YAKIMA COUNTY**ELIZABETH GOLD HILL MINING CO.****WASHINGTON**

North Yakima, Yakima Co., Wash.

Officers: L. L. Matterson, pres.; P. J. Eschbach, v. p.; Frank X. Nagler, sec.-treas.; preceding, with Jos. Feser, Thos. Hope, E. P. Sanford and Rudolph Mayer, directors.

Inc. 1900, in Washington. **Cap.**, \$1,000,000; shares \$1 par, non-assessable. Annual meeting, second Monday in March.

Property: 14 claims, unpatented, 200 acres, adjoining the Blue Bell mine on the north, about 65 miles N. W. of North Yakima, in the Summit district. Shows a number of orebodies in granite, carrying gold-silver-lead-copper ores, with 1,600' of workings.

Ore reserves: estimated by management, 150,000 tons of ore, with 100,000 tons blocked out for stopping, averaging \$40 per ton, which figures are excessive.

Equipment: includes steam and water power, and a small sawmill, with material for a 10-stamp mill on the ground. Idle.

WISCONSIN

Wisconsin produces over 40,000 tons of zinc per annum, from the treatment of over 2,000,000 tons of 2.7% ore. The dressed concentrate is mostly reduced to metal at Illinois smelters. The principal centers of production are Benton, Hazel Green, Linden, Livingston, Mifflin and Platteville. During 1916 there were 68 producers with full equipment.

The various copper and iron mines of the state are arranged alphabetically. **BARABA MINING CO. (COPPER)** **WISCONSIN**

Idle. **Office and mine:** Mellen, Ashland Co., Wis. Nelson Baraba, Sr., pres.; Nelson Baraba, Jr., sec.

Inc. 1906. **Cap.**, \$1,000,000, shares \$1 par. Has a shallow shaft showing ore assaying 2.8% copper, with traces of gold and silver.

B. M. & B. MINING CO. **WISCONSIN**

Address: Jos. Wilson, supt., Mifflin, Wis.

Company is operating zinc mines in the Mifflin district.

CLEVELAND MINING CO. **WISCONSIN**

Office: 625 Bank & Insurance Bldg., Dubuque, Iowa. S. W. Burford, mgr.; H. L. Jones, supt.

Property: 40 acres, includes the Cleveland, Scramble Creek, Lawrence and Square Deal Mines, at Hazel Green, Grant Co., Wisc. Lead-zinc ore occurs in flats and pitches in limestone.

Development: several 150' shafts with 1,500' underground workings said to block out 100,000 tons of ore.

Equipment: includes a 75-h. p. electric hoist, a 6-drill air compressor and a 250-ton concentrating plant, put into commission in May, 1915.

Production: shipments reported very light in June, 1917, from the Cleveland and Lawrence mines. From the Wilson mine at Potosi camp a car of high grade concentrate is shipped each week. Shipments made to Mineral Point Zinc Co. under contract. Employs 160 men on double shift.

FIELD MINING & MILLING CO. **WISCONSIN**

Office: 2200 Insurance Exchange, Chicago, Ill. **Supt.'s address:** R. F. D. No. 7, Scales Mound, Ills.

Officers: Robt. W. Hunt, pres.; Jas. C. Hallsted, v. p., with L. V. Rice, C. C. Whittier, directors. F. W. Guthrie, sec.-treas. L. V. Rice, gen. mgr.

Inc. 1908, in Illinois. **Cap.**, \$100,000; shares \$100 par; \$65,000 outstanding. Annual meeting 1st Tuesday in May.

Financial reports for 1916 shows: receipts from ore sales, \$776,329; gross earnings, \$778,500; operating expenses, including royalties, \$452,989; net income, \$325,511.

Property: the Thompson mine near New Diggings, Wisc., an important lead-zinc producer, developed to depth of 225' by vertical shaft. Ore occurs in fissure veins and disseminations traversing dolomite. Management estimates ore reserves at 350,000 tons in May, 1917.

Equipment: includes electric power, 50 h. p. hoist, 600' elec. compressor, centrifugal pump, 800-ton mill, equipped with jigs and tables.

Production: the mill treated 200,000 tons of ore during 1916, concentrates averaging 45% zinc, 75% lead, 31% sulphur, 16% iron.

FRONTIER MINING CO.

WISCONSIN

Office: 413 Fletcher Trust Bldg., Indianapolis, and Galena, Ill.

Officers: J. H. Billingsby, pres.; D. C. Ellison, v. p.; W. C. Haneisen, sec.-treas.; preceding, with C. W. Craig, C. R. Hinkle, Carl L. Rost, S. O. Deschler, directors.

Cap., \$125,000; shares \$100 par.

Dividends: begun April, 1916, were 2% the first of each month, and 10% on the 15th.

Property: 500 acres under lease, in Sections 8 and 9, T. 1 N., R. 1 E., at Benton, Wis. **Ore:** zinc sulphide in pitches and flats in limestone. Stopes are 120' wide and 35' high.

Development: 3 shafts, average depth of 150'. Room and pillar mining system is used.

Equipment: includes one 50-h. p. and one 75-h. p. electric hoists, air compressor and Keystone drilling machines. There are also 3 concentrators with daily capacity of 600 tons in 10 hours.

The Calvert property produces 220 tons of zinc concentrate and 6,000 lbs. lead ore weekly; the Bull Moose 200 tons weekly. The Hird mine, under development, shows high-grade milling ore. The Treganza mine is operated under lease by the Burr Mining Co., a subsidiary. A new power and concentrator plant began operations in May, 1916. Employs 400 men. Wages are \$2.75 to \$3 for car men and shovelers.

Shipments made under contract to the Grasselli Chemical Co.

GRUNOW MINING CO.

WISCONSIN

Address: Herman Grunow, supt., Mifflin, Wis.

Company is operating zinc mines in the Mifflin district.

HOLMES MINING & MILLING CO.

WISCONSIN

Idle. Mellen, Ashland Co., Wisc. **Officers:** John Holmes, pres.-mgr.; A. D. Barnes, v. p.; Thos. A. Humphrey, sec.; F. P. Simmonds, treas.; preceding with Edw. Bekken, A. D. Wilson and A. D. Hill, directors.

Inc. Jan. 9, 1902, in Wisconsin. **Cap.,** \$150,000; shares 25 cts. par.

Property: 160 acres in the Penokee iron range, about 1 mile N. of Bad river, shows fissure veins in greenstone, diorite and slate with E.-W. strike and dip of 70°. Three orebodies are claimed of which one, said to be 40' wide and traceable one-half mile by a strong gossan, with slate footwall and diorite hanging, is reported to have chalcopyrite in a quartz gangue. Ores give assays up to 9 oz. silver and \$3 gold per ton. **Development:** by shafts of 150' and 188'.

Equipment: includes a 16 h. p. hoist.

INDIAN MOUND MINING CO.

WISCONSIN

Quincy, Ill. **Mine office:** Benton, Wis. L. N. Dana, supt.

Property: the Monroe mine, near Benton, Lafayette Co., Wis., is a regular shipper of galena and sphalerite concentrates.

KLAR PIQUETTE MINING CO.

WISCONSIN

Address W. H. Doyle, sec., Platteville, Wisc.

Company is operating zinc mines in the Platteville district.

LUCKY FIVE MINING CO.

WISCONSIN

Mr. McKinley, supt., Dodgeville, Wisc. Operates a lease on Davis and Thomas lands, in Dodgeville district, near Cuba City, Grant Co., Wisc., and is the largest producer of high-grade lead-zinc concentrates in the district. Developed by 100' shaft.

- Equipment:** includes steam plant and 50-ton concentrator. Shipments made to the Collinsville smelter, under lease to the Picher Lead Co.
- LUCKY SIX MINING CO.** **WISCONSIN**
Office: care Republican House, Milwaukee, Wisc. J. N. Vail, supt., R. R. No. 2, Livingston, Wisc.
Property: in Mifflin district, Iowa Co., Wisc., developed by two shafts. Produced about 2,957 tons of zinc concentrate in 1916.
- LUCKY TWELVE MINING CO.** **WISCONSIN**
Address: L. N. Dana, mgr., Benton, Wisc.
 Company is operating zinc mines in the Benton district.
- McMILLAN ZINC CO.** **WISCONSIN**
Offices: Platteville and Hazel Green, Grant Co., Wisc.
Officers: A. C. McMillan, pres.; Henry Hornischfeger, v. p.; H. B. Morrow, sec.-treas.; preceding, with L. C. Dagenhardt and C. M. Echols, directors; L. C. Dagenhardt, supt., Hazel Green.
Inc. Aug. 3, 1914, in Wisc. **Cap.**, \$100,000; shares \$1 par. Annual meeting, August 14. Operating expenses for 1915 are given as \$34,536 with no income, due to fact that the company was putting the property in shape to produce.
Property: 100-acre lease, at Hazel Green, said to show zinc and lead sulphides occurring in a disseminated deposit in the Galena limestone formation.
Development: 180' vertical shaft.
Equipment: includes steam hoist, 300 cu. ft. air compressor, pumps and a mill, capacity 400 tons per 20 hours. No recent returns.
- M. & D. MINING CO.** **WISCONSIN**
Address: Geo. Jarrett, supt., Platteville, Wis.
 Company is operating zinc mines in the Cuba City district.
- MIDLAND MINING CO.** **WISCONSIN**
Address: R. Davis, supt., Platteville, Wis.
 Company is operating zinc mines in the Platteville district.
- MINERAL POINT ZINC CO.** **WISCONSIN**
Address: B. A. Hoskins, mgr., Galena, Ill.
 Subsidiary of the New Jersey Zinc Co., operating the following mines in the Wisconsin zinc region: Black Jack mine at Galena, Ill.; Coker at Livingston, Wis., Fox at Strawbridge, Kennedy at Highland, Kennedy at Hazel Green and the Penna-Benton at New Diggings, Wis.
 At Mineral Point company has a concentrating plant, including a multi-hearth roaster of 150 to 200 tons daily capacity and magnetic separators to remove pyrite from jig concentrates, whose zinc content is raised from 37 to 59%. Recovery is 90% at cost of \$2 per ton.
- NATIONAL ZINC SEPARATING CO.** **WISCONSIN**
Address: W. N. Smith, gen. mgr., Platteville, Wis.
 Company operates a roasting and magnetic-separating plant, capacity 200 tons of ore in 24 hours, at Cuba City, Grant Co., Wis., producing a 60% zinc concentrate.
- NORTHWESTERN IRON CO.** **WISCONSIN**
Address: J. H. Means, mgr., Milwaukee, Wis. E. P. O'Connor, supt.
Property: the Mayville mine in Dodge Co., Wis., developed to 125' depth.
Ore: is a soft, red non-Bessemer hematite, containing 38.42% iron. 1.09% phosphorus, 4.11% silica and 11.04% moisture. This is concentrated to 43.19% iron.
 Output in 1916 was 125,970 tons, making 1,101,360 tons to date.
- O. P. DAVID MINING CO.** **WISCONSIN**
Address: T. R. Webster, sec., Montfort, Wis.
 Company is operating zinc mines in the Montfort district.

- OPTIMO MINING CO.** WISCONSIN
Office: 1127 State Life Bldg., Indianapolis, Ind.
Property: at Linden, Iowa Co., Wis., is the main producer of lead-zinc concentrates in the Linden district. Operates a 100-ton mill and produces concentrates averaging from 30-40% zinc.
Equipment: includes electric power, drills and pump.
- PEACOCK MINING CO.** WISCONSIN
Address: Henry Ovitz, supt., Mifflin, Wis.
 Company is operating zinc mines in the Mifflin district.
- PENI MINING CO.** WISCONSIN
Address: H. C. Holtz, supt., Mifflin, Wis.
 Company is mining zinc ores in the Mifflin district.
- ROBT. W. HUNT CO.** WISCONSIN
Address: L. V. Rice, mgr., New Diggings, Wis.
Property: the Crawhill zinc mine at Scales Mound, Ill., near New Diggings, Wis.
- ROSS MINING CO.** WISCONSIN
Address: Chas. Ross, supt., Mineral Point, Wis.
 Company is developing and mining a zinc deposit in the Linden district.
- RUDOLPH LAND CO. (COPPER)** WISCONSIN
 Idle. Mine near Gordon, Douglas Co., Wis.
Inc. 1905, as successor of Minong Range Copper Co.
Property: 12 miles from Gordon, is in Secs. 11, 12, 13 and 14, T. 43 N., R. 10 W., on the southern fold of the Keweenaw syncline.
Development: by two shafts, deepest 350', sunk at an angle of 36°, on a dark amygdaloidal trap bed carrying small quantities of native copper.
Equipment: includes a 6-stamp mill. Property fully described under title of Minong Range Copper Co., Vol. III., Copper Handbook.
- ST. CROIX CONSOLIDATED COPPER CO.** WISCONSIN
 Out of business. For description see Vol. XII.
- SHAMROCK MINING CO.** WISCONSIN
 J. Maloney, mgr., Mifflin, Wisconsin.
Officers: H. F. Cochenus, pres., 1536 First Nat'l Bank Bldg., Milwaukee, Wis. P. C. Kolinski, gen. mgr.
Property: 37 acres in Mifflin, said to show a 32' vein, running N. W.-S. E., carrying a 10" to 12" streak of lead-zinc sulphides, averaging 35% zinc, 25% lead. Mine is the old Shamrook & Peni mine on the so-called old 80 tract, mined 100 years ago for lead, recently quarried for glass rock and now for its 10" to 12" of coal black "Jack" ore.
Development: by 340' tunnel, and opened to 28' depth, by quarry, stripping off the "glass rocks." About 800 tons shipped in 1915, that averaged 30% zinc and 10 tons of lead concentrate.
Ore: is treated in 50-ton mill and concentrate goes to DePue smelter. Property worked by double shift 1916. Company took over the Sunset mine, July, 1916.
- TIFFANY MINING CO.** WISCONSIN
Address: 925 Postal Telegraph Bldg., Chicago, Ill.
Inc. 1916. **Cap.,** \$50,000.
Property: 160 acres, leasehold, known as the Tiffany mine, formerly owned by W. N. Tiffany, of Platteville, Wis. Property has been drilled and orebody proven. Claims lie east of the Wilson Mining Co. land.
 In June, 1917, company was operating a 200-ton mill.
- UNIVERSAL MINING CO.** WISCONSIN
Address: R. S. Burnett, supt., Cuba City, Wis.
 Company is operating zinc mines in the Cuba City district.

VINEGAR HILL ZINC CO.**WISCONSIN**

(Owned by Mark Manufacturing Co.)

Office: Platteville, Wis. W. N. Smith, mgr.; J. A. MacCulloch, gen. supt.

Operates Blackstone, North Unity, Hodge, Graham, Martin, Kittoe, Yendall, Meloy, and Jefferson mines in Platteville district. Ships galena and blende concentrates.

WEST END MINING CO.**WISCONSIN****Inc.** June, 1916, by D. F. Gardner, C. May, L. Hable, Chas. Roselip, Jr., and W. F. Weigle, to lease and operate a zinc mine near Platteville, Wis.**WEST HILL MINING CO.****WISCONSIN**

W. Brown, supt., Platteville, Wis.

Cap., \$20,000. In last eight months of 1915, reported to have made 150% profit on capital stock.

Operates zinc lands in Platteville, Grant Co., extending its holdings by amalgamation with adjoining lands. An important shipper of zinc concentrates. Paid a 10% dividend in March and another in June, 1916.

WISCONSIN ZINC CO.**WISCONSIN**

Subsidiary of the American Zinc, Lead & Smelting Co., which see.

Address: A. W. Plumb, gen. mgr., Platteville, Wis.**Dividends:** 2% quarterly; No. 5 paid May 21, 1917.**Property:** the Winskell, Champion, Longhorn and Thompson mines in the New Diggings, Wis., district. Also has a roasting plant at New Diggings, containing 7 Skinner hearth furnaces, 20' diam., preparing ore for magnetic separation of marcasite from zinc blende. Crude ore averages 2.8% zinc.

In 1917 a 200-ton mill was erected on the Copeland lease, near Shullsburg.

WYOMING

Mines are arranged alphabetically, as State has no great mining center.

ACME CONS. GOLD & COPPER MINING CO.**WYOMING**

Inactive. See Copper Handbook, Vol. XI.

AETNA MINING CO.**WYOMING****Idle. Office:** Merrill, Wis. Mine near Riverside, Carbon Co., Wyo. See Copper Handbook, Vol. XI.**AMERICAN FIREPROOFING & MINING CO.****WYOMING****Address:** Investment Clearing House, Fin. Ag'ts, 513 Denham Bldg., Denver, Colo. A. E. Minimum, pres.; S. E. Coyler, mgr.**Inc.** 1913. **Cap.**, \$10,000,000, shares 10 cents par. Stock was offered at 2c with a guarantee of refund attached should the company's statement not be verified.**Property:** 8 and a fraction claims, 200 acres, in the South Pass mining district, 35 miles from Lander, Fremont Co., Wyo., the nearest railroad, comprising the Jerry Dain and Hidden Hand Fraction group, a bond and lease on the Bobtail, Denver and Bluebird claims, near Lewiston, and control of 120 acres of partially developed mineralized land.**Ore:** quartz, with gold in fissure veins, 15-24" wide; said to average better than \$100 per ton in gold.**Development:** includes shafts 40-70' deep, including 500' of underground workings on the Bobtail claim.**Equipment:** shaft house, blacksmith shop, pumping station, engine, boiler, crusher, electric plant and other machinery.**ANCHORIA COPPER MINING CO.****WYOMING**

Idle several years.

Office: Room 3, Algoma Bldg., Oshkosh, Wis. **Mine office:** Copper-ton, Carbon Co., Wyo. H. O. Granberg, sec.-treas.

Inc. April, 1901, in Wyo. **Cap.**, \$1,000,000, shares \$1 par.

Lands: 4 claims, 80 acres, patented, in the Battle Lake district, developed by a 200' shaft and tunnels of 45' and 60', showing an orebody estimated at 45' width, giving average assays of 17% copper, and from a trace to \$5 gold per ton. Has a 40-h. p. steam plant, with hoist good for 500', 3 power drills and 4 substantial mine buildings of logs.

ANNIE MINING CO.

WYOMING

Mine office: Jelms, Albany Co., Wyo. L. A. Hancock, sec.

Inc. 1903, in Wyoming. **Cap.**, \$250,000, shares \$1 par.

Lands: 100 acres, near Jelm, said to show two 4' contact veins between granite and schist, opened by a 140' shaft and a 138' tunnel, showing copper carbonates and bornite, assaying up to 20% copper and \$10 gold per ton. Idle since 1907, except for representation work performed each year.

AZURITE MINING CO.

WYOMING

Idle. Office: Room 3, Algoma Bldg., Oshkosh, Wis. Arthur Bishop, v. p.; H. O. Granberg, sec.-treas. and gen. mgr.

Inc. Dec. 17, 1904, in Wyoming. **Cap.**, \$1,000,000, shares \$1 par; issued, \$624,650.

Lands: 5 claims, 63 acres, in the Battle Lake district, near Dillon, in Carbon Co., Wyo., showing 3 fissure veins, in gabbro, of 15 to 20' estimated width, opened by 305' of work, including a 65' shaft and 70' tunnel, showing ore giving assays of 18% copper. Company paying taxes yearly.

BIG FIVE COPPER CO.

WYOMING

Main office: Rock River, Wyo. **Mine office:** Arlington, Wyo.

Officers: John F. Pierce, pres.; W. A. McIntyre, v. p.-mgr.; R. W. S. Donell, sec.-treas., with Ralph Booth, and S. Morris, directors.

Inc. 1908, in Wyoming. **Cap.**, \$1,000,000; shares \$1 par; non-assessable; 520,000 shares outstanding. Annual meeting, July 17.

Property: 2 claims, 40 acres near Arlington, Carbon Co., Wyo., shows small vein of copper ore carrying gold and silver values. Only assessment work done, but management planned sinking to 220' and crosscutting at 175' level at last accounts.

BOSTON & WYOMING COPPER MINING CO.

WYOMING

Idle. Office: care Jas. A. Shinn, Leadville, Colo. **Mine office:** Esterbrook, Albany Co., Wyo.

Inc. Jan., 1903. **Cap.**, \$500,000.

Property: the oldest in the district, includes 120 acres mineral lands and 120 acres miscellaneous lands, taken over from Esterbrook Mining Co. The Esterbrook mine has a 4' fissure vein, traversing diorite, schist and granite, carrying cuprite, chalcopyrite, cerussite and galena, estimated by former owner to average 2 to 4% copper, 25 to 30% lead, 2 to 4 oz. silver and \$1 to \$2 gold per ton, developed by 2 short tunnels and 5 shafts, deepest 335'.

COMMERCIAL GOLD MINING CO.

WYOMING

Office: Centennial, Wyo.

Officers: P. A. Peterson, pres., Canon Falls, Minn.; P. L. Holtum, sec.; B. Holtum, mgr., Centennial, Wyo.

Transfer office: Centennial. Annual meeting, second Tuesday in August.

Inc. 1909, in Wyoming. **Cap.**, \$1,000,000; shares \$1 par; 350,000 outstanding.

Property: 2 patented claims of 96 acres in Centennial mining district. The formation is similar to that of the district, granite, schist, porphyry, quartzite, etc., with N. E.-S. W. trend.

CONGO MINING CO.**WYOMING**

Address: Rawlins, Wyo.

Owns property in Battle Lake district, idle for several years on account of lack of transportation. Mine to be reopened, October, 1917.

CONTINENTAL-MORRIS COPPER MNG. CO.**WYOMING**

Office: Morris, Ill. Mine near Encampment, Carbon Co., Wyo.

Officers: J. H. Rogers, v. p.; Dr. G. A. Leach, sec.-treas.; preceding, with I. F. Hatcher, U. C. Davis, W. A. Thomas, E. R. Joyce, B. C. Hitchcock and B. W. White, directors.

Inc. March 31, 1908, in Wyoming, as a merger of the Continental Copper Mining Co. and Morris Mining Co. Cap., \$2,250,000, increased later to \$5,000,000; shares \$1 par, non-assessable; issued, \$1,750,000. Annual meeting, first Tuesday in February.

Property: 7 claims, patented, 120 acres, in the Battle Lake district, carrying about 50 acres of good pine timber. Claims show schist, with 4 veins, of 13 to 40' estimated average width, traceable 1,500 to 3,000', carrying carbonate and sulphide ore, estimated to average 1 to 8% copper, with small gold and silver values.

Development: includes several shafts and 1,400' of tunnels.

Equipment: includes a steam hoist, good for 500', and 2 buildings. Idle, but resumption planned as soon as property can be refinanced.

COPPER BOTTOM MINING & MILLING CO.**WYOMING**

Inez, Converse, Wyo. Henry Metz, Sr., pres.; Fred Metz, sec.-treas.

Property: the Green Hope mine, in the Hartville district, Laramie Co., is under bond and lease until 1916, to Messrs. Wm. F. Moenke and Geo. Botsford, Sunrise, Wyo. Mine has produced about 125 tons of ore. Company also owns a few copper claims in the region at the head of Broom creek, 15 miles north of Sunrise in Sec. 26, T. 29, N., R. 65 W., on which annual assessment work has been done.

ELENOR MINES CO.**WYOMING**

Address: O. M. Beck, Atlantic, Wyo.

Officers: O. M. Beck, pres.; Nate Wilson, v. p.; F. V. Marsh, sec.-treas.

Inc. 1917, in Wyo. Cap., \$150,000; shares 50c par.

Property: 12 claims about 4 miles N. W. of South Pass and 28 miles south of Lander.

Claims show a well-defined vein carrying copper, gold and silver values.

ELKHORN COPPER MINING CO.**WYOMING**

Property: on Elk Mountain, near Overland, Carbon Co., Wyo., is said to carry a 7' vein of sulphide ore, giving assays of 6 to 20% and claimed to average 7 to 8% copper, with considerable ore in sight. Mine has a shaft and a 460' tunnel, with about 1,000' of drifts. Worked under lease by W. C. Sammons of Saratoga and reported shipping in 1914.

No later returns.

EMERALD MINING CO.**WYOMING**

Idle. Wheatland, Laramie Co., Wyo.

Property: the Cooney Hill mine, formerly owned by the Cooney Hill Gold & Copper M. & M. Co., and the Emerald mine, on Slate creek, showing a prominent gossan outcrop in schist. The Emerald has a 60' shaft in ore, and a 100' shaft bottomed in a gossan showing traces of copper sulphides. No recent report received.

FERRIS-HAGGARTY COPPER MINING CO.**WYOMING**

Inactive. Owns, or did own, the copper mine of this name at Rudefeha, Carbon Co., Wyo. Company also owned \$375,000 of the Penn Wyoming bonds, but as its stock is practically all owned by the Penn Wyoming, its corporate officers and affairs are of no public interest, save as the only valuable mining

asset of the chain of bankrupt corporations, controlled by the Penn Wyoming and its alleged and equally rotten successor, the United Smelters, Railway & Copper Co. The mine itself has been idle for many years. See Penn Wyoming Co.

GOULD MILLING AND LEASING CO. WYOMING

Address: B. A. Lathrop, mgr., Centennial, Wyo.

Since 1915 company has been leasing property of the Utopia M. & M. Co. (which see) in the Centennial district.

Development: 5 tunnels have opened copper-gold-silver ore said to average \$15 per ton.

Equipment: erected 50-ton mill, costing \$20,000 in 1917.

HAGGARTY COPPER MINING CO. WYOMING

Probably dead. Mine at Rudefeha, Carbon Co., Wyo. L. N. Pennock, former pres.

Cap., \$10,000, increased Nov. 9, 1908, to \$1,500,000; shares \$1 par. Controlled and owned by the United Smelters, Railway & Copper Co. Is a companion of the Ferris Haggarty Co., but like all its sister companies owned by the U. S. R. & C. Co. Only a lawyer can tell which of the two owned the copper mine that has been the bait for so many "investors."

HECLA CONSOLIDATED MINES CO. WYOMING

Idle. Office: Henry Schwartz, pres., 308 Masonic Bldg., Denver, Colo. Mine at Hecla, Laramie Co., Wyo.

Inc. 1909, in Wyoming, as a merger of the Hecla Mining Co., Amalgamated Copper Mining & Extraction Co. and Kopper Krown Mining Co. **Cap.,** \$5,000,000; shares \$1 par.

Property: 610 acres, including the Hecla group, 13 claims, 2 patented, and a 35-acre townsite, in the Silver Crown district, 4 miles from Granite Canyon, on the Union Pacific railroad and 7 miles from the Cheyenne Northern line. The Hecla is claimed to show 16 fissure veins, of 8' average width, in schist and granite, of which 3, of 7' average claimed width, carry oxidized and sulphide ores, said to give average assays of 3.4% copper, 3 oz. silver and several dollars in gold per ton, besides nickel, platinum and uranium.

Development: includes a 40' tunnel and 14 pits and shafts of 10 to 140' depth:

The Teddy Roosevelt-Good Hope group, formerly held by the Amalgamated Copper Mining & Extraction Co., comprises 10 claims in the Silver Crown district, 2 miles from the Union Pacific railway and 23 miles from Cheyenne, with about 700' of workings, claimed to show ore giving fair assays in copper.

The Kopper Krown group, about 2 miles S. W. of Hecla and 22 miles W. of Cheyenne, 7 claims, 140 acres and not 154 acres as claimed by the company, has 413' of workings, claimed to show 10,000 tons of sulphide ore blocked out for stoping.

The Hecla mill has 15 stamps, a 50-ton concentrating plant and a leaching plant. The Ohly process, installed in an attempt to save the rare metals, was not a success.

Ore: mainly low in grade, is only in part adapted to concentration, and the mill requires overhauling and adaptation to the ore. With concentration by the Minerals Separation process, on the sulphide ores, property ought to be workable. The history and financial methods of this company and its predecessor are described in Vol. X.

Same management as the Henley Cons. Copper Mines, Wyo.

HENLEY CONSOLIDATED COPPER MINES WYOMING

Henry Schwartz, 308 Masonic Temple, Denver, Colo., chief owner.

Property: 25 claims, 500 acres, 25 miles S. W. of Cheyenne, Laramie Co., Wyoming. Developed for 15 years past. Mine has 2 orebodies.

Same management as the Hecla Cons. Mines Co., which see.

HOME RUN COPPER MINING CO.

WYOMING

Office: Rooms 17-18, Postoffice Bldg., Colorado Springs, Colo. Mine near Rudefeha, Carbon Co., Wyo.

Officers: A. L. Bohrer, pres.; J. F. Humphrey, v. p.; Adolph Fehringer, treas.; Wm. C. Robinson, sec., at last accounts.

Cap., \$1,500,000; shares \$1 par.

Property: 180 acres, partly patented, known as the Copper Bell group, near the Ferris-Haggarty mine, having a 350' tunnel showing a vein of 30" to 9' width assaying up to 12% copper, with gold and silver values. Idle.

IMPERIAL COPPER & GOLD MINING CO.

WYOMING

Inactive. **Office:** 423 Caswell Block, Milwaukee, Wis. Jacob Best, sec-treas.

Property: 6 claims, 113 acres, patented, near the Penn Wyoming mine, on Upper Cow creek, 12 miles west of Encampment, said to show 2 veins, 1 of 26 to 32' estimated width, being a schist dike. Mine has about 500' of tunnels, developing ore giving assays of 6 to 14% copper, with small gold and silver values. Secretary reports all taxes paid, 1915. Idle in 1915-17.

INDEPENDENCE MINING CO.

WYOMING

Idle. **Office:** Algoma Bldg., Oshkosh, Wis.

Officers: E. E. Meeleus, pres.; Henry L. Larsen, v. p.; H. O. Granberg, sec.-treas. and gen. mgr.

Inc. June 28, 1904, in Wyo. **Cap.,** \$1,000,000, shares \$1 par, as successor of Leighton-Gentry Mining Co.

Property: 6 claims, patented, 120 acres, 2 miles north of Dillon in the Battle Lake district, shows eruptive metamorphic country rocks, carrying an 11' contact vein between quartzite and diorite.

Development: by 200' incline shaft and 250' tunnel, showing occasional stringers of 3 to 12" width, carrying a little chalcocopyrite assaying 12% copper, with small quantities of nickel and cobalt and traces of silver and gold. Has steam power, a hoist and several small mine buildings.

ITMAY COPPER MINING CO.

WYOMING

Idle. **Office:** Rawlins, Wyo. Mine near Rambler, Carbon Co., Wyo. I. C. Miller, mgr.; Albert Bryle, supt., at last accounts.

Property: 4 miles S. of Rambler, is said to have a 20' vein, carrying a paystreak of high-grade ore, apparently undeveloped, and another vein up to 8' in width carrying sulphide ore averaging about 8% copper.

Development: by a 300' shaft. Mine has been a complete failure to date.

JACK POT MINING & MILLING CO.

WYOMING

Idle. **Office:** Room 3, Algoma Bldg., Oshkosh, Wis.

Officers: H. Thorsgaard, v. p.; H. O. Granberg, sec.-treas.

Inc. Dec. 23, 1903, in Wyoming. **Cap.,** \$1,000,000; shares \$1 par.

Property: 9 patented claims, 180 acres, in the Battle Lake district, showing fissure veins in diorite and chloritic schist, and 2 contact veins, between diorite and porphyry, carrying carbonate and sulphide ores. Two veins, slightly developed, are said to average 14' to 60' width. The smaller vein has averaged 8% copper and \$3 to \$12 gold per ton, the larger vein showing very low-grade copper ore.

Development: 75' tunnel, 100' shaft and 8 pits of 20 to 36' depth, with 411' of workings. Though inactive for many years, company still in existence and reports that all taxes have been paid to date.

KIMBALL MINING CO.

WYOMING

Idle. **Address:** Kimball, Neb. B. A. Lathrop, pres. and supt., Centennial, Carbon Co., Wyoming. G. W. Forsling, v. p.; A. J. Hull, sec.-treas.

Property: 19 unpatented claims, near Centennial. Has driven 800' of tunnels to develop a quartz vein with gold and silver-bearing copper ores. Management reports that development work has been done in 1915, opening up milling ore that will average about 3% copper and \$3 gold per ton. Nothing available for 1916.

LEIGHTON-WYOMING MINING CO.**WYOMING**

Idle Office: 417 Seventh St., Milwaukee, Wis.

Officers: M. H. Yewdale, pres.; Herman Pereles, v. p.; H. E. Dankoler, sec.; Spencer C. Yewdale, treas.; with A. G. Weissert, S. P. Bjorklund and C. W. Hendricks, directors.

Inc. 1906. Cap., \$1,000,000; shares \$1 par; issued, \$810,000.

Property: 2 patented claims, about 1 mile north of the Ferris-Haggarty mine in the Battle Lake district.

Development: by a 186' tunnel and a 65' shaft.

Equipment: includes a saw mill and a small machinery plant, bought 1909, from the Haskins mine.

LOST CABIN MINING CO.**WYOMING**

A. B. Elnick, pres., Lysite, Fremont Co., Wyo. A. O. Heyer, sec.; D. Schoening, treas.

Cap., \$150,000.

Property: the Lost Cabin group, in the Boyeson section, is said to carry the Summit vein. Gold, silver and copper ore occurs in quartz veins. Since 1909 assessment work only has been done.

MAGGIE MURPHY COPPER CO.**WYOMING**

Office: care Chas. S. Ashley, pres., New Bedford, Mass. Mine near Douglas, Converse Co., Wyo.

Inc. Aug., 1904, in Wyoming. Cap., \$1,000,000; shares \$1 par.

Property: 12 claims, 180 acres, and a 60-acre mill site in Horseshoe canyon, in the Laramie Peak district. Claims show granite, with gneiss and schists, carrying 7 veins between gneiss and mica-schist, one of which ranges 30 to 60' in width and shows covellite, bornite and chalcopyrite, with pyrrhotite ores assaying 1 to 6% copper, 2 to 9 oz. silver and 40 cts. to \$4.50 gold per ton.

Development: includes 114' shaft and various shallow workings. Company has kept up necessary annual assessment work, but has done no development.

NORTH LARAMIE PEAK COPPER MINING CO.**WYOMING**

Office: care L. V. Saul, sec., Esterbrook, Wyo.

Mine office: Douglas, Converse Co., Wyo. H. C. Saul, pres.; W. A. Saul, treas.

Inc. 1908, in Wyoming. Cap., \$2,000,000; shares \$1 par; fully paid and non-assessable; 500,000 shares in treasury.

Property: 29 claims, 440 acres, patented, in the North Laramie Peak district. Claims show pre-Cambrian schists bordering granite contacts, on which 1,000' of diamond-drill work has proven existence of a flat body of disseminated chalcopyrite ore 40' wide. A shaft has been sunk 100' on a chimney of chalcopyrite ore said to assay 27% copper, 6 oz. silver and \$2 gold, for a total width of 5'. A second shaft, also in ore, will be deepened to 200'.

Equipment: includes 80 h. p. boiler with hoist, Cameron pump, steam power and a 3-drill compressor. Expected to start shipments in 1916. Is a close corporation, entirely owned and financed by Messrs. Saul.

OSHKOSH-WYOMING MINING CO.**WYOMING**

Office: 3 Algoma Bldg., Oshkosh, Wis. Mine near Dillon, Carbon Co., Wyo.

Officers: O. A. Koch, pres.; E. E. Meeleus, v. p.; H. O. Granberg, sec.-treas. and gen. mgr.

Inc. June 20, 1904, in Wyoming. **Cap.**, \$1,000,000; shares \$1 par.

Property: 11 claims, 220 acres, in the Battle Lake district, is said to carry fissure veins in gabbro, of 22' estimated average width, opened by shafts of 32' and 72' and a 22' tunnel, showing chalcopyrite and oxide ores of copper. Idle.

OTEGO MINING CO.

WYOMING

Hecla, Wyo. Officers: Horace E. Adams, pres.; A. G. McGregor, v. p.; Ray E. Lee, sec.-treas.

Inc. in Wyo. Cap., \$5,000,000; shares \$1 par.

Property: 3 claims, about 60 acres, in Secs. 25 and 36, T. 14 N., R. 70 W., in the Silver Crown mining district near Hecla, Laramie Co., Wyo. The Arizona mine is said to show granite and schist cut by an extensively fractured dike of diorite, about 200' wide and 2,000' long, outcropping at surface over a considerable distance.

Ore: at surface is oxidized and carries principally malachite, succeeded at depth by copper sulphides and native copper. Gold values occur disseminated throughout the orebody.

Development: by 160' shaft with 102' crosscut at the 80' level, 260' of crosscuts and drifts on the 130' level, and a 100' tunnel. Mine has been reported on by C. E. Jamison, State geologist of Wyoming (1912), and by Prof. H. C. Beeler (1907).

PARK GOLD MINING CO.

WYOMING

Office: Mining Exchange Bldg., Colorado Springs, Colo. **Mine office:** Centennial, Wyo.

Officers: Henry Sachs, pres.; C. A. Sheetz v. p.; C. B. Garnett, sec.-treas.; P. J. Winters, mgr., with J. A. Barton, directors.

Inc. 1916, in Wyo. Cap., \$700,000; shares \$1 par, 333,250 shares outstanding.

Property: 10 claims, 100 acres, 40 acres being placer ground, in Centennial mining district, Albany County.

Development: work was started in Jan. 1917, and consists of two tunnels, longest 110', and a shallow shaft.

Stock being sold at 10c per share, May 1916, to raise funds for development work and necessary equipment.

PLATINUM MINING & MILLING CO.

WYOMING

Address: 29 So. La Salle St., Chicago, Ill. **Mine address:** Holmes, Albany Co., Wyo.

Officers: Julius Thielman, pres.-mgr.; David Finn, v. p.; Robert Thielman, sec.-treas. D. Mapes, gen. mgr.

Inc. Jan., 1912, in Wyoming. Cap., \$200,000; shares \$1 par, issued \$50,000. Annual meeting, second Monday in January.

Statement of accounts from Aug., 1916, to March, 1917, shows expenditures, \$22,648; income, \$16,200 from stock sales, \$3,351 from ore sales.

Mine was located in 1870 for gold, relocated 1900 for copper and worked 1906 by Rambler Mining & Smelting Co., consolidated 1908 with New Lincoln Copper Co., as Rambler Copper & Platinum Co. The Platinum M. & M. Co. is operating mine under lease profits to be divided between the 2 companies.

Property: the Rambler mine, with 13 claims patented, 260 acres, in the Douglas district. Claims show a fissure vein reported as 20' wide in granite, running N. W. and dipping at 45° E.

Development: includes a 200' vertical shaft with drifting on the vein on the 100' and 200' levels. Total amount of underground work is about 5,000'. Average assays give 2% copper and 0.25 oz. platinum.

Work was begun June, 1912, but neither mine nor mill was operated during 1913, as mill was being remodeled and a 50-ton Peck centrifugal concentrator installed. No shipments were made until 1916.

Production: one carload shipped, 1916, netted \$2,552.

Ore: carried 11% copper, with platinum and palladium values.

Total ore shipped to May, 1917, 5,341 tons, yielding 1,905,925 lbs. copper and commercial values in gold and silver. Mining 7-10 tons of ore daily, 1917.

Equipment: includes a steam hoist.

PLUTO GOLD & COPPER MINING CO.

WYOMING

Idle Office: 3 Algoma Bldg., Oshkosh, Wis. Mine near Dillon, Carbon Co., Wyo. H. Thorsgaard, v. p.; H. O. Granberg, sec.-treas.

Inc. Dec. 15, 1902, in Wyoming. **Cap.**, \$1,000,000; shares \$1 par.

Property: 11 claims, patented, 220 acres, and a 40-acre mill site, in the Battle Lake district, near the Ferris-Haggerty mine, said to show both fissure veins in quartzite and contact deposits between diorite and quartzite, ranging from 2 to 30' in width, and carrying copper ore, with average assays of 1% copper, a trace of silver and \$3 gold per ton.

Development: by numerous pits of 10 to 20' depth, 5 shafts of 55 to 100' depth, and a tunnel of 1,004' with about 2,000' of underground workings.

Equipment: includes a 40-h. p. steam plant and 3-drill air compressor. Inactive since 1908.

PORTLAND CONSOLIDATED COPPER CO.

WYOMING

Office: 20 Broad St., New York.

Officers: Phil. S. Delany, pres.; Myer Newberger, v. p.; Thos. C. Delany, sec.-treas.; above with Herbert Frankenberger and Wm. H. D'Esterre, directors.

Inc. 1916, in Wyoming. **Cap.**, \$2,000,000; shares \$1 par; 1,136,912 shares outstanding; fully paid and non-assessable. Metropolitan Trust Co., New York, registrar; Company office, transfer office. Stock listed on New York Curb.

Property: formerly owned by the West Virginia-Wyoming Copper Mining Co. and the Portland Copper Mining Co., comprises 203½ acres, 153¾ acres patented, at Encampment, Carbon Co., Wyo., said to cover over a mile along a mineralized zone of diorite and limestone. The Portland group is reported to be traversed for 1,800' by a system of veins, which runs westerly into and through the West Virginia-Wyoming for another 1,800', veins said to vary from 12" to 40' in width, and to average 3% copper and some gold.

Ore: minerals are chiefly pyrite, chalcocite, bornite and malachite.

Development: 2,600' of underground workings, of which 1,650' are on the Portland, consisting of an 1,150' tunnel, drifts and 250' main shaft. Management estimates ore reserves at 300,000 tons of probable mill ore, containing 2-3% copper and 40c gold and 50,000 probable smelting ore, containing 10-25% copper and \$1-\$6 gold per ton. Further development necessary to prove value of the property.

RAMBLER COPPER & PLATINUM CO.

WYOMING

Office: 29 So. La Salle St., Chicago.

Mine address: Holmes, Albany Co., Wyo. Julius Thielman, pres.; Edw. White, v. p.; F. C. Sheldon, treas.; Dorchester Mapes, sec.

Inc. Jan. 21, 1908, in Wyoming, as a merger of the Rambler Mining & Smelting Co., and New Lincoln Copper Co. **Cap.**, \$2,500,000; shares \$1 par; all issued. Has indebtedness of \$100,000, 90% of which is in the form of refunding mortgage notes (bonds) held by stockholders.

Property: leased for 15 years, in 1912, to the Platinum Mining & Milling Co. (which see).

SHAWNEE COPPER MINING CO.

WYOMING

Address: J. M. Bovee, mgr., Shawnee, Okla. **Owners:** J. M. Bovee and A. H. Ikenberry.

Property: 5 claims, unpatented, in Medicine Bow Mts., French Creek district, Carbon Co., Wyo., near New Rambler mine, shows granite and schist cut by a fissure zone 200' wide, carrying \$4.10 gold ore.

Development: by 160' and 210' shafts. A new 1,500' tunnel has been considered. Examinations have been made by H. C. Beeler, J. J. Hinton and other engineers. Ample assessment work is done each year.

SNAKE RIVER CONSOLIDATED MINING CO. WYOMING

Mine P. O.: Columbine, Routt Co., Colo.

Officers: L. A. Pease, pres., treas. and gen. mgr.; A. L. Arnold; sec.

Inc. July, 1906, in Wyoming. **Cap.**, \$5,000,000; shares \$1 par; non-assessable; fully issued, with \$2,500,000 stock assigned to a trustee, for the benefit of the treasury. Annual meeting, second Wednesday in July.

Property: 9 lode claims, 2 patented, 180 acres, and 520 acres of placer claims, unpatented, in Three Forks district, 26 miles S. W. of Encampment, the nearest rail point. Claims show granite and diorite, reported by management to have veins carrying auriferous galena, with strike of N. 25° W., and cross veins carrying copper striking at nearly right angles. The management reports the galena vein system to have an extreme width of 120', with length of 4,500', the paystreak varying from 10" to 54" in width. The galena ore is said to average 10 to 20% lead, free from zinc, with silver and gold values. The copper veins are undeveloped, but show a variety of oxidized ores, at surface.

Development: by pits and shafts, and numerous short tunnels, from 30 to 500' in length, nearly all openings showing ore. The management estimates 5,000 tons of ore blocked out for stoping. Planned raising necessary funds for proper equipment and small concentrating plant at last report.

UNITED SMELTERS, RAILWAY & COPPER CO. WYOMING

Dead. The property claimed by this company is described under the title of the Penn-Wyoming Copper Co., which apparently was the legal owner, and full particulars regarding the entire chain of rotten promotions, including this company, are given in Vol. X, Copper Handbook, under Penn-Wyoming Copper Co.

Judgment for \$2,500,000 secured by Continental & Commercial Trust & Savings Bank, Chicago, Dec., 1913. Bank had loaned money to company taking a mortgage on the property. Several years of litigation were thus ended and the properties of the United Sm., R'y. & C. Co. and its subsidiaries were sold at forced sale, being bought in by the bank.

UTOPIA MINING & MILLING CO. WYOMING

Address: Centennial, Albany Co., Wyo.

Officers: Lee Van Voorhis, pres.; Jas. McCune, v. p.; P. L. Holtum, sec.; Bernard Holtum, gen. mgr.

Inc. 1898, in Wyoming. **Cap.**, \$1,000,000; shares \$1 par; non-assessable; issued, \$875,000. Annual meeting, third Tuesday in August.

Property: 2 claims, 30 acres, unpatented, in the Centennial district, said to show 2 contact veins between diorite and schist, of which 1 averaging 6' in width, is reported to have given assays of 3% copper, 4 to 20% zinc, up to 63 oz. silver and \$44 gold per ton.

Ore: minerals are mainly chalcocopyrite, sphalerite, and pyrites. Ore averages \$15 per ton.

Development: by tunnels of 250', 600', 175', 300', and 1,200', with about 2,600' of workings, all in ore.

Equipment: includes a small electrical installation, with electric drill, and 6 buildings. Reopened in 1913; nothing heard about it until 1917, when company stated that property had been leased in 1915 to the Gould Milling & Leasing Co (which see), B. A. Lathrop, mgr. A 50-ton mill costing \$20,000 is being erected.

WESTERN POTASH CHEMICAL CO. WYOMING

Office: E. B. Woodbridge, sec., 1303 Rector Bldg., Chicago, Ill.

Officers: J. W. Boileau, pres.; F. H. Woodbridge, v. p.-gen. mgr.; with E. B. Woodbridge, W. S. Phillips and J. S. Pennington, directors.

Cap., 1,000,000 shares of no value; non-assessable; 530,000 issued

Property: 720 acres in Austin Co., Wyo., said to contain a deposit of alkali clay, 30' deep, containing 5 to 25% potash and 10 to 12% alumina. Scrapers and steam shovel are to be used. A 10 to 100-ton plant has been erected. The salts are said to be soluble in hot water.

WILLIAMS LUMAN MINING CO.

WYOMING

Address: care W. J. Thom, cashier First Nat'l Bank, Buffalo, Wyo.

Mine office: Depass, Fremont Co., Wyo. L. R. Vanhouten, pres.

Inc. May 2, 1908, in Wyoming. **Cap.,** \$2,500,000; shares \$1 par; issued 2,385,000 shares.

Property: 9 claims, patented, 130 acres, 16 miles from a railway, in the Copper Mountain district, shows 8 fissure veins in granite, diorite and altered schists. The main vein, a zone 50 to 60' wide, traceable 3,400', in much altered, crushed and fissured diorite, has a 2' paystreak carrying free gold, copper ore, and native copper in thin sheets and nuggets, ore minerals being cuprite, melaconite, malachite and chalcocite.

Ore: is reported to assay 10% copper, 5 to 10 oz. silver and \$2 to \$8 gold per ton.

Development: by an 820' shaft, showing sulphides on the 800' level, with 2,000' of workings. There also are tunnels of 513' and 300'.

Equipment: includes an 80-h. p. gasoline plant, with a 15-h. p. hoist and a 2-drill compressor. The company is operated as a close corporation, money for development having been furnished by about 10 shareholders only. Property favorably regarded, but needs railroad transportation.

Late in 1916, a 3-year's option was given to Denver people, who have shipped some ore, but no returns are available.

WINONA GOLD-COPPER MINING & MILLING CO. WYOMING

Office: 111 Market Ave., S., Canton, Ohio. **Mine office:** Painter, Big Horn Co., Wyo.

Officers: L. Cavanah, pres. and gen. mgr.; Geo. House, v. p.; Dr. J. H. East, 2nd v. p.; Wm. H. McAloney, sec.-treas., at last accounts.

Inc. 1903, in Wyoming. **Cap.,** \$5,000,000; shares \$1 par; fully paid. Management was changed and company practically reorganized Dec. 12, 1905.

Property: 25 claims, unpatented, 440 acres, in the Sunlight basin, on Silver creek, in Bear Tooth and Sulphur mountains, in the N. W. corner of Big Horn County, about 12 miles E. of the Yellowstone National Park. Claims show granite, porphyry and andesitic breccia, carrying 6 fissure veins with shoots of low-grade copper ore. The ores carry chalcopyrite and chalcocite and are reported to average 7 to 8% copper with about \$3 gold per ton. The principal veins in andesite are known as the Bluff, Malachite and Greenhorn. The Bluff vein is said to be 25' wide with a 12' paystreak of copper ore. The Malachite vein, 10 to 25' wide, has a paystreak of high-grade copper ore, 1½' wide at surface, increasing to 5' at depth.

Development: by 2 tunnels, the lower or main working tunnel, 804' long. Total workings, 1,032'.

Equipment: includes steam and electric power plants and 10 buildings.

WYOMING COPPER & GOLD MINING CO. WYOMING

Office: Alma, Kan. No representative at former mine office, Encampment, Carbon Co., Wyo. C. B. Henderson, pres.; Al Rohr, v. p.; J. R. Henderson, sec.-treas.

Inc. Sept. 3, 1903, in Arizona. **Cap.,** \$1,500,000; shares \$1 par; non-assessable.

Property: 9 claims, known as the Metal Chief and Jessie group, in Hog Park, in the upper Platte district, 12 miles from a railway.

Claims show granite and gneiss, cut by 2 fissure veins with S.-E. strike, reported by management to average 28 to 35' in width, and to carry copper oxide and carbonate ores, with average assay of 3 to 15% copper, a little silver and \$1.63 to \$3.29 gold per ton. The Metal Chief vein has a 105' shaft and the vein is reported to widen at depth. The Jessie vein has a 175' shaft showing ore of 5 to 10% copper tenor with small gold and silver values.

Equipment: includes a small steam plant with a hoist, steam-pump, and 3 buildings.

Development: has been slow for some years past, as the officers have furnished most of the funds, but considerable work has been done annually according to last advice.

WYOMING COPPER MINING CO.

WYOMING

Idle. **Office:** 303 Detroit Free Press Bldg., Detroit, Mich. **Mine office:** South Pass City, Fremont Co., Wyo.

Officers: Charles K. Skinner, pres.; C. F. Remington, treas.; Jas. MacFarlane, v. p. and supt.; C. A. Spalding, sec.; preceding, with Chas. E. Murphy, and Chas. D. Ridgway, directors.

Inc. 1905, in Wyoming. **Cap.,** \$2,000,000; shares \$1 par; non-assessable; issued \$1,375,000. Annual meeting, last Saturday in July.

Property: 12 quartz claims, 240 acres, and a 30-acre placer claim, in the South Pass district of the Wind River mountains, is reported to show a contact zone, between granite and metamorphic rock, proven for one-half mile length by prospect pits.

Development: includes a 500' incline shaft, and several hundred feet of crosscutting. The vein is reported by the former management to show sulphide ore at depth of 72', ore giving assays of 2 to 6% copper, with an average of 1 to 2 oz., and maximum of 20 oz. silver, and \$3 to \$4 gold per ton.

Equipment: includes an 80-h. p. boiler and a 40-h. p. Fairbanks-Morse hoist, with several buildings.

**CANADA
AND NEWFOUNDLAND**

CANADA

The mining companies of Canada are grouped by provinces and by districts. Cobalt, Porcupine, etc., are therefore described under Ontario. The Pas district, the new copper district of Canada is in Manitoba and the great number of mineral properties of the Pacific Coast region are described in the appropriate districts of British Columbia.

Newfoundland being an independent Crown Colony is in a separate section.

ALBERTA

ATHABASCA MINING CO.

Inc. in Alberta, Can., April, 1914. **Cap.**, \$1,000,000. Hon. G. H. V. Bulyea, Gov. of Alberta, Hon. Chas. R. Mitchell, E. J. Taylor and C. L. Freemann, directors, all of Edmonton.

Property: assets and properties of the Athabasca Mng. Syn. consisting of 800 acres of nickel claims, 160 acres iron claims, on and near Lake Athabasca, near Edmonton, Alberta, Canada.

Ore: nickel-iron-copper. Assays of surface samples showed 1½ to 5% nickel, iron samples ran 66.7% iron, 2.12% silica, .014% phosphorous and .013% sulphur. Copper occurs as bornite. Property operated under lease by A. E. Rand and G. D. Brymner, in 1916-17. Five men employed.

BRITISH COLUMBIA

The mining companies of this province are grouped by districts, except that Vancouver and Vancouver Island properties are put in one section. Readers interested in British Columbia mines should consult the report of the Provincial Mineralogist, issued as Annual Report of the Minister of Mines for the year 1916, obtainable free by writing for it to the Minister, Victoria, B. C.

The Granby (Hidden Creek, or Anyox) and the Tonopah Belmont properties, on the Coast, are described under the Skeena Division.

Companies with Properties in Various Districts in British Columbia

GRANBY CONS. M., SM. & POWER CO., LTD.

BRITISH COLUMBIA

Offices: 718 Granville St., Vancouver, B. C., and 52 Broadway, New York. Mines at Phoenix and Hidden Creek, B. C., and Valdez, Alaska; and other places in B. C. and Alaska. Smelters at Grand Forks and Anyox, B. C.

Officers: W. H. Nichols, pres.; E. P. Earle, W. H. Robinson, Edwin Thorne and F. M. Sylvester (mg. dir.), v. p's.; Henry-Bruere, B. Hochschild, W. A. Paine, S. H. Steele and G. W. Wooster, directors; Edward Everett, sec.; H. Harvey, asst. sec.; G. W. Wooster, treas.; H. T. Mahan, asst. sec.; O. B. Smith, supt. of mines; C. M. Campbell, supt. at Phoenix mines; E. E. Campbell, supt. at Anyox mines; W. A. Williams, supt. of smelters; W. B. Bishop, supt. Grand Forks smelter; A. J. Bone, supt. Anyox smelter; N. W. Sweetser, supt. at Alaskan mines; H. J. C. Mac

Donald, E. J. Conway and J. F. Coats, min. engrs.; Charles Wing, sec. safety-first committee.

Inc. March 29, 1901, by special act of the British Columbia parliament. Cap., \$15,000,000; shares \$10 par; changed, 1906, to \$100 par; \$14,995,075 outstanding. Bonds authorized Feb. 25, 1913, \$5,000,000, first-mortgage, 6%, 15-year, convertible at par. Series A of \$1,500,000 bonds underwritten Feb., 1912, at 96 by Speyer & Co. Bonds redeemable at 105 plus interest after 10 years, 4% to be retired by purchase at \$110, annually; \$2,514,400 outstanding June 30, 1917. Shares listed on Boston Stock Exchange. Boston Safe Deposit & Trust Co., and Lincoln Trust Co., Boston, registrars; American Trust Co., Boston, and Title Guarantee & Trust Co., New York, transfer agents. Annual meeting, first Tuesday in October. Columbia Trust Co., New York, trustee of bonds; Title Guarantee & Trust Co., New York, registrar of bonds.

Company was organized to purchase the property and assets of the Old Ironsides Mining Co., Knob Hill Gold Mining Co., Ltd., Gray Eagle Gold Mining Co., Ltd., Granby Consolidated Mining & Smelting Co., Ltd., and the Grand Forks Water & Light Co., at an aggregate cost of \$12,097,030. Stock to the amount of \$1,402,970 was issued for cash and services rendered.

Comparative General Balance Sheet, years ending June 30:

Assets:

	Prop. & Equip.	Investments	Supplies Accts. Rec.	Cash, Ore & Metals	Total
1917.....	\$22,315,637	\$683,230	\$6,448,063	.....	\$29,447,931
1916.....	20,366,316	575,644	1,041,012	2,927,317	24,910,288
1915.....	19,965,755	430,517	568,465	1,756,543	22,721,281
1914.....	19,630,026	514,809	525,097	1,375,794	22,045,726

Liabilities:

	Capital Stock	Bonds	Loans Unsecured	Accounts Payable	P. & L. Surplus	Total
1917.....	\$15,000,420	\$2,514,000	.....	\$1,242,806	\$9,434,038	*\$29,447,931
1916.....	14,998,520	3,042,300	.....	281,997	6,587,471	24,910,288
1915.....	14,998,515	3,390,000	.....	664,680	3,668,087	22,721,281
1914.....	14,998,515	2,290,000	\$960,000	1,057,296	2,739,914	22,045,726

* Includes \$1,256,267, reserve for depletion of ore and plant.

Comparative Income Account, years ending June 30:

	Gross Sales.	Oper't'g Expenses.	Int. Deprec.	Net Income.	Div. Paid.	Prev. Surplus.	P. & L. Surplus.
1917.....	\$12,259,185	\$7,022,402	\$211,532	\$5,025,251	\$1,349,962	\$6,587,471	\$12,040,267
1916.....	11,370,500	7,262,379	288,225	3,819,295	899,911	3,668,088	6,587,471
1915.....	5,053,286	3,713,329	411,393	928,164	.....	2,738,823	3,668,088
1914.....	4,504,766	3,882,695	182,520	439,551	\$899,901	3,199,273	2,738,922

Dividends: for years ended June 30:

\$133,630.....	1903	\$449,955.....	1913
339,991.....	1905	899,900.....	1914
1,620,000.....	1906	.....	1915
1,215,000.....	1907	899,911.....	1916
540,000.....	1908	1,349,962.....	1917(a)
270,000.....	1909		
248,481.....	1910		

(a) Present rate \$10 per share, payable quarterly.

Properties: include original Granby group at Phoenix in the Boundary district, B. C.; the Hidden Creek mine on Granby bay, Observatory inlet,

B. C.; Copper Key and Belcher groups at Belcher mountain, Wash., taken over, 1910, under a working bond and lease; the Oversight group; the Bonanza mine creek; 30 quartz claims on Granby Peninsula; Mamie and Dean mines on the Kasaan Peninsula; the Midas mine at Valdez, and an option on It mine adjoining the Dean on Prince of Wales Island. Also owns a large interest in the coal mine and coking plant at Crow Nest Pass, and a 100,000-h. p. waterpower plant at Kettle Falls, both together valued at \$2,000,000; a smelter at Grand Forks, operated since 1901, and one at Anyox, blown in 1914. Coal lands are being acquired to ensure a regular supply of coke.

The Phoenix Mines.

C. M. Campbell, supt., Phoenix, B. C.

The Granby or Knob Hill properties at Phoenix, B. C., 43 claims and fractions, 1,050 acres, 15 claims being in the mineralized area, include the Old Ironsides, Knob Hill Victoria, Gray Eagle, Banner, Tip Top, Triangle, Gold Drop, Curlew, Monarch, Tamarack, Monte, No. 13 and others. Claims form a compact tract of about 8,000x9,000' size, carrying 8,000' of the strike of the mineralized zone. The Phoenix property has 2 distinct sets of orebodies. The largest and longest worked are those of the Knob Hill-Ironsides mines; the other one, one-half mile east, is the Gold Drop. The first named has 3 mines with separate crews and equipment.

Geology: of the district is not simple. Paleozoic rocks, limestones, tuffs and argillites overlie beds of fragmental volcanic rocks with small amounts of limestone. These rocks are intensely altered by contact metamorphism, due to igneous intrusions, and orebodies formed in basin-shaped troughs in the zone of mineralization. They are replacements of limestone by garnet, epidote, quartz-calcite, with magnetite and finely-divided copper pyrite. The foot-wall is either jasperoid or limestone; the hanging wall is determined by assays.

The Old Ironside-Knob Hill claims carry the main orebody, the Gold Drop ore deposit being irregular in shape, and of limited size. The main orebody has an approximately N. S. strike, with an eastward dip of 60° at surface and 30° at depth. Ore now being mined at Phoenix yields slightly less than 15 lb. copper and about 84c in gold and silver per ton. The mine is opened by an immense pit, or glory-hole, 400x1,000' in size, which, however, is worked out and present extraction is mainly through tunnels. On the Gold Drop only 80,000 tons of ore remain to be extracted, and the Snowshoe, Curlew and Monarch claims are almost worked out. Practically all reserve tonnage is in the Ironsides.

Development: 5 shafts, the more important being the 300' Aetna shaft, 400' No. 2 shaft, and the 485' Victoria shaft. Principal extraction is by tunnels, including the 250' Knob Hill tunnel; 250' No. 1 Gold Drop tunnel; 1,000' No. 3 Gold Drop tunnel; 2,500' No. 2 tunnel; 3,000' No. 3 tunnel, and 1,500' No. 4 tunnel. The ore stoped is milled through chutes to lower levels, the mine having electric haulage on the 200', 300' and 400' levels, with double-tracked tunnels equipped with 75-h. p. locomotives drawing 10-ton ore cars. Development for 1916 included 14,608' of underground work and 11,392' of diamond-drillings, or about 1,000' per month. Total shipments up to June 30, 1917, have been: above No. 3 tunnel; 6,150,039 tons; Victoria shaft, 5,039,633 tons, and Gold Drop mine, 1,635,754 tons, a total of 12,825,426 tons.

Average cost per ton crushed on cars including all development was \$1.175, an increase of 23.4c. Ore is smelted direct. The mechanical equipment at the mine is fully described, Volume X.

The 3 main haulage tunnels are each equipped with 150-ton crushers, and bins of 2,000 and 3,000 tons capacity. The main crusher house at the portal of No. 3 tunnel, has a 30x42" Farrell-Bacon crusher driven by a

150-h. p. Westinghouse motor, the crusher being capable of breaking masses of nearly a cubic yard in size to chunks not larger than 7 to 8". This crusher was shipped to Anyox, when the properties closed down in August, 1914, following the declaration of war in Europe. A 42" rubber belt conveyor, with capacity of 250 tons hourly, handles the ore. An electric shovel installed in 1915 proved very satisfactory. Operating costs were about \$1.10 per ton crushed in cars at No. 2 tunnel, including development and handling waste.

The mine is connected with the smelter at Grand Forks, 24 miles distant, by 2 railways, the Canadian Pacific and the Great Northern. By means of extensive ore bins at the Victoria shaft and the 3 main tunnels a train of 35 thirty-ton cars can be loaded in 25 minutes or less.

Hidden Creek or Anyox Mines.

E. E. Campbell supt., Anyox, B. C.

The Hidden Creek mine is located on Granby (formerly Goose) bay, Observatory inlet, south of and parallel to Portland canal. It is probably the largest copper mine of British Columbia. The 9 claims cover the top and sides of a hill 920' high, enclosed by 2 branches of Hidden creek and 2 miles from Anyox, the smelter site and seaport town of the company.

The ore occurs as a mass of solid sulphides, pyrite and chalcopyrite, or mixed with country rock in shear zones, in crushed and schistose argillite. The rocks are folded and mashed but are part of the cover of the great granite mass forming the Coast range. There are 2 deposits, one of 25 to 40' wide, traced 1,400' said to average 6%, the other estimated to be 100' wide and of unknown length. Development by diamond drill holes shows the ore to extend 300' below sea-level, a vertical distance of 1,250' below outcrop.

Development: by tunnels with principal workings on the 750' crosscut main tunnel, which is about 450' from the surface.

New work in 1916 totaled 2,333', making a total of 27,439'. Diamond-drilling amounted to 5,873', or 49,464' to date. New electric hoists were installed, also crushing plant, new drills, residences, etc.

Cost of ore delivered on cars was \$1.235 per ton, an increase of 23.4c per ton. Cold weather and high price of mining supplies increased the cost during 1916.

Reserves at June 30, 1917, were estimated at 18,139,163 tons, averaging 1.61% copper. So far, this mine has yielded 2,041,338 tons, of which 760,705 tons was mined in 1916-17.

Company also owns the Bonanza group, adjacent to the Hidden Creek mine. No development work was done on this property in 1916, but erection of compressor, crusher, aerial tram, etc., was commenced.

This mine contains 904,355 tons of 1.6% ore. No work was done in 1917.

Alaskan Mines

Operations during the year ended June 30, 1917, may be summarized as under:

Situation.....	MAMIE	Ir	MIDAS
	Hadley, S. E. Alaska	Kasaan Bay, S. E. Alaska	Valdez, S. W. Alaska
Period, months.....	8	12	9
Tons ore shipped to Anyox.....	20,115	14,881	21,019
Copper content, %.....	1.46	4.09	4.12
Gold and silver per ton.....	\$0.36	\$1.68	\$1.55
Total workings, feet.....	8,518	5,114	3,713
Diamond-drilling to date, feet.....	10,875	6,164	.....
Reserves, tons.....	522,560	7,500	44,457
Cost per ton.....	\$3.730	\$5.543	\$5.770

The Mamie ore, containing an excess of iron, is considered a flux. The mine is closed indefinitely, until such ore is needed at Anyox. Under present conditions it cannot be profitably worked. The ore is valuable as a flux, as it is high in lime. So far, the property shows a profit of \$133,827. It is fully equipped. Indications point to the Midas (P. J. Cook, supt.) opening well at depth. Low-grade concentrating ore is being developed and a mill is being considered.

Ore reserves: estimated as follows (June 30, 1917):

Mine	High Grade			Low Grade		
	Tons	Copper, %	Precious Metals	Tons	Copper, %	Precious Metals
Phoenix.....	3,275,996	1.00	\$0.75	300,000	0.65	\$0.60
Hidden Creek.	9,882,183	2.31	0.30	8,257,500	0.64	0.15
Bonanza.....	414,775	2.66	0.30	489,580	0.70	0.15
Mamie.....	93,080	1.39	0.35	429,480	0.81	0.20
It.....	7,500	3.30	1.30	.....	.....	.....
Midas.....	44,487	4.00	1.53	.....	.....	.....
	13,717,021	.....	.....	9,476,560	.....	.....

The total is 23,193,581 tons, against 23,156,000 in the previous year. Total copper contents are 674,191,016 lbs.

Grand Forks Smelter: company's reduction plant at Grand Forks has up-to-date smelting, converting and power plants, with 2,000 acres of land and 68 town lots. Smelter has 4,400 tons daily capacity, being the largest in Canada, and among the largest in the world. Steel storage bins hold 8,000 tons of coke and 13,000 tons of ore. Ore is handled by 4 electric locomotives, each drawing two 2-ton cars, constituting a single charge; the ore being practically self-fluxing, is charged without concentration, or assortment, just as it comes from the mines, with the addition of limestone and fuel.

The 8 blast furnaces are 4x22' in cross-section at the tuyeres. A steel dust chamber, set 22' above the charging floor, is 13' wide, 15' high and 313' long, with a floor of 28 hoppers, having a conveyor underneath for flue dust. Slags now granulated are dewatered, carried on conveying belts to a height of 120' and discharged.

The first-fusion 40% matte is taken in ladles by a 40-ton electric traveling crane to the converter house, which has 3 stands, electrically operated by 25-h. p. motors, with ten 84x126" shells of barrel type. There are 3 mould carriers under each stand and the product is blister copper of 98.5% tenor, containing an average of 18 oz. silver and 4 oz. gold per ton, sent to the Laurel Hill works of the Nichols Copper Co., for electrolytic refining.

The smelter power plant is driven by electricity. Equipment includes 9 small blowers and 2 Connorsville Jumbo blowers, with capacity of 100,000 cu. ft. of free air per minute, driven by two 300-h. p. motors. Converter blast is furnished by an Allis-Chalmers double-cylinder air compressor, with capacity to reduce 10,000 cu. ft. of free air per minute to a pressure of 15 lbs. per square inch, driven by a 500-h. p. direct-connected electric motor.

Mines and smelter in B. C. well described in *Min. & Sci. Press* of Feb. 24, 1917.

Anyox Smelter: in March, 1914, this plant on Observatory inlet was blown in. The plant has 4 furnaces, 52" wide and 30' long, and is the largest pyritic smelter in the world. Daily capacity is from 2,000-2,500 tons. Company has laid out a town, installed water works, electric plant, graded streets, built stores, hospitals, etc.

Recent production: for years ending June 30, except 1916, which is for 9 months ending March 31:

	Ore Tons (a)	Cost Mng. \$1.248	per Ton Sm. \$1.926	Tot. \$3.274	Lbs. Cu. per Ton 25.27	Copper Lbs. 37,676,368	Silver Oz. 406,302	Gold Oz. 25,123	Cost Cu. (b) 13.7
1917.....	1,490,804				22.29	42,198,083	487,845	44,848	12.30
1916.....	1,929,205	0.99	1.30	2.29	23.99	26,638,912	377,881	31,388	10.66
1915.....	1,098,020	.85	1.19	2.18	16.89	23,320,007	435,275	43,882	11.5
1914.....	1,289,000	.80	1.22	2.78	17.68	23,688,614	324,336	47,266	10.6
1913.....	1,279,869	.75	1.31	2.65	18.01	13,231,121	225,305	33,305	11.1
1912.....	789,819	.77	1.26	2.90					

Custom ore is not included in the 1917 figures.

Cost of producing copper was as follows, in cents per pound:

	Phoenix	Hidden Creek
1917.....	20.80c	11.50c
1916.....	14.25c	10.00c

(a) In 1916 approximately 1½% of ore treated was custom ore. (b) after crediting gold and silver.

Owing to labor troubles in British Columbia there was a decreased output in 1917. In October the yield was 3,259,974 lbs. copper.

Granby is under efficient, progressive management and its future looks bright. Major operations are now conducted at the Anyox property.

AINSWORTH-KASLO DISTRICT

EDEN-CRESCENT MINING CO.

BRITISH COLUMBIA

Address: W. Y. Williams, mgr., Coffee Creek Landing, near Ainsworth, B. C.

Officers: A. L. White, pres.; W. J. Nicholls, v. p.; E. B. McBride, sec.-treas., with W. Y. Williams, C. F. Caldwell and W. H. Button, directors.

Inc. Jan., 1917, in Washington. Cap., \$75,000; shares 5c par; 900,000 issued.

Property: 8 claims near Coffee Creek Landing, on Kootenay lake, near Ainsworth, B. C.

Development: by 2 shallow shafts and 800' tunnel. In Sept., 1917, a crosscut had opened 6' of ore assaying 30% lead and 6 oz. silver per ton.

Prospects are reported by management to be favorable.

FLORENCE SILVER MINING CO.

BRITISH COLUMBIA

Offices: Hutton Bldg., Spokane, Wash., and Ainsworth, B. C.

Officers: F. R. Wolfe, pres. and gen. mgr.; A. F. Kelly, v. p.; D. E. Sanders, sec.-treas.; with W. M. Frost, J. A. Lavender, directors. Chas. Simpkins, gen. supt.

Inc. July 1, 1911, in Washington. Cap., \$1,000,000; outstanding \$900,000; shares \$1 par; non-assessable. Stock transferred at company office. Annual meeting July 3.

Property: 9 claims, crown granted, 370 acres, 3 miles N. of Ainsworth in the Ainsworth mining district. Claims, on the west side of Lake Kootenay, extend west from shore about 2 miles.

Ore: lead, zinc and silver in E. W. fissure veins in quartzite and slate. Three oreshoots have been developed. One oreshoot said to have over 400' of commercial ore. Milling ore said to contain 10% to 20% lead, 8% to 15% zinc and 6 oz. silver per ton.

Development: by the 2,400' No. 2 tunnel with over 5,000' of underground workings at average depth of 700' and 2,100' No. 2 tunnel, 360' lower, and the main working level. Company states there are 300,000 tons ore blocked out, averaging 14% lead, 10% zinc and 4 oz. silver.

Equipment: includes 250-h. p. compressor, 350-h. p. hydro-electric plant and 1,800' aerial tramway from No. 3 tunnel to the mill. The 300-ton concentrating mill on the shore of Kootenay Lake was completed May 1, 1917 and is reported treating 220 tons per day, producing 32 tons of concentrate. Water power is developed at Woodberry Creek, under 350' head. Total cost of improvements to Sept. 1917, \$175,000. Shipments in July, 320 tons valued at \$30,000, with expenses of \$10,000 for the month. A 500' surface tram runs from tunnel portal to terminus of a 1,400' aerial tram that runs to the mill. Mill to be enlarged November, 1917. Gasoline motor of 40-h. p. will haul 10 tons of ore per trip from No. 3 tunnel.

LEO MINING CO.**BRITISH COLUMBIA**

Office: 1005 Eleventh Ave., Spokane, Wash.

Officers: Thos. Hooker, pres.; S. Hanauer, v. p.; G. W. Roche, sec-treas.; above with W. Merryweather, and W. S. McCrea, directors.

Inc. Aug., 1916, in Wash. Cap., \$50,000; shares 5c par; assessable; 750,000 issued.

Owns 2 claims near Ainsworth, B. C., showing a fissure vein in gneiss-quartzite.

Ore: galena with gold and silver values occurs in a shoot 18" wide. Average assays given as \$80 a ton.

Development: by 2 tunnels, 625' and 1,200' long with 300' of drifts.

Is still in the prospect stage.

NEW CANADIAN METAL CO.**BRITISH COLUMBIA**

S. S. Fowler, Nelson, B. C., mgr. Control is held in France.

Property: the Bluebell lead-silver mine at Riondel, near Ainsworth, B. C.

The deposit is a replacement in limestone, irregular masses of ore following the bedding, with tongues projecting into the foot-wall country of pre-Cambrian sediments.

Development: mine is 600' deep on incline of 35°.

Equipment: includes mill with Blake crushers, rolls, jigs, trommels, Huntington mills, Wilfley and Deister tables. Concentrate contains 48% lead, 12 oz. silver and 3% zinc, which is shipped to Trail.

Production: 250 tons of ore daily.

SILVER HOARD MINING CO.**BRITISH COLUMBIA**

Office: 614 Hutton Bldg., Spokane, Wash., and Ainsworth, B. C.

Officers: Geo. Chew, pres.-gen. mgr.; E. R. Northrup, v. p.; L. R. Hawley, sec.-treas.; W. S. Hawley, asst. gen. mgr.; preceding with A. B. Lee, W. H. Carder and D. T. Fox, directors, all of Spokane.

Inc. in Wash., registered in British Columbia. Cap., \$1,000,000; \$925,000 issued; shares \$1 par. Listed on Spokane Exchange.

Bonds authorized, \$75,000, 10% 1st mtge., due Jan. 24, 1921; int. payable semi-annually; \$25,000 offered for sale in denominations of \$100, \$500 and \$1,000 each, carrying stock bonus of one share treasury stock for every dollar's worth of bonds.

Property: 5 claims, 202 acres, crown-granted, near Ainsworth, which are said to carry the vein mined at No. 1 mine of Cons. M. & M. Co., which is 2,400' away. **Ore:** silver-lead-zinc in limestone; claimed that milling ore averages \$15 to \$25 per ton.

Development: 7,000' of workings. **Ore reserves:** said to be 50,000 tons.

Equipment: includes hydro-electric power, compressor, hoist and concentration mill.

Production: since beginning of operations in 1911 to 1916, reported as 43 cars of ore, assaying 46.9 oz. silver, 4% lead, and 15% zinc per ton, with net smelter returns of \$32,000.

Mine was idle in 1916, but worked by lessees (W. S. Hawley Co.) during 1917. In July a flotation plant was started. Table concentrates contained 65% lead, 45% zinc, and 150 oz. silver per ton. The new plant was expected to add 5% on the lead and zinc, and make a total recovery of 85 to 90%.

UTICA MINES, LTD.**BRITISH COLUMBIA**

Office: Kaslo, B. C.

Officers: V. D. Williamson, pres. and managing director; C. F. Caldwell, v. p.; with W. C. Sivyver, R. H. Voorhees and W. Tolman, directors. C. B. White, mgr.

Inc. in British Columbia. **Cap.**, \$2,000,000; shares \$1 par; non-assessable; 1,600,000 issued.

Operating profits in 1916 were \$72,875. In first quarter of 1917 profits were \$34,119. An initial dividend of 2c. was paid in June, followed by 2c. in September.

Property: silver, lead, zinc holdings in Ainsworth district, B. C.

Development: by tunnels to 1,200' below vein outcrop. Workings cover over 6,000'. In July, 1917, 8' of high-grade ore was opened 1,020' below No. 2 level.

Production: in 1916 was 983 tons of ore, averaging 22% lead and 170 oz. silver; also 75 tons assaying 43% zinc and 145 oz. silver per ton. The total value was \$170,000. Regular shipments are being made to the Trail smelter.

Company is now in a fairly strong position to continue dividends. Costs are high, being \$31.16 per ton in 1916.

WOLVERINE MINING & DEVELOPMENT CO.**B. C.**

Succeeds Kootenay Dev. Co. Ainsworth, B. C. Jere Madden, pres., Rapid River, Mich. J. Cleveland Haas, managing director, and J. F. Carey of Spokane, Wash., director.

Property: the Nicollet group of 14 claims on Kootenay lake, north of Ainsworth and adjoining the Highland and Florence mines (Florence Mng. Co.). Veins in metamorphic rocks are said to carry rich silver-lead ores. A new tunnel was to have been driven in 1916-17.

ASHCROFT DISTRICT**HIGHLAND VALLEY MINING & DEVELOPMENT CO.****B. C.**

Office: 610 Hutton Block, Spokane, Wash. **Mine address:** Howland B. King, supt., Ashcroft, B. C.

Officers: Frederic Keffer, pres. and gen. mgr.; Sigmund Dilsheimer, v. p.; Chas. G. Hall, sec.-treas.; above, with J. C. Haas, directors.

Inc. 1915, in Wash. **Cap.**, \$1,500,000; shares \$1 par, non-assessable; 984,000 outstanding.

Report for year ending Dec. 31, 1916, shows, receipts from ore shipments, \$16,815; operating expenses, \$2,802; net income, \$14,013.

Company has unpaid balance of \$48,115 to pay on the Chataway and Sanson groups.

Property: the Chataway, Tamarack and Sanson groups, 15 claims, about 600 acres, 28 miles S. W. from Ashcroft, a station on the C. P. R. R. Eleven claims held under bond for \$50,000.

Ore: copper with small silver-gold values, occurs as contact vein between granite and quartz-feldspar porphyry. Vein is from 3-17' in width, and ore has been drifted on for about 400'. Ore carries chalcopyrite in a micaceous gangue. Average assays are 5% copper, with 50c gold and silver.

Development: by 400' tunnel to depth of 130'. Total work, 900' of drifts and tunnels, 300' raises and stopes.

Equipment: includes 1,000' tramway and 50-ton mill using flotation and making a 90% extraction, 1917.

Production: 26 carloads of concentrate shipped from August, 1916, to September, 1917, netting \$68,351. Reserves about 15,000 tons of 5% ore. Is a clean cut and creditable mining promotion.

MINES OF THE COAST DISTRICT

(Excepting Vancouver district and Vancouver Island, which are grouped together)

DRUM LUMMON COPPER MNG. CO., LTD. BRITISH COLUMBIA

Address: S. J. Maloney, Vancouver, B. C.

Directors: J. Pearse, W. Patterson, J. Robertson, Geo. Kent, J. Bratch and P. Matheson, all of Vancouver.

Property: a group of claims, a mile from tidewater, at Miskatlah bay, Douglas channel, halfway between Kitimat and Hartley bay.

Ore: copper glance in quartz gangue, with 1.42 to 74% copper and 0.8 to 14 oz. silver per ton; occurs in a shear zone 75' wide in granite.

Development: by 360' crosscut tunnel, with depth of 150'.

CARIBOO DISTRICT

LIGHTNING CREEK GOLD GRAVELS & DRAINAGE CO., LTD. BRITISH COLUMBIA

Office: C. H. Unverzagt, owner and treas.; 405 Lexington Ave., New York.

Mine address: P. M. Hamlin, supt., Cottonwood, B. C.

Inc. 1896 in B. C. **Cap.,** \$8,000,000; shares \$5 par; 450,000 issued. **Bonds:** \$250,000' authorized; \$150,000 outstanding.

Property: 40 claims, 2,036 acres, or about 20 miles of Gravel beds on Lightning Creek, at Wingdam, B. C., credited with a production of many millions in the 70's and 80's. Shaft, 165' deep, is sunk in gravel to bedrock.

Company is equipping property and expected to start work June, 1917.

GREENWOOD DISTRICT

BRITISH COLUMBIA PHOENIX CO., LTD. BRITISH COLUMBIA

Secretary and office: H. W. Batty, 146 Bishopsgate, London, E. C., England. Geo. S. Waterlow, chairman, and L. C. F. Robson, directors.

Company is a reorganization, July, 1914, of the British Columbia Phoenix Syn., Ltd. **Cap.,** £5,000 in 20,000 shares of 5s each; 6,205 shares issued and fully paid. Shareholders in the B. C. Phoenix Synd., Ltd., received 1 share of 5s fully paid in the new company for 10 shares, 1s each, of the old company.

Properties and interests taken over from the liquidator of the B. C. Phoenix Syn., Ltd., include an interest in the New Velvet-Portland Mine, Ltd., consisting of a mortgage debenture, loans to the receiver and accrued interest, an unsecured debt and also the equity of redemption. The mine was leased for one year from July, 1915. Other properties and interests include mining claims in British Columbia, real estate in Rossland and sundry shareholdings and other interests.

GRANBY CONS. M., S. & P. CO.

See first page of British Columbia mines.

JEWEL-DENERO MINES, LTD.

BRITISH COLUMBIA

Secretary's office: W. Robertson, 71 George St., Edinburgh, Scotland.

Mine office: Greenwood, B. C.

Directors: J. Galloway, chairman; J. E. Rogerson and W. W. Slater. **Inc.** Nov. 22, 1912, in Edinburgh.

Cap., £70,000; shares 5s each; 279,400 shares issued. Authorized bond issue, £12,500, 8%; £11,202 issued.

Property: the Jewel gold mine at Greenwood and the Idaho Alamo mine in the Slocan district, B. C. The Jewel mine is developed to depth of 500' by shafts and crosscuts and started production in 1911. Produced 16,525 tons of ore in 1914, yielding £31,360. In 1915 only development work was done and in 1916 the mine was being operated by lessees. **Equipment:** includes a 15-stamp cyanide mill. Company expects to resume operations on both properties but no 1917 information available.

McKINLEY MINES, LTD.

BRITISH COLUMBIA

Office: Rossland, B. C. Mine near Franklin, Boundary district, B. C.

Officers: B. Lequime, pres.; H. W. Warrington, v. p.; A. M. McKenzie, sec.; C. L. Hammond, managing director.

Property: 4 claims, on the North fork of Kettle river, about 34 miles north of Grand Forks and 18 miles from the Kettle Valley railway terminus.

Orebodies occur as sulphides and oxides of iron carrying gold and copper. Several tunnels on property. Results of extensive diamond drilling not reported. Claims were under bond and lease to the British Columbia Copper Co., 1912, and a long tunnel driven. James Breen, of Spokane, owns 75% of the stock. The company was promoted by P. A. O'Farrell, who spent \$30,000 supplied by F. A. Heinze, in diamond drilling, before Heinze abandoned the proposition. Property is too inaccessible to work its low-grade ore profitably.

NEW DOMINION COPPER CO., LTD.

BRITISH COLUMBIA

Controlled by B. C. Copper Co.

Mines considered exhausted and of no commercial value. For description, see Vol. XII.

GRAND FORKS MINING DISTRICT

INTERNATIONAL EXPLORATION & DEVELOPMENT CO.

BRITISH COLUMBIA

Address: Jas. McIntire, mgr., 525 Rookery Bldg., Spokane, Wash.

Officers: T. A. Farrell, pres.; S. A. Haynes, sec.-treas., with E. T. Smith, R. L. Smith and J. W. Osborne, directors. Leroy Way, Old National Bank Bldg., Spokane, agt.

Cap., \$500,000; shares \$1 par.

Organized to locate, acquire and develop prospects, eventually disposing of them to operating companies. A 3-yr. option for \$60,000 has been taken on 7 claims near Paulsen, 17 miles from Grand Forks, B. C. Several claims are being exploited 12 miles from Grand Forks.

HAZELTON or OMINECA DISTRICT

AMARGOSA COPPER CO.

BRITISH COLUMBIA

Office: 823 Old National Bank Bldg., Spokane, Wash.

Officers: E. P. Spalding, pres.-mgr.; C. D. Muxen, v.p.; A. M. P. Spalding, sec.-treas., with Oscar Cain and G. A. Henkel, trustees.

Inc. 1916 in Wash.

Property: 7 claims, 300 acres, 5 miles from Hazelton, claimed to cover 3,000' on the strike of a series of veins, from 4-10' wide, carrying copper-silver-gold ore.

Development: by crosscut tunnel, in 200', May, 1917. Management plans further development and installation of compressor plant and power drills.

BUTTE & ROCHER DE BOULE COPPER CO. BRITISH COLUMBIA

Office: 49 East Broadway, Butte, Mont. Branch office: Hazelton, B. C.

Officers: Samuel McConnell, pres.; C. J. Stone, v.p.; J. W. McLane, sec.-treas.; preceding officers, Paul Ozanne and P. J. Jennings, directors.

Inc. 1912 in Arizona. Cap., \$1,000,000; shares \$1 par; fully issued and non-assessable.

Property: the Highland Boy group adjoining, but 1,000' above the Rocher de Boule mine and covering 400 acres on Juniper Basin, Rocher de Boule mountain, Omineca mining district, 3 miles from New Hazelton and 4 miles from the Grand Trunk railroad. Claims show the extension of the Rocher de Boule veins, 2 of which have been opened by tunnels and open cuts. Ore occurs in fissure veins following intrusive dikes of porphyry in granite. Samples from veins 18" to 5' wide, assayed from 1.5% to 5.7% copper; with 0.5 to 0.8 oz. silver and slight gold values.

Property considered promising and worthy of further development.

CASSIAR CROWN COPPER CO. BRITISH COLUMBIA

Office: 601 Empire State Bldg., Spokane Wash.

Officers: I. W. Anderson, pres.; W. C. Miller, v.p.; J. V. Pohlman, sec.-treas.; A. C. Mason and E. Pohlman trustees.

Inc. in 1916. Cap. increased from \$1,000,000 to \$1,500,000, shares \$1 par; in treasury, 1,010,000 shares.

Property: five 50-acre mineral claims on Goose Mt., 18 miles S. E. of Telkwa and Aldermere, B. C., and 260 miles from Prince Rupert on Grand Trunk Pac. R. R. A 750' tunnel has been driven and is now, July, 1917, entering the mineralized zone 240' below the surface. Mineralized area as indicated by surface workings is a sheeted zone of 10' to 12' from hanging wall to foot wall. Average value of ore exposed in all workings is claimed to exceed 7% copper and \$3 gold.

Property: has several shallow shafts and pits all showing copper more or less. One shaft is down 56' and shows ore to that depth. For Geology see Canadian Geological Survey of Cassiar Crown group, for 1915, by J. D. McKenzie.

This property so far as prospected and developed has a promising appearance.

DELTA COPPER CO. BRITISH COLUMBIA

Address: Harrison Clement, Hazelton, B. C.

Property: 25 claims, including the Delta and Chicago, in the Hazelton district, adjoining the Rocher de Boule mine on the east. In Sept., 1917, 6' of ore was said to average 5½% copper. Railroad connection is being made at present.

GOLDEN WONDER GROUP BRITISH COLUMBIA

Owned by W. S. Harris and Dennis Comeau of Hazelton and operated under bond by M. W. Sutherland, 1917.

Property: 3 claims on Rocher de Boule Mt., about 1 mile from Hazelton, said to show a 2½' vein of chalcopyrite ore assaying 8% copper. Sinking shaft, September, 1917.

GREAT OHIO COPPER MINE. BRITISH COLUMBIA

Sargent & Munro, owners, New Hazelton, B. C.

Property: adjoins the Butte Rocher de Boule mine and is operated by Jennings and Trimble, under lease and bond. Ore occurs in a well defined fissure vein in granodiorite, traceable at surface for 700'. Main orebody, 4' wide gave assays of 22.5% lead, 9.5% copper, 134 oz. silver, 8.6% zinc and 0.04 oz. gold.

Developed: by 355' tunnel, open cuts and drifts. Ore occurrence and conditions are similar to those in the Rocher de Boule, but further development necessary to determine value of mine.

MONTANA CONTINENTAL DEVELOPMENT CO. BRITISH COLUMBIA

Address: care J. E. Oppenheimer, c/o Symons Dry Goods Co., Butte,

Mont. Company leased and operated main holdings of Rocher de Boule Copper Co., built tramway, equipped property and turned it over to the latter company in January, 1916. See Rocher de Boule.

ROCHER DE BOULE COPPER CO. BRITISH COLUMBIA

Office: 419 D. F. Walker Bldg., Salt Lake City, Utah. Mine at Hazelton, B. C.

Officers: M. S. Browning, pres.; A. Fred Wey, v.p., and S. A. Douglass, directors. D. J. Williams, mgr.; J. A. Cowan, supt.

Inc. Oct. 15, 1911, in Arizona. **Cap.**, \$1,000,000; shares \$1 par; non-assessable; fully issued, fully paid. Listed on Butte Exchange. Annual meeting, Oct. 20.

Property: 6½ claims, crown grant, 325 acres with 50 acres mill site and 100 acres other lands, in Hazelton district, 9 miles from the Grand Trunk Pacific railroad.

Ore occurs in fissure veins in granite, veins having an E.-W. strike with dip of 60°. Five ore-shoots being developed have average width of 5½', are 3,000' long and proven to depth of 150', according to management.

Development: by shaft and 800' tunnel estimated to have blocked out 25,000 tons of ore averaging 15% copper, 5 oz. silver and \$1.50 gold per ton. Copper occurs principally as chalcopyrite and bornite.

In July, 1917, 5' of 10% ore was opened on 1,000' level of No. 1 vein which had yielded \$1,500,000 up to Jan. 1. This shoot is being explored at 1,200' depth by a 3,000' tunnel, eventually to be driven through the mountain, a distance of 7,000'

Mine was under lease to Montana Continental Dev. Co. from 1913 to Feb., 1916. Lessees shipped about 17,000 tons of ore, 1915, averaging 7% copper and \$2.50 gold-silver, according to reports.

Output in 1916 was 1,250,000 lbs. copper from 10,000 tons of ore.

Equipped: with 240-h.p. hydro-electric plant, aerial and surface tramways, compressor and saw-mill by lessees who worked mine on royalty basis. Is a good mine with rich ore.

SILVER STANDARD MINING CO. BRITISH COLUMBIA

Office: 506 Winch Bldg., Vancouver, B. C. **Mine office:** W. C. Norrie, New Hazelton, B. C.

Owners: J. W. Stewart, Angus Stewart, D. McLeod, and the estate of late A. L. McHugh.

Gross earnings in 1916 were \$49,000.

Property: the Silver Standard mill, 14 crown grant claims, 700 acres, 7 miles N. of New Hazelton, in Omineca district, said to show 8 fissure veins in calcareous sandstone, dipping 62° and pitching N. 50° E. Veins are from 12 to 72" wide and 3 of them carry profitable ore. Shoots are 100 to 200' long. Ore is a sulphide, mill ore averaging 0.10 oz. gold, 30 oz. silver, 3% lead and 11% zinc.

Development: by 1,300' tunnel and total of 4,000' of workings to 500' depth. Mining is by shrinkage stoping. Reserves are 15,000 tons.

Equipment: includes Jenckes hoist, 350 cu. ft. compressor. Building a 25 to 50 ton concentrator. Additional machinery is to be installed.

Production: 1,880 tons in 3 years; 707 tons in 1916, the latter yielding 660,448 lbs. lead, 269,624 oz. silver and 444 oz. gold. The mine is well located for cheap mining; wood and water are plentiful and railway transportation is within a short distance.

SILVERED-COPPER MINING CO. BRITISH COLUMBIA

Office: 1621 Madison St., Denver, Colo. **Mine Office:** Aldermere, Omineca district, B. C.

Officers: F. Thoman, pres.; C. W. Peaslee, v.p.; C. A. Hubbard, sec.-treas.; C. E. Thoman, gen. mgr.

Inc. March 23, 1908, in Arizona. **Cap.**, \$1,000,000; shares \$1 par; non-assessable; issued, 568,754 shares. Debentures, \$50,000 authorized and un-issued.

Property: 6 claims, 300 acres, in the Hunter Basin, Omineca district, about 15 miles from the railway at Telkwa, shows a bedded agglomerate of volcanic rocks, chiefly diorite, beds standing almost perpendicular and striking N. 35° E. Orebodies occur as true fissure veins in diorite. Ores contain bornite and chalcocite. Three cars ore shipped to smelter in 1914 said to have averaged a little over 100 oz. silver and 5% copper per ton.

Development: by a short tunnel, numerous pits and open cuts, with a total of about 200' of workings.

The mine has no power equipment. A concentrator is planned, but ore reserves should first be developed. The company is pinched for funds, but apparently has a valuable property, which, if handled right, may develop into a paying mine. Idle in 1915, and no information since.

SPOKANE ROCHER DE BOULE MINING CO.

BRITISH COLUMBIA

Officers: P. J. Jennings, pres.; 1314 Addison St., Spokane, Wash. P. A. Brady, v.p.; John J. Jennings, sec.-treas.

Inc. April, 1916. **Cap.**, \$100,000; shares 10c. par; 600,000 shares subscribed by incorporators, balance in treasury.

Property: 7 claims, including Spokane & Washington and has bond on Daly West group near New Hazelton, B. C. Ore so far developed said to carry 7% copper, \$2 gold and 15 oz. silver per ton.

Development planned is 1,000' drift tunnel on vein giving 1,000' back at face and cutting beneath four ore-shoots. \$30,000 to be spent in installing compressor plant, power station on Mission Creek, an aerial tram and wagon road; an ambitious program for this amount of money.

KAMLOOPS DISTRICT

IRON MASK MINE

BRITISH COLUMBIA

Owned by Kamloops Copper Co., at Kamloops, Yale district, B. C.

Shaft is down 780' and diamond-drilling under way. Has 600-ton mill, with flotation unit.

KAMLOOPS COPPER CO.

BRITISH COLUMBIA

General office: 609 First National Bank Bldg., Duluth, Minn. **Mine address:** Kamloops, Yale district, B. C.

Officers: E. G. Wallinder, pres.-mgr.; W. H. Eaton, v.p., with G. Carlson, S. H. Hudson, F. M. Needham, J. J. Eklund, Reiner Hoch, Theodore Michel, Otto Johnson, directors; W. W. Blackshaw, sec., 1412 Tower Ave., Superior, Wis.; Otto Johnson, treas.; John Jenswold, atty; Arthur Wallinder, supt.

Inc. Sept. 7, 1909, in Arizona. **Cap.**, \$3,000,000; shares \$10 par, part paid; 128,561 issued, none preferred. First-mortgage bonds on Iron Mask mine amount to \$210,000; and convertible 6% notes, \$128,500.

Accounts for period of 2 years show revenue of \$337,454 of which ore sales netted \$109,330. Balance at end of September, 1916, was \$77,572. Excess of current assets over liabilities was \$33,840.

Property: 10 claims, 2,041 acres, 228 acres mineral land, including the Iron Mask mine, 4 miles S. W. of Kamloops. The Iron Mask shaft is sunk on a shear zone, mineralized for 20 to 30' in width, with segregations of better grade ore forming a paystreak of variable width, carrying chalcopyrite, associated with magnetite in a choritic gangue containing orthoclase intercrystallized with copper sulphide. The country rock is a diorite with smeary basic patches of gabbroic material. The Iron Mask

orebody averages 28' in thickness, but is lenticular in shape. The ore averages 5% copper, 0.2 oz. silver and .09 oz. gold per ton. It is troublesome to concentrate by ordinary methods owing to its chloritic and quartz-orthoclase gangue.

The mine shows several orebodies besides the Iron Mask, all of them due to "igneous after effects," and occurring in fresh diorite, filling fissures as replacements along fissures and in patches, the ore consisting of orthoclase, chlorite, epidote and other secondary pneumatolytic minerals, with interlocked chalcopyrite, pyrite, magnetite, etc.

The Erin orebody shows excellent ore and numerous pits at various points on the property all show ore.

Development: includes the 780' Iron Mask shaft and some 16,500' of workings, on 9 levels; the 330' Erin shaft sunk on ore for 300' with 600' of drifts and crosscuts; the 50' Lucky Strike shaft and 3 other prospect shafts. Electric power is obtained from the City of Kamloops power-station at 1c. per kw.-hr.

Ore reserves: of Iron Mask and Erin mines claimed to be 1,800,000 tons of 2½% copper ore. Mine shows a large tonnage of low-grade ore susceptible to concentration by flotation, a unit costing \$35,000, being recommended. The old 160-ton concentrating mill has been enlarged to a 30-ton per hour capacity.

In 1916 considerable crosscutting and raising was done from the 750' level and a crosscut started on that level toward the Erin mine, 1,500' distant.

The Erin vein was cut in 1916, also a strong flow of water, preventing raising for exploration and ventilation. Orebody is a sulphide, apparently extensive.

For 1917-18 a geological survey and sampling of the Iron Mask and Erin mines is planned, with an expenditure of \$10,000 for diamond-drilling.

Equipment: includes one 150 h. p. compressor, one 225 h. p. motor for the "Iron Mask" hoist and 8 smaller motors, 6' double-drum hoist, 3 air compressors of 1,300 cu. ft. capacity, good for 15 drills, an electric-light plant and a sawmill. Transportation is by a good wagon road with steep grades, leading to the railway siding below Kamloops. The management plans a 2½-mile tram, having a drop of 1,100', when financial conditions are better.

Machinery, etc., added during 2 years cost \$24,352.

Production: Oct. 1, 1914, to Sept. 30, 1916, 6,290 tons of ore averaging 3.96% copper and \$1.31 per ton gold and silver; also 1,313 tons of concentrate, containing 10.39% copper and \$1.77 per ton precious metals. Metal yield was 771,199 lbs. copper, 482 oz. gold, and 1,616 oz silver. Ratio of concentration was 7 to 1, with 80% saving, at cost of \$2.75 per ton of concentrate.

It is understood that the English corporation has extended the time for further payments on the property.

KAMLOOPS MINES, LTD.

BRITISH COLUMBIA

Office: 151 Coronation House, 4 Lloyds Ave., London, E. C., Eng. Company in hands of trustees, as property is under lease and bond to the Kamloops Copper Co.

NELSON DISTRICT

DUNDEE MINING CO.

BRITISH COLUMBIA

B. H. Washburn, Ymir, B. C., manager.

Property: the Dundee mine, adjoining the Yankee Girl at Ymir. The property has little ore developed, but is reported to have very favorable prospects for a large tonnage of commercial ore.

EFFANJAY GOLD MINING CO.**BRITISH COLUMBIA****Address:** A. J. Grover, sec.-treas., Hyde Bldg., Spokane, Wash.**Officers:** J. A. Irvine, pres.; J. L. Goodwin, v.p.

Company organized in 1916 to take over the Fawn group of claims, under bond. Also leased a 4-stamp mill on adjoining Nugget claim.

The Fawn group is in Sheep Creek district, near Salmo, B. C., and is reported to show an orebody 14" wide carrying from \$21 to \$65 gold per ton.

Development: by tunnel.**EUREKA COPPER MINES, LTD.****BRITISH COLUMBIA****Address:** Nelson, B. C.

Officers: J. J. Malone, pres.; A. B. Ritchie, v. p.; L. B. Reynolds, sec.-treas.

Inc. March 2, 1906, in British Columbia. **Cap.**, \$250,000; shares 25c. par, non-assessable; issued, \$231,250. Property was under bond and lease to B. C. Copper Co., Ltd.

Property: 7 claims, 2 fractional, all except 1 crown granted, approximately 250 acres. Situated 2½ miles from the Canadian Pacific railway, and about 9 miles westerly from Nelson. Claims contain several veins, partly along contacts between limestone and granite, and partly along fracture planes in the granite. One of these veins is developed by shaft, winzes, raises and a 900' crosscut tunnel. Mine is equipped with hoisting and steam-compressor plant. Crosscut adit, driven 1914, failed to disclose any ore and operations were discontinued.

GENERAL MINING, MILLING & LEASING CO.**BRITISH COLUMBIA**

Officers: W. H. Honefenger, pres., Hyde Bldg., Spokane, Wash. W. A. Kelly, sec.; Chas. V. Bobb, mgr., with W. T. McCurry, directors.

Has a lease on the Lucky Strike and Wisconsin mines, on a tributary of Midge Creek, 7 miles W. of Kootenay landing, said to show a 30' vein in Nelson granite, traceable for 3,000'. Ore in pits along vein reported to assay \$25 to \$40 gold and 3 to 7 oz. silver per ton.

Development: 2 tunnels claimed to open up \$1,000,000 in ore, which seems a very high figure. Company said to plan driving a new tunnel at greater depth, to add machinery and an aerial tram. Ore will be shipped to Trail, B. C., or to Tacoma, Wash.

GRANITE-POORMAN MINE.**BRITISH COLUMBIA****Address:** Nelson, B. C. F. H. Skeels, supt.

Spokane and Butte capital purchased this gold mine during 1916. In 1917, a 1,500 cu. ft. compressor and 300-h.p. motor were installed; improvements were also made to mill, increasing capacity to 100 tons daily.

Regarded as a promising producer.

HOBSON SILVER LEAD CO.**BRITISH COLUMBIA**

Address: Box 1123, Spokane, Wash., and Ymir, B. C. **Officers:** George T. Reynolds, pres.; W. L. McEachren, v.p.; W. B. Ward, Jr., sec.-treas.; C. H. Harvey, asst. sec. and treas.; preceding, with J. C. Buchanan, F. R. Monfort and W. A. Buchanan, directors; E. W. Westervelt, supt.

Inc. 1911 in Wash. **Cap.**, \$1,500,000; shares \$1 par; outstanding 1,286,571. Stock transferred at company's office. Annual meeting in January. Operating expenses in 1915, \$30,977.

Property: Yankee Girl mine, 3 claims, patented, 126 acres, at Ymir, Nelson mining district, B. C., said to show gold, silver, lead, zinc ore in contact deposits between granite, slate and schist; strike N. E.-S. W.; dip 60°. One orebody is said to be 90' long, another 400' long. Ore is said to assay \$20 gold, 6.5 silver and 5.5% lead per ton. The main vein, the

Yankee Girl, has been drifted on 300' in No. 4 tunnel; it is said to be 5' to 7' wide and to average \$7.24 gold and 0.77 oz. silver per ton. Another vein the Yukon, is of secondary importance to the Yankee Girl.

Development: 4 tunnels; No. 1, 1,600' long; No. 2, 2,100' long and 400' below the surface; No. 3, 400' long and 175' below No. 2; No. 4, 2,100' long and 600' below No. 2, is driven in the footwall and for the first 1,160' nearly parallels the vein. At No. 4 tunnel level the Yukon vein is estimated to lie 100' N. E. of the tunnel. Company claims to have 400,000 tons ore blocked out. Total underground workings, 6,000'.

Equipment: includes 2 air compressors and a 6,000' tramway. Total output to date, 24,900 tons.

Company plans completing the development of No. 4 tunnel to add a compressor, build a 300-h.p. hydro-electric plant and a 200-ton concentrator.

HUDSON BAY ZINC CO., LTD.

BRITISH COLUMBIA

Office: Salmo, B. C.

Inc. April, 1916, in B. C. **Cap.**, \$5,000,000; shares \$5 par; listed on N. Y. Curb, May 1, 1917. Incorporators were M. W. Bacon, Old National Bank Bldg., Spokane, Wash.; W. E. Cullen, Jr., and associates, who are reported to have secured a 3-yr. lease and bond dating from Sept. 1, 1915, on the property described below. An 18 months' option on the property, acquired by the Butte & Superior Mng. Co. (Hayden, Stone & Co.), for approximately \$1,200,000, in May, 1916, was not exercised.

The Canadian Cons. at one time held a lease and bond on this property for \$500,000, and shipped 3,200 tons of lead carbonate ore containing a small amount of zinc from near the surface. The option was relinquished, due to increase of zinc with depth.

Property: 14 claims, 600 acres, 8 miles S. E. of Salmo, and 25 miles S. of Nelson on the Great Northern Ry. **Ore:** zinc, contains lead values in varying amounts, but no silver. Orebodies occur as replacement deposits along bedding planes in shattered limestone. Orebody cut, but not displaced by diabase dike. Vein is on N. E. slope of mountain, 1,500' above Sheep creek; runs N. 28° W. and dips 85° S. W. It is stripped and stoped for 1,000'.

Development: in Oct., 1917, consisted of a 600' crosscut tunnel, No. 2 tunnel, 200' below the outcrop, said to cut a mineralized zone 300' wide with many veins carrying low-grade zinc carbonates, and one or two of shipping grade. Veins strike N. 28° W., dip 85° S. W. The main vein is 33' in width and averages 10% in zinc, with 4' of 30% zinc ore. For 840' of stope, the vein averaged 9% zinc, 3.93% lead, 18% iron, 2.29% lime. During 1916 it had been drifted on 1,000' north and south with no decrease in size or value. A 100' winze from this tunnel level showed 30' of vein matter and a 10' orebody, 4' which was shipping grade. A lower tunnel, now in several hundred feet, is being driven 1,700' to cut the vein 830' below the outcrop.

Ore reserves: estimated at 225,000 tons in sight, 10% of shipping grade.

Equipment: includes a small water-power plant working under a 300 head to operate the compressor plant. An aerial tram was built from the mine to the foot of the hill, where a mill was to be erected in Summer of 1916. The railroad was to be continued from Salmo to the mill location.

Production: all from development work during the past two years has been about 1,000 tons monthly of carbonate ore. The present management is pushing development work, completing the lower tunnel and adding to the equipment. Production will be increased as soon as pos-

sible. Recent developments show sulphide ore and indicate that the property will become one of the large and profitable producers of the province.

KOOTENAY BONANZA MINES, LTD. BRITISH COLUMBIA

Office: 901 Vancouver Block, Vancouver, B. C.

Officers: W. Finch Page, pres., London, Eng.; A. E. Rand, v.p.; R. S. Lennie, sec.-treas.; preceding, with A. C. Burdick and J. A. Hendry, directors.

Inc. in British Columbia. Cap., \$3,000,000; shares \$5 par; outstanding, \$200,000. Company organized to take over the Silver King mine from the bondholders of the Hall Mining & Smelting Co., Ltd.; the claims of the Kootenay Development Syndicate, Ltd.; Dandy & Ollie Cons. Mines, Ltd., and of the Starlight Mines, Ltd., as well as other properties.

Silver King and Dandy groups of claims were sold to the Silver King Mines, Ltd. The company now holds 34 other claims, comprising the North Star, Great Western Starlight and Irene groups.

KOOTENAY GOLD EXPLORATION CO. BRITISH COLUMBIA

Address: F. H. Skeels, supt., Nelson, B. C.

Company controlled by H. I. Wilson and John MacGuinnis of Butte, Mont., and W. E. Cullen and Robert Carnochan of Spokane, Wash.

Cap. \$1,500,000; shares \$1 par. Stock listed on N. Y. Curb. Registrar & Transfer Co., transfer agents.

Property: the Granite-Poorman mine, 5 miles from Nelson, well situated for economical operations, said to show 5 veins in granite, 4 of which are parallel. Vein filling is quartz, containing 3 to 8% sulphides, as pyrite, chalcopyrite, galena and zinc blende, the last named in small quantities. About 70% of the gold is free. From 1900 to 1912, the mine was worked and the average recovery was \$8 per ton, with about \$3 in the tailings. The Hardscrabble, Poorman and Granite veins have considerable possibilities.

Equipment: 1,500 cu. ft. Sullivan compressor, 20 stamps, Deister Overstrom tables, etc. Ball-mill being installed will raise capacity of plant to 200 tons daily.

MOTHER LODE SHEEP CREEK MINING CO. BRITISH COLUMBIA

Address: Sheep Creek, B. C.

Officers: Alex. L. Smith, sec., transfer agent and registrar, Cornwall, Ont.; John McMartin, pres., with L. H. Timmins, Duncan McMartin, John K. Erskine and Wm. Watson, directors; J. R. Rutherford, gen. mgr.

Inc. in Maine. Cap., \$1,250,000; shares \$1 par. A dividend of 11% was declared in Dec., 1915.

Property: at Sheep Creek, West Kootenay district, B. C., shows gold ore in an orebody said to have a maximum width of 35' on 6th level.

Equipment: includes 10-stamp mill and cyanide plant, connected with the mine by a 3,600' aerial tram.

In 1914 ore mined and milled amounted to 20,000 tons; bullion recovered reported as \$100,000. Owing to lack of power the mine has been operating only about 9 months of the year.

No production in 1916. Mine is closed.

QUEEN MINES, INC. BRITISH COLUMBIA

Address: E. V. Buckley, mgr., Salmo, B. C.

Property: the Queen, Yellowstone and Alexandria mines and a mill-site on Sheeps Creek, near Salmo, said to show several veins containing gold ore. Recent work has been concentrated on the Queen group, developed by 700' shaft with drifts run every 100'.

Equipment: includes 20-stamp mill, handling 50 tons daily and reported making an extraction of 60% of the gold values.

Property was under option to Tonopah Belmont M. Co., in 1916.

Mine credited with total production since 1908 of \$700,000 in gold.

QUEEN VICTORIA MINE**BRITISH COLUMBIA**

Owned by the British Columbia Copper Co. Described Vol. VIII., Copper Handbook. Work suspended March, 1915. Costs were \$3 per ton and ore averaged only 1.2% copper; 0.36 oz. silver; trace gold; 36.8% silica; 14% iron, so that no profit could be made. Shipments totaled 7,920 tons.

RECORD MINING CO.**BRITISH COLUMBIA**

Address: Exchange Nat'l Bank Bldg., Spokane, Wash.

Officers: John R. Cassin, pres.; W. H. Turner, v.p.; W. R. Orndorff, sec.-treas.

Cap. \$100,000; shares 10c. par; 600,000 issued.

Property: the California mine, about 3 miles from Nelson, said to show a 4-8' vein with 6" shoot of gold-silver-zinc ore, developed to 500' vertical depth. Shipments by former owners reported to total \$50,000. Management plans erecting a 50-ton mill.

RELIEF MINE**BRITISH COLUMBIA**

Address: Erie, B. C., and Bayfield, Wisc.

Officers: Frank Stark, pres.; H. J. Wachsmuth, v. p. and treas., with C. R. Liehy, R. J. Nelson and A. D. Westby, directors; F. V. Holston, sec.

Inc. March, 1914, in Arizona. **Cap.**, \$300,000; shares \$1 par; 250,000 shares issued. First Nat'l Bank, Bayfield, Wisc., registrar. Annual meeting 1st Tuesday in May.

Property: 6 claims, patented, 186 acres, on Salmon river, in West Kootenay Nelson mining division, 14 miles N. from Erie, B. C., said to show sulphide ore in a quartz fissure vein in diorite. Vein strikes N.-E. with dip of 85°. Pay ore occurs in shoots, from 50-170' wide, and is said to average \$18 per ton in gold.

Development: to 416' depth by 4 tunnels, each 1,200' long.

Equipment: includes 14-drill compressor, pump, steam power and 75-ton cyanide mill.

Mine is credited with production of \$500,000 and management estimates ore reserves, August, 1917, at 56,000 tons, with 6,500 tons blocked out.

SILVER KING MINES, LTD.**BRITISH COLUMBIA**

Office: Trail, B. C. **Mine address:** Nelson, Kootenay Lake, B. C.

Officers: R. H. Stewart, pres.; S. G. Blaylock, v. p.; T. W. Bingay, sec.; W. M. Archibald and R. S. Lennie, directors. Company is owned jointly by the Kootenay Bonanza Co., and the Consolidated Mining & Smelting Co., of Canada, Ltd., in the proportion of $\frac{1}{4}$ and $\frac{3}{4}$, respectively.

Property: 5 claims, on Toad mountain, include the old Silver King mine, formerly owned and operated by the Hall Mining & Smelting Co., Ltd. Mine is opened by a shaft to the 10th level, showing 3 well-defined veins in diabase schist. The ore occurs in those portions of the veins which are intersected by 2 dikes, and in the altered surface zone is principally bornite, with tetrahedrite, iron pyrites and silver occurring in the unaltered zone below. Gold is present in small amounts. Considerable ore was extracted in the past from above the 5th level in the Main vein. The South vein and the K vein are practically untouched. The Main vein is lower in silver, but higher in copper than the South Vein, and the K vein is higher in silver than either of the others, The total ore reserves in

the mine are conservatively estimated at 100,000 tons. Ore in the Main vein has been proven to a depth of 1,130' by diamond drill borings.

Equipment: includes electrical motors of 50-h.p., a 100-h.p. electric pump, an 1,850' tramway, and all necessary mine buildings. Shut down 1915-16. No information for 1917.

YMIR-WILCOX DEVELOPMENT CO., LTD. BRITISH COLUMBIA

Office: J. C. Breese, 1580 Sherman Ave., Evanston, Ill.

Officers: W. S. Mason, pres. and treas. J. C. Breese, sec.; with C. H. Poppenhusen, E. R. Johnston and B. J. Jayne, directors.

Inc. June 29, 1911 in British Columbia. **Cap.**, \$500,000; shares \$1 par; non-assessable; 400,000 issued.

Property: 6 patented claims, 188 acres, near Nelson, B. C. Examined by Arthur Lakes, Jr. Ore carries gold and some silver. Under development in 1917.

NICOLA DISTRICT

DONOHUE MINES, LTD.

BRITISH COLUMBIA

Address: F. M. Hawkes, or James McKieran, Quilchena, Nicola district, B. C.

Property: Tubal Cain, King William and Joshua mines containing copper, lead, zinc, silver and gold ores. Development has followed veins to 400' in depth.

Equipment: includes a 30-ton mill, with a "balanced rod" mill and Monarch concentrators.

OSOYOOS DISTRICT

OLALLA COPPER MINING & SMELTING CO.

BRITISH COLUMBIA

Office: 305 Colt Bldg., Paterson, N. J. **Mine office:** Olalla, Yale district, B. C.

Officers: Robt. Gaede, pres.; Jos. Bamford, Jr., v. p.; John E. Tylee, sec.-treas.; preceding with Frank A. Blauvelt, Warren N. Conant, Robt. Swinley, H. Chas. Royce and Frank E. Morrison, directors.

Inc. Oct. 19, 1901, in Maine. **Cap.**, \$8,000,000; shares \$25 par. Annual meeting, first Monday in August.

Property: 32 claims, crown-granted, 1,183 acres, and a 92-acre mill, smelter and town site in Olalla, in the lower Similkameen and Keremeos camps, Osoyoos district, 4 miles from a railway. Lands said to show contact deposits between diorite and felsite, with orebodies in both, but mainly in the felsite. Twelve claims adjoin the town site of Olalla, and the Dividend group of 7 claims is 17 miles distant. Vein under development is claimed by management to carry bunchy replacement deposits of chalcopyrite, with garnetite and magnetite gangue, in limestone, near intrusive contacts, assaying 1.5 to 5% copper, a little silver and \$1 to \$7 gold per ton.

Development: by a 70' shaft, and tunnels of 642', 600', 150' and 112', with 1,504' of workings. There is no power equipment. Property now idle, is leased for 25 years to the Yale Development & Construction Co., organized among the stockholders of this company.

YALE DEVELOPMENT & CONSTRUCTION CO.

BRITISH COLUMBIA

Has a 25-year lease on property of Olalla Copper Mining & Smelting Co., which see.

QUEEN CHARLOTTE ISLAND

HERCULES MINING CO.**BRITISH COLUMBIA**

Idle. Nearest P. O.: Jedway, Queen Charlotte island, B. C. Claims are near the Ikeda mine, on Moresby island. Apparently has little or no development.

IKEDA MINES, LTD.**BRITISH COLUMBIA**

Ikeda Bay, Queen Charlotte Island, B. C. S. J. Castleman, gen. mgr.; Andrew G. Larson, cons. engr. and supt.

Inc. Sept., 1910, in British Columbia. Cap., \$850,000; shares \$1 par.

Property: the former holdings of the Aways-Ikeda Co., Ltd., taken over for \$200,000, include 42 claims, 2,100 acres in several groups on Ikeda bay, at the southern end of Moresby island, 3 miles from Jedway, and connected therewith by government rail and telephone. Steamer connection is had with Vancouver, 450 miles distant.

The Lily group, 8 claims, 400 acres, crown patented in 1912, on the southwestern side of Ikeda bay, discovered May, 1898, by Arichika Ikeda, and developed by him until taken over by the present company, Sept., 1910. The group shows limestone and slate cut by dikes of greenstone and diorite, having well defined flat fissures at right angles to and between the main fissures, which are practically vertical, the others being approximately horizontal and of great number. Ore occurs in a series of veins of 2 to 8' width, the largest orebodies lying along the horizontal main fissure. The vein principally developed is of 5 to 30' width, proven for 1,000' in length and about 300' in depth. The ore shoot, up to 20' in width, carries lenses of chalcopryrite, averaging, as mined, about 2.5% copper, with a gangue of silicious country rock and occasional stringers of quartzite and limestone. The ore mined by the former owners averaged about 4% copper, 2.2 oz. silver and \$2.25 gold per ton.

The Lily mine has 4 tunnels connected by winzes. No. 3 tunnel, 940' long, has about 5' of chalcopryrite of good average tenor and ends in a 40x50' chamber from which considerable ore has been stoped, the ore in the chamber apparently being not the same as that followed in the tunnel, lying about 45' to the N. and found by crosscutting.

Stoping in No. 3 tunnel in 1916 covered an area 100' long by 75' wide, from which 1,060 tons was sent to the Granby smelter and 1,600 tons held for local treatment.

Production: to end of 1910 was about 12,000 tons of ore. Property idle in 1912, save for assessment work on unpatented claims, but was reported as shipping 50 tons of ore monthly to the Granby smelter at Anyox in 1915.

Smelter returns in 1916 totaled 1,060 tons assaying from 4.80% to 17.48% copper, 0.10 to 0.34 oz. gold, and 1.0 to 3.8 oz. silver per ton.

A mill was to be built during 1917.

TASSOO MINING & SMELTING CO., LTD. **BRITISH COLUMBIA**

Out of business. Property now owned by F. C. Elliott of Victoria, B. C., and J. E. Cortell of Seattle, Wash.

Mine at Jedway, Queen Charlotte Island, B. C., consists of 12 claims, 850 acres, including a town site on the S. W. side of Tassoo harbor, W. side of Moresby Island. The mine is accessible by steamer direct, or by 5-mile trail from Sewell. Property shows granite cutting limestone, with diabase and trap dikes in both rocks. The ore deposits, in limestone, consist of magnetite containing 62% iron, 2% copper, \$1 gold-silver, 1% lime and 3% silica. The orebody is 107' wide, with 56' of 2.5% ore, balance

1.55% and 23' more of 1%. A 280' adit tunnel, at 1,130' elevation, cuts the orebody.

Shipments to Tacoma smelter total 1,150 tons. A 2,300' aerial tramway connects mine with harbor.

SIMILKAMEEN DISTRICT

BRITISH COLUMBIA COPPER CO., LTD. BRITISH COLUMBIA
See Canada Copper Corporation.

CANADA COPPER CORPORATION, LTD. BRITISH COLUMBIA
Office: 42 Broadway, New York.

Officers: L. W. Mayer, pres. and cons. engr.; A. J. Ronaghan, v. p.; R. H. Eggleston, sec.-treas.; preceding officers, with exception of R. H. Eggleston, C. H. Burke, August Heckscher, C. A. Starbuck, C. I. Stralem, E. L. Gruver, Newman Erb, Colgate Hoyt, directors. Oscar Lachmund, gen. mgr., and F. S. Norcross, Jr., supt. of mines, British Columbia.

Inc. March 1914, in Virginia. **Cap.,** \$10,000,000; \$5 par; increased Aug. 29, 1917, from \$5,000,000; outstanding Aug. 2 1917, 945,454 shares. New issue convertible bonds, \$2,500,000, dated Jan. 1, 1918. Equitable Trust Co., N. Y., transfer agt.; Empire Trust Co., registrar.

The 1917 increase of capitalization of 1,000,000 shares was to provide 833,333 shares for conversion of the new bonds at \$3 per share, the balance, 166,667 shares, being held for corporate purposes.

On March 20, 1917, company purchased the properties and assets of the British Columbia Copper Co., Ltd., the operating company, by exchange of one of its shares for two of the latter. In May, 1917, there was less than 3% of the capital stock of the B. C. company outstanding.

Amount of old debentures outstanding May 8, 1917, \$63,800 was called for redemption, August, 1917.

The new bond issue is underwritten by Hayden, Stone & Co. and Eugene Meyer, Jr., and is secured by a first mortgage on all the company's property. It provides funds for a new mill, etc., at the Copper Mountain property.

Balance sheet showed capital assets of \$4,828,966, including organization expense, deferred charges, etc., \$140,220; investments, \$4,059,665; purchase of properties, \$10,272; expenditure on properties, \$47,889; cash on hand and in banks, \$15,814; supplies, \$396; mortgage notes of B. C. C. Co., \$540,000; interest accrued on notes receivable, \$14,710; liabilities included accrued interest on and bills payable, \$111,255; accounts payable, \$7,046.

Excluding notes payable and interest accrued thereon due, for advances made to the British Columbia company, under the terms of the mortgage of July 1, 1914, which were cancelled as one of the considerations of the transfer of the properties, the current assets and liabilities of the latter company, on Dec. 31, 1916, were: current assets, including cash, metals, smelter products, supplies, accounts receivable, prepayments, etc., \$314,156; current liabilities including open accounts payable and amounts advanced by banks, \$293,968.

Copper Mountain Properties

Property: the new and most important properties consist of 3,006 acres of mineral and other land located in the vicinity of Copper Mountain, British Columbia, at an elevation of 4,200 feet. Copper Mountain is 9.5 miles due south of Princeton, British Columbia, 307 miles by rail north-west of Spokane, Washington; Vancouver lies 182 miles by rail to the

west of Princeton. A 13-mile branch railroad between Princeton and Copper Mountain will give railway transportation, and a subsidiary of the Canadian Pacific Railroad has agreed to build it at its own expense.

The company also owns and operates its old properties in the vicinity of Greenwood, British Columbia, where the smelter is at present in operation.

Geology: the geological formation at Copper Mountain consists principally of monzonite-porphry and granodiorite, which rocks carry the ore. This formation has been intruded by a system of light-colored porphyry dikes.

The ore consists of chalcopyrite, bornite and pyrite finely disseminated in the porphyry and granodiorite, carrying recoverable values in gold and silver. The orebodies for the most part evidence themselves at or close to the surface, but occurrence of oxide minerals is rare.

Development: property has been developed in a systematic manner by a large amount of diamond drilling and underground work. There has been executed 118,323' of diamond drilling, 31,738' of surface trenching, 11,836' of drifting, 2,299' of raising, and 859' of sinking.

All ore thus far developed is primary, lying well above the level of the Similkameen River, which passes along the base of Copper Mountain at an elevation of approximately 2,500'. There are only slight evidences of secondary enrichment.

Ore reserves: estimated at 10,000,000 tons of developed ore and 2,000,000 tons of probable ore having an assay value of 1.74% copper, and approximately 35c per ton in gold and silver. Careful geological study suggests the possibility of eventually doubling the present tonnage of assured ore. Company in addition owns several other promising prospects in the locality.

The average grade of ore is derived from bulk samples drawn from the underground workings, and such areas have been thoroughly checked both by drill and groove sampling.

Treatment of ore: a 40-ton flotation test mill was erected at the property and has been in operation during four months in 1917, giving very satisfactory results. Since there is a marked absence of oxidized material in the ores, a recovery of 90% of the copper will be secured in regular operations; actual savings very close to this figure on extended experimental runs have already been obtained. Concentrates assaying 25% copper have been maintained with a concentration ratio of approximately 17 into 1.

For the purpose of estimating earnings, a recovery of 27.4 lbs. of copper per ton of ore is assumed after allowing for a certain amount of dilution by waste rock. As the wall rock is generally light colored dike material, the ore admits of close sorting.

The cost of producing copper is estimated at 9½c per lb. when operating on a basis of 3,000 tons per day. It is possible that this cost figure may be lowered. Approximately one-half of the present ore reserves will be extracted by open-cast mining methods, and all of the ore will be drawn from the mines by means of tunnels.

Equipment: for extraction purposes is well advanced. The greater part of the equipment is of a permanent nature so that the development work at the mine can be readily completed in time for the mill, the design for which is now in hand. The Canadian Pacific Railroad will proceed at once with the construction of the branch railroad, between the present railroad terminus at Princeton and the mill site.

The company also owns some claims on Kennedy Mountain, adjoining the Copper Mountain on the west and across the Similkameen river; 1,777' of diamond drilling and 956' of tunneling having been done, costing \$44,600. Some ore was found, but no continuous orebodies were outlined.

The old property of the company is extensive, about 1,900 acres, of which 80 are smelter and mill sites and the balance mineral lands. Claims held under Crown Grant or U. S. patents. The Boundary Creek properties of the company are the Mother Lode mine, at Greenwood, B. C., the Napoleon mine in Washington, the Queen Victoria mine and Lone Star mine and the Copper Mountain group of claims.

The Eureka group near Nelson, the L. H. group and the Butte claim at Wellington camp, held under option in 1914, were abandoned, as exploratory work was unsatisfactory. A three-fourths interest in the Emma mine was sold for \$55,000 in 1915.

The Mother Lode group of mining claims near Greenwood, in the Boundary district, comprises 339 acres. The copper ore occurs in a contact deposit between limestone and eruptive rocks, largely as altered limestone that has been replaced by massive garnet, magnetite, silica and alumina, together with iron and copper sulphides. Much lime is also present as calcite. All these minerals are present in such proportions as to make the ore practically self-fluxing. Copper occurs exclusively as chalcopyrite, the ore carrying from 1 to 1.75% copper with from 75c to \$2 per ton in gold and silver. The main orebody measures about 160x1,200', running nearly north and south, the greatest width being 260' and the dip about 70° easterly. Diamond drill work is reported to have failed to find an extension of the orebody.

The ore is mined by both quarrying and underground stoping, though the first method is now almost abandoned owing to the depth of the quarries. Due to different mining methods used at different periods, the mine became honeycombed and stoping was impossible. A large blast was set off in Sept., 1913, which was a record for underground work. Number of holes, 4,830; 40% dynamite, 49,550 lbs.; wire, 18.5 miles; estimated amount broken, 400,000 tons. The shaft has four compartments, 2 for the 5-ton skips, 1 for a man cage, and 1 for ladders and pipe lines. On the 2 lower levels ore is hauled by electric motors, and on the upper levels by horses. It is dumped into capacious pockets at the shaft and hoisted to a bin at the head of the shaft, where it is crushed by one of a pair of Farrel crushers, with jaw openings 24x36" and 36x42", respectively. From the crushers it passes to the railway bins over a 200' Robins belt conveyor. At the bin end of the conveyor the ore passes an automatic sampler, which cuts out the daily sample.

Shipments of the Mother Lode mine, now nearly exhausted, were 256,784 tons, averaging 0.945% copper, .034 oz. gold, .16 oz. silver in 1916. It was only possible to operate the smelter profitably because of the high price of copper. High costs were due to taking ore from pillars and caved areas in the mine and also to high cost of labor and supplies.

The Lone Star group of 3 claims, 52 acres, is 8 miles S. E. of Greenwood and is connected with the Canadian Pacific railway at Boundary Falls by a 28,560' aerial tram, having 72 towers of from 15 to 67' in height, with 3 tension and 2 anchor stations. The ore of this mine is contained in two orebodies in a highly altered, eruptive rock now largely altered to a talcose schist. Approximately 300,000 tons have been developed by drilling and other work, the major portion of the area being as yet unprospected. The mine is equipped with a 7-drill compressor driven by an electric motor, the hoist being run with compressed air. The average assay

value of the Lone Star ore is higher than that of other Boundary district ores, but it is silicious, and as it carries alumina as well, it is much more refractory.

Ore reserves: April, 1916, estimated to be 170,000 tons of 1.60% copper. The ore is amenable to wet concentration with subsequent flotation treatment.

The Napoleon mine, about 60 acres, is in the Pierre Lake district at Napoleon, Wash., 7 miles from Marcus. The ore is needed for its sulphur content. Output for 1914 until shut down in May was 5,332 tons, averaging gold 10.94c and silver 0.08 oz. per ton, with copper 0.204%, silica 20.3%, iron 35.3%, lime 5.3% and sulphur 17.7%.

Ore reserves: Jan. 1, 1915, 3,300 tons as floors of stopes. Costs per ton laid down at the Greenwood smelter were \$2.8575.

Equipment: includes 2 compressors of 10-drill capacity, Farrel crusher and a 4,100' aerial tramway to the Great Northern railway. The sulphide ores are capped by 75 to 150' of oxidized ore. To treat this ore a 10-stamp mill has been erected, with a 100-ton cyanide plant. All power is steam, electric lines not having been extended into the district.

The Victoria mine, purchased 1912, comprises 5 claims, about 75 acres, near Nelson, B. C., about 110 miles easterly from Greenwood. Ore is an altered limestone, similar in genesis, nature and mineral contents to the Boundary ores, carrying about 1.26% copper with some silver and gold. Mine is equipped with a 5-drill electrically-driven compressor and the ore is taken to the Canadian Pacific railway, on the bank of the Kootenay river, over a 3,000' aerial tramway. Operations were suspended March, 1914, due to low copper content of the ore, averaging about 0.77 oz. silver, 0.0037 oz. gold, 2.28% copper per ton.

Equipment: the 2,500-ton smelter at Greenwood, 5 miles by rail from the Mother Lode mine, receives its ores over the Canadian Pacific railway, and does a general custom business also. The plant is electrically operated, requiring about 1,600 h. p. A 600-ton sampling mill has a custom ore bin connected with the sampler by a belt conveyor. All ores are coarse crushed at the bins, then pass the samplers, and then go to the receiving bins over a belt conveyor. The cupola building has 3 blast furnaces. The ore bins have a capacity for 12,000 tons ore and 4,000 tons coke. There are 6 Baldwin-Westinghouse electric motors for the charging and slag lines. The slag cars have 25-ton side-dumping ladles operated electrically from the locomotives.

The converter building adjoins the blast-furnace building and has 2 stands, with 84x126" shells, taking matte with from 25 to 55% copper and producing blister copper of 99 to 99.5% copper, carrying 20 to 50 oz. silver and 5 to 10 oz. gold. Stands are tilted by hydraulic accumulators, and shells, matte, etc., handled by a 40-ton, 4-motor traveling crane. There is a 72" silica mill for linings. In the power house are three 300' Connersville blowers, a Norberg compressor for the converters, and four 300 h. p. motors. There are 3 motor generators furnishing direct current to the railway locomotives and an air compressor for operating furnace gates, steam hammers, etc., and an electrically-operated hydraulic accumulator.

A power transmission line 13.6 miles long was constructed from Princeton, B. C., where a lease on a power plant was secured. A pumping plant with a Gould triplex pump working under a head of 1,700' was installed. Since January, 1917, a 50-ton experimental flotation mill has been placed in operation.

The works have a briquetting plant handling flue dust. Smelting fuel

is coke, costing under \$6 per ton, consumption being about 90,000 tons yearly.

The Greenwood smelter suffered a scarcity of coke in 1912, and for 2½ months but 2 furnaces were running; 740,589 tons was smelted in 13 months ending Dec. 31, 1913, as compared with 608,945 tons for the year ending Nov. 30, 1911; 443,022 tons came from the company's mines; the balance was custom ore. The smelter was idle until July, 1915, when one furnace was put in operation, treating 7,374 tons custom ores and 115,140 tons company ore to Dec. 31, 1915. Output was 1,850 tons of matte, containing 48% copper. In April, 1916, a second blast furnace was blown in and 306,450 tons of dry ore was smelted, of which 23,243 tons were custom ore. 350 men employed in Greenwood mine and smelter.

Production:

Year	Fine			Year	Fine		
	Gold, Oz.	Silver, Oz.	Copper, Lbs.		Gold, Oz.	Silver, Oz.	Copper, Lbs.
1905....	26,226	95,410	5,601,309	1911....	31,144	134,266	9,944,987
1906....	20,238	82,193	5,820,651	1912....	25,863	142,025	11,146,811
1907....	24,967	101,114	8,643,133	1913....	26,640	137,052	8,296,902
1908....	13,597	58,204	5,567,355	1914*....	14,442	63,501	4,116,190
1909....	18,244	64,234	6,325,000	1915....	5,417	23,002	1,734,385
1910....	24,962	84,180	7,143,456	1916....	12,366	49,928	5,196,239

*Jan. 1 to Aug. 23.

The following estimates of future operations and earnings is made by the company's president: with the treatment of 1,000,000 tons of ore annually the production is estimated at 27,400,000 lbs. of copper per annum. The earnings per share, assuming 1,778,787 shares outstanding (which allows for the conversion of the \$2,500,000 of bonds), would be as follows on various prices for copper:

Price of Copper.....	15c	16c	17c	18c	20c
Estimated Annual Earnings.....	\$1,507,000	\$1,781,000	\$2,055,000	\$2,329,000	\$2,877,000
Estimated Annual Earnings (per share, all bonds converted)....	\$0.85	\$1.00	\$1.16	\$1.31	\$1.62

It will be seen from the foregoing that the estimated net operating profit of \$1.50 per ton of ore is based on 15c copper, which on the developed and probable ore would represent a total net profit of \$18,000,000, not allowing for amortization. The estimated life of the property based on present ore reserves is 12 years. With the development work now in progress it is expected that the present ore reserves will be substantially increased.

HEDLEY GOLD MINING CO.

BRITISH COLUMBIA

Offices: 42 Broadway, New York, and Hedley, B. C. Officers: I. L. Merrill, pres.; W. B. Dickson, v. p.; J. D. Clarke, sec.-treas.; preceding, with W. D. Thornton, E. C. Congdon, G. E. Tener, Marcus Daly and W. E. Corey, directors. Gomer P. Jones, gen. supt., Hedley, B. C.

Inc. Aug., 1909, in Delaware. Is successor of the Yale Mining Co. Cap., \$1,500,000; shares \$10 par; outstanding, \$1,200,000. American Trust Co., Boston, transfer agent; Old Colony Trust Co., Boston, registrar. Annual meeting, second Wednesday in April, at 42 Broadway, New York. Listed on Boston Stock Exchange.

Comparative Statements of Income Account:

Year	Rec. at Mill	Expenditures	Profits(a)	Dividends	Surplus	Earnings on Cap. Stk.
1916	\$711,997	\$463,380	\$248,617	\$240,000	\$443,688	\$2.07
1915	796,591	421,846	374,745	300,000	74,745	3.12
1914	797,341	409,112	388,229	300,000	88,229	3.23
1913	802,330	397,075	405,255	360,000	45,255	3.38
1912	748,133	362,253	385,880	360,000	25,880	3.22
1911 . . . . .	.....	.....	318,152	300,000	18,152	2.65

(a) includes interest earned.

Comparative General Balance Sheet, Dec. 31:

	Assets:			Liabilities:			
	Property Account	Current Assets	Total	Capital Stock	Undivided Profits	Total	
1916..	\$1,487,018	\$156,670	\$1,643,688	1916..	\$1,200,000	\$443,688	\$1,643,688
1915..	1,439,542	195,528	1,635,070	1915..	1,200,000	435,070	1,635,070
1914..	1,394,275	166,049	1,560,324	1914..	1,200,000	360,325	1,560,325

Dividends:

	Amount	Rate %		Amount	Rate %
1909.....	\$0.30	3	1913.....	\$3.00	30
1910.....	1.40	14	1914.....	2.50	25
1911.....	2.50	25	1915.....	2.50	25
1912.....	3.00	30	1916.....	2.00	20
			1917*.....	1.50	15

*To October, 1917.

Property: the Nickel Plate and Sunnyside mines, 31 claims, crown-granted, and a mill site, 1,370 acres in all, on Nickel Plate Mountain, and in Similkameen Valley, Osoyoos mining division, Boundary district, Hedley, B. C. Also owns the Copper Flat property near Silver City, N. M.

Geology: the Hedley ore deposits are of contact metamorphic origin, and occur at contact of dikes and sheets of gabbro in altered limestones; they are irregular in outline, usually have a well-defined boundary on the side of the gabbro, and dip about 24°. Ore occurs in shoots. Nickel Plate shoot is 150' wide, 40' thick, and 1,500' long. Principal ore mineral is arsenopyrite, with which occurs chalcopyrite, pyrrhotite, sphalerite, pyrite, gold and sometimes tetradymite; the valuable content of the ore is gold alone. In the association of gold with arsenopyrite in deposits of this origin the Nickel Plate ore deposits are unique and have no known counterpart in North America.

All ore treated in 1916 came from the Nickel Plate property.

Ore reserves: estimated Jan. 1, 1917, at 399,050 tons, average assay \$9 per ton.

Development: 2 tunnels, 900' and 1,160' long and a 35° incline shaft, 900' deep. Greatest depth of working, at 5,200' elevation, 670' below the outcrop. Shrinkage stoping is used; no timbering required. In 1915 ore opened up on the 700' level was found to be 25' wide, assaying \$12 to \$13 per ton. Below the 700' and separated from it by an andesite sheet, lies another orebody which is said to be as wide as the ore on the 600' and 700' levels, but with values averaging \$15 per ton. New work in 1916 totaled 1,040', in addition to 3,605' diamond drilling.

Ore is transported from the mines to the mill at Hedley by means of electric and gravity tramways; the electric tramway is 1 mile long, while the 45° gravity tramway is 10,000' long, with a 4,000' drop.

Equipment: includes an air hoist, two compressors, each of 2,000 cu. ft. capacity and driven by 440 h. p. motors; also a 200-ton 40-stamp mill equipped with 24 Frue vanners and 12 Deister tables.

Mill was changed, 1916, and cyanidation now precedes concentration.

Electric power supplied by company's hydro-electric plant on the Similkameen river. The dam, located on the river just below its confluence with Twenty-Mile Creek, is of the stoplog type; from it water is conveyed in a flume, 7'x9' inside dimensions, a distance of 15,000' to the forebay, which supplies 2,100 h. p. twin turbines through an 8' steel penstock. Powerhouse has a 1,250 k. v. a. alternating current generator. Work was started on the dam about Jan. 1, 1914, and the whole plant was finished and in operation Jan. 2, 1915. Total cost of plant, \$192,009, charged to capital account.

Recent production:

	Ore Tons	Ave. Assay	Gold Rec.	% Rec.
1916.....	73,491	\$10.65	\$711,997	....
1915.....	74,625	11.65	796,592	....
1914.....	78,494	10.80	797,340	94.09
1913.....	70,796	12.03	802,330	94.14
1912.....	70,455	11.19	748,133	....

Conditions in the lower levels of the mine have changed considerably during the last two years. While the orebodies are larger and stronger and maintain practically the same grade, the specific gravity has increased due to an increase in arsenopyrite, which adds to the cost per ton of ore milled. Concentrate tonnage rose from 3,831 tons in 1913 to 6,218 tons in 1915, and to offset this increase in costs the company installed a cyanide plant. Is a good property and well managed.

JUNE GROUP

See Copper Mountain Mining & Development Co.

BRITISH COLUMBIA

KING EDWARD MINES, LTD.

Idle. Fairview, Boundary district, B. C.

Inc. 1904, in British Columbia. Cap., \$500,000; shares \$1 par.

BRITISH COLUMBIA

Property: 10 claims, 500 acres, in the Similkameen district. Opened by 350' workings to show a sulphide orebody 6 to 10' wide averaging 5% copper.

OREGON & BRITISH COLUMBIA MINING & DEV. CO., LTD.

BRITISH COLUMBIA

Office: 826 Northwestern Bk. Bldg., Portland, Ore. Mine at Copper Mountain, near Princeton, B. C.

Officers: at last accounts, W. J. Peddicord, pres.; Walter T. Woodew, v. p.; G. Evert Baker, sec.-treas.-gen. mgr., with G. B. Tucker, directors.

Inc. Jan. 6, 1906, in Oregon. Cap., \$150,000; shares 10c par; non-assessable; issued, 1,455,000 shares.

Property: 8 claims, crown-granted, 379 acres, well timbered, in the Yale district, B. C. Claims show diorite cut by diabase carrying patches, stringers and disseminations of chalcopyrite, bornite and magnetite, without quartz. The ore carries from 1½ to 3½% copper and is said to show as high as \$4.50 gold per ton.

Development: a 176' tunnel, reported to show 40' of mineralized ground, carrying chalcopyrite and bornite, the last 8' of the tunnel said to show an 8' vein of solid ore, with 18" to 2' of talc gangue. Claims adjoin the Sunset mine and other properties of the British Columbia Copper Co. Management expects to resume development work.

PACIFIC SYNDICATE, LTD.**BRITISH COLUMBIA**

Reported, March, 1917, to have taken over the Voigt property on Copper Mtn., described in Vol. XII. See Similkameen Cons. Copper Co.

SIMILKAMEEN CONSOLIDATED COPPER CO.**BRITISH COLUMBIA**

Property now worked by Pacific Syndicate, Ltd., which see. Company, etc., described in Vol. XII.

SIMILKAMEEN MG. & SM. CO., LTD.**BRITISH COLUMBIA**

Idle. Office: Bank of British North America Bldg., Vancouver, B. C. Mine near Princeton, B. C.

Officers: Fred Buscombe, chairman; W. H. Armstrong, managing director; Chas. F. Law, sec.

Inc. Feb. 8, 1906, in British Columbia. Cap., \$2,000,000; shares \$10 par.

Property: the St. Lawrence and St. George groups, 5 claims, 3 crown granted, about 300 acres, 3 miles from Tulameen City, at the head of Bear creek, a few miles from the Great Northern railway.

Development: 4 shallow shafts of about 50' depth each, besides a short crosscut tunnel and numerous trenches. The work shows a strong orebody between schist and granite with intrusive porphyry dikes. The St. Lawrence mine has an 8' vein of massive cupriferous iron sulphide, giving average assays of about \$10 per ton in copper, silver and gold. The St. George group shows a 4' vein, carrying ore with quartz gangue, giving average assays of 1.38% copper, 2.08 oz. silver and some gold per ton. Inactive some years.

SKEENA DISTRICT**BABINE BONANZA M. & M. CO.****BRITISH COLUMBIA**

Jas. Cronin, mgr. Owns a group of claims at the head of the Tuchi river in the Babine range, Skeena district, 22 miles by trail from Smithers, on the Grand Trunk Pac. R. R. Orebodies occur on contact of granite porphyry and altered sediments, and in fissure veins, 1' to 3' wide, in the porphyry. Values are in the silver-lead-zinc contents. Average assays show 20 to 60 oz. silver, 11 to 56% lead, 10 to 34% zinc.

Development: several tunnels, longest 400', and shafts, deepest 105'. Property has had only a little development work done during the last few years. It is a promising prospect, but handicapped by its inaccessibility. See Ann. Report, Min. of Mines for B. C., pp. 174, 279. -

BELMONT-CANADIAN MINES, LTD.**BRITISH COLUMBIA**

Office: 500 Bullitt Bldg., Phila., Pa.

Inc. 1915, by the Tonopah Belmont Development Co.

Officers: Clyde A. Heller, pres.; K. Kitto, sec.-treas.; C. S. Verrill, resident director in Vancouver; F. W. Holler, supt.

Company exercised an option Jan. 1, 1916, on a gold mine, belonging to Surf Inlet Gold Mining Co., Surf Inlet, Princess Royal Island, B. C., and a new company has been formed, the Belmont Surf Inlet Mines, Ltd., with capital of \$2,500,000, of which the Tonopah Belmont owns 80%, the remaining 20% going to original owners of the Surf Inlet Mines. Belmont Canadian mines will probably be dissolved.

Ore: gold-quartz with iron sulphides. Orebody proven to depth of 1,000'. Average assays run \$12 per ton, in 3 lenses of ore so far developed.

Development: for year ending Mar. 1, 1917, consisted of about 2,595' of tunnel and drifting by machine drills.

Ore reserves: estimated at 385,320 tons developed.

Equipment: power plant, boilers, compressor, office buildings and bunk houses. Plan driving tunnel 2,000' to cut orebody.

Company spent \$150,000 during life of option and \$500,000 installing 300-ton mill, hydro-electric power, and cyanide plant. When in full operation, mine will employ 300 men.

See Surf Inlet Gold Mining Co.

(See Ann. Report of Minister of Mines of British Columbia for 1916, pp. 50 and 435.)

BELMONT SURF INLET MINES, LTD. BRITISH COLUMBIA

Office: 500 Bullitt Bldg., Philadelphia, Pa.

Cap., \$2,500,000. Inc. by the Tonopah Belmont Development Co. of Nevada to take over property of Belmont-Canadian Mines, Ltd. (which see), and Surf Inlet Power Co., two British Columbian corporations owned by the Tonopah Belmont, and which controlled the mine during construction period. Of the capital, 80% will be held by Tonopah Belmont, and 20% by original owners, the Surf Inlet Mines.

Property: gold-copper mine on Princess Royal Island, B. C.

Development: about 7,000' of tunnels. Reserves are given as 385,320 tons, averaging \$11.22 per ton. Ore is somewhat refractory.

Equipment: hydro-electric plant containing 2 turbo-driven 468 k. v. a. generators, 5.65 mile power line, railway, 2 compressors and 300-ton mill (started Sept., 1917), containing gyratory crusher, ball mills, concentrating tables, and Jones-Belmont flotation machines. Table concentration will save 50% and flotation 50% of the recoverable gold content; while 94% of the total gold and 96% of the copper will be recovered in the combined concentrates.

This looks like a future profit maker, and has been well handled thus far.

GRIBBELL ISLAND COPPER CO. BRITISH COLUMBIA

Office: 203 First National Bank Bldg., Bellingham, Wash. Mine at Gribbell Island, Skeena River division, Cassiar district, B. C. Idle since 1906, owing to lack of funds. Fully described, Vol. XI, Copper Handbook.

PORTLAND CANAL TUNNELS, LTD. BRITISH COLUMBIA

E. J. Hearn, sec., 214 Belmont House, Victoria, B. C.

Officers: R. I. Elliott, K. C., pres.; J. A. Mara, R. M. Stewart and J. R. Waghorn, directors.

Inc. Aug. 23, 1912, in British Columbia. Cap., \$700,000; shares 25c par.

Property: 10 claims, Crown granted, near Stewart, Portland Canal, B. C. Company was organized to drive a crosscut tunnel to intersect the vein series of Glacier Creek, previously worked in the Portland Canal and in the Stewart Mining Co.'s properties. The tunnel, over 3,000' long, has so far failed to disclose orebodies of permanent commercial values. Idle since 1914, owing to lack of funds. Being examined with a view to reopening property.

RED CLIFF MINING CO. BRITISH COLUMBIA

Idle. Bankrupt. Mine at Stewart Skeena district, B. C. See description in Vol. XII.

SURF INLET GOLD MINES. BRITISH COLUMBIA

Surf Inlet, Princess Royal Island, B. C. F. W. Holler, supt. Controlled by Tonopah Belmont Mining Co. and operated by Belmont-Canadian Mines, Ltd., which see.

Parent company spent \$723,002 on the purchase and equipment of this property to October, 1917.

Property has a mill in operation, shipments having started October, 1917.

Available and indicated ore reserves are figured at 385,320 tons, averaging \$11.22 in gold.

SLOCAN DISTRICT

BLACK PRINCE MINE.**BRITISH COLUMBIA**

Operated under lease by J. A. Tipping, Slocan City, B. C., Canada.

Ore: silver, in 6" vein, in schist.

Development: by tunnels only. Property is said to have made first shipment in Nov., 1915, and expected to have output of 1 car of ore every 2 weeks. Owing to inaccessibility of property, only the high-grade ore can be profitably mined. Twelve men employed at last accounts.

CORK-PROVINCE MINES, LTD.**BRITISH COLUMBIA**

Office: Kaslo, B. C. Mine at Zwicky, B. C.

Officers: W. E. Zwicky, pres.-gen. mgr.; Henry Giegerich, v. p.; W. H. Burgess, sec.-treas.; preceding with W. O. Miller, G. O. Tierbey, H. Rindal and W. M. Archibald, directors. Transfer office: Kaslo, B. C. W. H. Burgess, registrar.

Inc. May, 1915, in British Columbia. Cap., \$1,000,000, shares 10c par, 6,158,005 issued, on bonds, non-personal liability.

Property: 13 claims, 9 crown granted, containing about 580 acres on the S. Fork of Kaslo creek in the Slocan district. Company is the consolidation of the Cork and Province groups.

The orebodies are found in fissure veins in slate. They have an N. E.-S. W. course and 68° dip, the shoots are 6' to 30' wide, with ore containing silver, lead and zinc.

Development: has been by a 1,400' crosscut tunnel, which intersects the Black Fox and the Cork veins, with greatest vertical depth of 300 and 1,300 linear feet of underground work. The Black Fox vein was cut at 700' from the portal and shows a width of 4' to 6' of vein material but no commercial ore. Company will prospect this vein. The Cork vein was intersected at 920' and is said to be stronger and wider than is usual in the district. Four shoots, developed on this vein, are reported to show a width of 8' and a length of 50' to 150'. Ore reserves are said to be 10,000 tons.

Equipment: 100-ton concentrator, hydro electric plant, sawmill, compressor and electric lighting system,

Production: mine yielded 1,206 tons previous to consolidation, and about 850 tons in 1915, which are said to have given net smelter returns of \$30,000. Ore shipments said to average 30 oz. silver and 45% lead. No production reported for 1916.

FISHER MAIDEN MINING CO.**BRITISH COLUMBIA**

Officers: J. L. Prickett, pres.; Wm. Huntley, v. p.; H. S. Stoolfire, sec.-treas., with John O'Connor, directors, all of Spokane, Wash.

Cap., 1,500,000 shares, 10c par; 1,000,000 issued.

Property: the Fisher Maiden group, 7 miles from Silverton, Slocan district, B. C., reported sold to Barney Crilley and J. J. Malone, on a 3-year bond and lease, 1917. Claims said to carry silver-lead-zinc values.

GALENA MINING & MILLING CO.**BRITISH COLUMBIA**

Company was formed to take over the Galena Farm silver-lead-zinc mine in the Silverton district, B. C. The estate of the late Patrick Clark of Spokane holds 75% of the stock, and the A. W. McCune interests of Salt Lake City hold the remainder. P. W. Clark is manager, and A. King in charge of the mill.

Net earnings during the first 11 months of operations were approximately \$200,000. A bond for \$100,000 was paid off, and development and mill construction of \$80,000 also paid.

Ore: averages about 12% lead and 18% zinc. Development: exploration has been kept well ahead of milling capacity. For a length of over 300,

the oreshoot is said to average 14' in width. A raise above the 200' level opened 10' of good ore.

Equipment: includes a 100-ton concentrator, erected early in 1916. Daily output of concentrate is 35 tons. Additional tables and flotation machines installed during 1917 raised the capacity to 150 tons of ore daily. Recovery is 90% lead on tables and 80% zinc by flotation. Rolls and Huntington mills do the crushing.

JACKSON BASIN ZINC CO.

BRITISH COLUMBIA

Address: Spokane, Wash. **Mine office:** via Retallack, B. C.

Officers: Volney D. Williamson, A. L. White, W. Y. Williams of Spokane.

Cap., \$2,000,000; shares \$1 par.

Property: Sunset and other claims in the Slocan-district, B. C., said to have deposits of high-grade zinc ore.

LUCKY JIM ZINC MINES, LTD.

BRITISH COLUMBIA

Office: 2926 Orillia St., Victoria, B. C.

Officers: A. C. Burdick, pres.; F. J. Walker, v. p.; W. J. Nicholls, sec.-treas.; A. W. Allen, asst. sec.; A. G. Larsen, receiver; H. Lakes, supt.

Cap., \$2,500,000; shares \$1 par; authorized bond issue \$150,000, bearing 7%. Stock listed on Spokane Exchange.

Property: the Lucky Jim Mine at Zincton, B. C., developed by 3,600' of tunnels, drifts, raises and crosscuts. Two promising shoots of zinc ore are developed on No. 5 level. **Shipments:** 780 tons of crude ore in 1913 averaged 46.37% zinc.

Operations were interrupted by lack of funds in the Autumn of 1914 and efforts made to foreclose on the first mortgage of \$62,000, but the Court appointed a trustee to reopen the mine and operations were resumed in 1915. In Dec., 1916, receiver paid off first mortgage and has since been instructed by the Court to pay off the second mortgage.

Concentrating ore is shipped to the Roseberry mill on Slocan lake, owned by the Monitor Mining Co., and to Kaslo; crude ore shipped direct to smelter.

In July, 1917, company was badly involved in litigation with the former manager, G. Weaver Loper and associates, an over-issue of 123,000 shares of capital stock being charged.

NOONDAY MINES CO.

BRITISH COLUMBIA

Office: 704 Paulsen Bldg., Spokane, Wash.

Officers: Bruce White, pres.; R. C. Lammers, v. p.; J. M. Scott, sec.; J. B. White, treas.; with H. S. Burdick, directors.

Cap., \$750,000; shares 25c par; 1,800,000 issued.

Property: the Noonday and other claims near Sandon, B. C.

Development: by tunnels, which have opened 14,000 tons of \$17.50 lead-silver ore. In 1916 openings amounted to 1,850'. Shipments were valued at \$10,000. A long development tunnel is to be driven through the properties.

A promising prospect.

PANAMA MINE.

BRITISH COLUMBIA

H. Giegerich, Kaslo, B. C., owner. The mine, W. of Whitewater, in the Slocan country, is developed by 2,000' of tunnels and drifts to depth of 300', reported to carry a contact vein, from 3-5' wide, that averages 120 oz. silver. Small shipments made to the Trail smelter. Developing with a small force.

RAMBLER-CARIBOO MINES, LTD.

BRITISH COLUMBIA

Address: Three Forks, B. C.

Officers: A. F. McClaine, pres.; Alfred Coolidge, v. p.-sec.-treas., with Dr. B. W. McPhee, J. F. Hall, C. L. MacKenzie, Dr. Johnston Armstrong

and Rev. P. F. Hylebos, directors; A. E. Cable, asst. sec.; J. A. McPhee, asst. treas.

Cap., \$1,750,000; shares \$1 par; all issued. Listed on Spokane Exchange.

Balance sheet of April 30, 1917, showed total receipts of \$189,090, which included: balance forward, \$16,509; ore in transit and at smelter, \$72,513. Disbursements for year ending April 30 were \$167,808, including \$11,097 for development, \$44,375 for mining and \$16,324 for milling expenses. Net earnings for the fiscal year ended April 30, 1917, amounted to \$49,844. On April 30, 1917, the company reported cash on hand \$21,850 and \$10,000 ore at the smelter or in transit.

Dividends: 1915-16, \$52,500; 1916-17, \$87,500. The company is reported as having paid 22c per share in as many consecutive installments prior to suspension of dividends in 1903. Total dividends including Sept. 1, 1917, said to be \$542,500; exact records not available.

Property: 5 crown granted claims, at the head of McGuigan creek, near Three Forks, Slocan mining district, has been operated for many years as a silver-lead-zinc mine and has been extensively developed at depth. On the 14th level at 5,000' crosscut was run, but development there has been disappointing, the orebody evidently not extending that far. Reported in April, 1917, that new orebodies had recently been found on the 600, 800, 900, 1,200 and 1,300' levels south, but the extent of these deposits has not yet been determined.

The product is lead and zinc concentrates and crude lead ore. The crude ore runs from 148 to 165 oz. silver and 50 to 58% lead, while the lead concentrates average from 70 to 100 oz. silver and 32 to 40% lead, and the zinc concentrates run 35 to 37% zinc and about 25 oz. silver.

Development: work from May 1, 1916 to April 30, 1917, amounted to 910'. Ore reserves estimated as sufficient for 2 years' operations. Employs 40 to 50 men.

Concentrator during 1916 treated 18,000 tons of ore, producing 993,751 lbs. lead, 137,329 oz. silver and 388,657 lbs. zinc.

Management is reported as "honest, efficient and extremely conservative," but gives out but little information.

SILVERTON MINES, LTD.

BRITISH COLUMBIA

Offices: A. Martin, sec., 23 Throgmorton St., London, E. C.; G. Stilwell, mgr., Silverton, B. C.

Officers: G. Freeman, chairman; M. S. Davys, F. J. Ferguson, D. H. Gibb, and E. W. Monkhouse, directors.

Inc. Oct., 1909, in England. **Cap.**, £50,000, in 30,000 7% cumulative and 20,000 ordinary shares at £1 each; 28,050 pfd. and all ord. shares issued. Profit of £2,522 in year ended Sept. 30, 1915.

Property: the Hewitt-Lorna Doone mine at Silverton, carrying silver-lead-zinc ores, which are concentrated in a mill having a flotation unit. In 1914, 18,000 tons of ore was mined. The silver-lead concentrate is sent to the Trail smelter.

In 1917 assets were transferred to the Silver Tip Mining & Power Co.
SLOCAN STAR MINES, LTD. (N. P. L.) **BRITISH COLUMBIA**

Offices: 901 Vancouver Block, Vancouver and Sandon, Slocan district, B. C.

Officers: R. S. Lennie, pres.; A. C. Burdick, v. p., with J. B. White, John Elliot, Thomas McPherson, J. M. Harris and J. P. McGoldrick, directors. T. B. Hooper, sec.-treas.; Oscar V. White, gen. mgr.

Inc. in British Columbia, Oct. 20, 1911, under the "Companies Act."
Cap., \$2,500,000; issued \$2,175,028; shares \$1 par. Listed in Spokane.

Balance sheet year ending Oct. 31, 1916: Assets total \$2,316,268, in-

cluding property and plant, \$2,054,610; mine exploration as at Oct. 31, 1915, \$99,214; current, \$34,179, and deferred charges, \$128,124. Liabilities include current, \$32,924; debentures, \$91,696, and profit and loss, \$16,619.

Bonds: authorized, \$100,000 4-year 7% 1st mortgage; issued, \$90,000. Dividends: paid in former years, \$542,000.

Property: at Sandon, Slocan district, consists of Slocan Star and Rabbit Paw groups of 12 Crown Granted claims, which formed the subject of protracted and costly apex litigation between the Star Mining & Milling Co., plaintiff, and the Byron N. White Co., in the Supreme Court of B. C. for about 10 years, finally determined by a judgment of the Supreme Court of Canada. Holdings also include a patented mill-site and extensive water rights.

Ore: carries silver, lead, zinc. The main vein, the "Slocan Star," is a strong fissure in slate, traceable over a mile. Vein strikes N. E.-S. W., dips S. 47°, width 6-8', widening out in places to as much as 50'.

Development: 10 main adit levels; No. 10, the lowest is 2,300' long; total workings 13,000'; new work in 1916, 1,610'. Silver-lead ore has been almost all extracted down to 5th level; from 6th level to surface several zinc-siderite orebodies have been left intact as unprofitable under former market conditions.

Ore reserves: recently estimated as 49,000 tons zinc concentrating ore in sight with net value of \$190,000 and 100,000 tons partly blocked ore, valued at \$400,000. Average assay value reported as 3 oz. silver, 1.2% lead, and 10% zinc, or total value of \$11.50 per ton. Costs estimated at \$7, spelter figured at 5c.

Early in 1917 the Silversmith vein was opened for 100' on No. 10 level, where it was 14' wide. Mine was examined by R. H. Stewart of Trail, in Aug. 1917.

Equipment: provided for by the recent bond issue includes, 15-drill compressor, 1,500-h. p. electrical plant, 4,000' aerial tram connecting mill with shipping bins at Sandon and flotation units added to the 100-ton concentrator, increasing capacity to 250 tons. Mill is at level of No. 10 adit.

Production: in 1916: 1,070 tons of crude ore and concentrate averaging 63.1 oz. silver, 59.5% lead, and 7.1% zinc, valued at \$100,539; and 2,008 tons of zinc concentrate containing 34.5% zinc, worth \$30,395; a total of \$130,933. In the third quarter of 1917, shipped ore and concentrates worth \$39,725. Concentrates on hand are valued at \$10,000.

The future of the mine looks favorable now that litigation is ended, transportation is being bettered, and mill capacity increased.

STANDARD SILVER LEAD MINING CO. BRITISH COLUMBIA

Offices: Empire State Bldg., Spokane, Wash., and Silvertown, B. C.

Officers: W. J. C. Wakefield, pres.; J. F. Clark, v. p.; Chas. Hussey, sec.-treas.; Geo. H. Aylard, gen. mgr., Victoria, B. C., with Henry White, directors.

Inc. Dec., 1910, in Washington. Operated under present management since 1911. Controlled by the Finch-Campbell-Clark estates of Spokane. **Cap.,** \$2,000,000; shares \$1 par; fully paid; non-assessable; all issued. Annual meeting, first Tuesday in May. Security Transfer & Registrar Co., New York, registrar and transfer agent. Listed in Spokane and on New York Curb.

Operating statement for 1916 shows total income of \$905,713, of which \$843,188 was from ore sales. Expenses totaled \$495,636; dividends, \$600,000.

Balance from 1915 was \$336,943, plus \$388,364 profit in 1916, made available \$725,307, of which \$600,000 was distributed, leaving \$125,307 surplus at end of 1916. On June 30, 1917, the balance was \$301,247, after paying dividend of \$100,000.

Dividends: 1912, \$425,000; 1913, \$650,000; 1914, \$475,000; 1915, monthly at rate of 2½% commenced Sept. 10, total for year, \$250,000; in 1916, \$600,000; in 1917 to July, \$200,000, making \$2,600,000 to date.

Under present Canadian taxation laws the company is taxable for 25% of earnings over the 7% allowance. With reported present earnings of \$1,000,000 yearly there would be available for dividends approximately \$785,000 against present dividend requirements of \$600,000.

Property: 10 full claims, 6 fractions, 600 acres, 2 miles N. E. of Silverton, located on Slocan Lake, B. C. The claims carry fissure veins in slate and graphitic schist. Ore carries silver, lead and zinc in a quartz-pyrite gangue. Silver occurs as gray copper and ruby. The orebodies occur in the form of lenticular masses along the vein, varying in width from 1' to 25'.

Development: tunnels numbered from 1 to 7, inclusive, develop the vein to a depth of 800'; tunnel No. 8, now being driven, gives an additional 400' depth. Work in 1915 amounted to 5,749', compared with 9,059' in 1914. Total work to April 1, 1916, aggregated 20,000' of drifts on the vein, raises and crosscuts. **Ore reserves:** not reported, but management claims that reserves guarantee many years of profitable operations.

The vein contains ores which are readily concentrated and which constitute the bulk of the mine's output. There is, however, a large amount of material in the vein in which ruby silver and zinc blende occur as streaks and coatings and in which galena is found in a very finely divided state in graphitic schist and slate. Such ores cannot be treated successfully by ordinary concentration. An experimental flotation plant installed in 1914 was unsuccessful, as the graphite floated off with the metallic particles. In 1916 the plant was rebuilt, using Wyman pneumatic flotation machines, which have given a total recovery of 93-95% of the values in the mill feed. The ore as sent to the mill averages 24% lead, 35 oz. silver and 14% zinc.

Equipment: 150-ton concentrator, hydro-electric power plant on Four Mile Creek and an 8,000' tramway connecting mine and mill.

Production:

	Ore, Tons	Silver, Oz.	Lead, Lbs.	Zinc, Lbs.
1916.....	69,764	.....	.....	.....
1915 (b).....	39,447	.....	.....	.....
1914 (a).....	49,720 (b)	1,050,000	10,000,000	5,000,000
1913.....	13,959	1,081,849	17,988,805	.....
1912.....	9,702	811,823	13,497,260	.....

(a) Approximate production. (b) Gross; tons milled, 44,806 in 1914; 35,920 in 1915.

In 1916 shipment totaled 15,399 tons, which included 1,114 tons crude lead ore averaging 57.58% lead and 94.20 oz. silver per ton; 4,171 tons lead concentrates averaging 63.02% lead and 89.12 oz. silver per ton; 10,114 tons zinc concentrates averaging 43% zinc and 20 oz. silver per ton. Total cost per ton, exclusive of development, was \$5.20 per ton; development charges were 78c per ton ore mined, compared with \$4.33 and \$1.10 respectively in 1915.

STAR MINING & MILLING CO.

See Slocan Star Mines, Ltd.

SURPRISE MINE.

Owned by Wm. Kent, Kentfield, Cal. H. L. Hollis, gen. mgr., 1025 Peoples Gas Bldg., Chicago; J. P. McFadden, supt., Sandon, B. C.

Property: 3 crown granted claims, 93 acres, 2 miles N. E. of Sandon, in Slocan mining district, said to show silver, lead and zinc ore in a fissure vein in slate with N. E. strike and dip of 65°. Crude lead ore averages 148

oz. silver per ton, 65% lead, and 7% zinc. Mill feed averages 28 oz. silver per ton, 9% lead, and 16% zinc. Ore reserves not estimated.

Development: by tunnels; main tunnel 3,000' long is 1,000' below out-crop; underground workings total 12,000'.

Equipment: includes an aerial tram, concentration and flotation plant.

Shipments: in 1915 totaled 2,550 tons lead concentrate, 2,740 tons zinc concentrate and 375 tons crude lead ore.

VAN ROI MINING CO.

BRITISH COLUMBIA

Controlled by Le Roi No. 2, Ltd., Rossland, which holds 63,193 ordinary and 10,483 preference shares, out of 90,000 and 30,000 issued.

Office: F. A. Labouchere, sec., 539 Salisbury House, London, E. C., Eng. **Mine office:** Silverton, B. C.

Directors: Lord Ernest Hamilton (chairman); A. B. Dealtry and H. W. Morrison. Alex Hill & Stewart, cons. engrs.; T. J. Lloyd, supt.

Inc. July 9, 1908. Cap., £34,500 in 30,000 £1 pd. and 90,000 1s. ordinary shares.

Property: the Vancouver group of claims in Slocan district, B. C. Operations were stopped in 1914, but resumed early in 1917 at mine and mill. Ore contains silver, lead and zinc. An option was granted to a syndicate, Dec., 1916.

STIKINE DIVISION

A. B. C. METALS CO.

BRITISH COLUMBIA

See Alaska British Columbia Metals Co.

ALASKA BRITISH COLUMBIA METALS CO.

BRITISH COLUMBIA

Office: 50 Broad St., New York.

Officers: S. I. Silverman, pres.; Chas. S. Cohen, v. p.-mgr.; S. B. Silverman, sec.-treas., with J. D. Trenholme, J. C. Eden and Louis N. Gross, directors.

Inc. Dec., 1915, in Wash. Cap., 1,000,000 shares \$1 par; outstanding 200,000 shares; 500,000 shares held for issue. Transfer agent, 50 Broad St.; Registrar, Metropolitan Trust Co., New York City. Listed on New York Curb.

Company's report for 1915 shows assets of \$1,700,000 which include 400,000 shares Stikine Mining Co., \$400,000; option on 200,000 shares Stikine Mng. Co., \$175,000; 200,000 shares Glenora Mining Co., \$200,000; option on 50,000 shares Glenora Mining Co., \$37,500; Stikine claims \$750,000; machinery, supplies, etc., to make up the balance.

Property: 4 groups of claims in B. C.; company's newest and most important holdings are the Tofino Co.'s mines and the Dewdney group, or Indian Chief mine of the Dewdney Canadian Syndicate; optioned by the Tidewater Copper Co., and bond transferred to A. B. C. Co.

Also owns the Stikine group, 3 claims of the Stikine Mining Co. located 115 miles from Wrangel, Alaska, up the Stikine River, thence 2 miles by trail to claims; elevation, 1,500' to 2,500'. Claims said to have a mineral zone 3,000' wide, running through entire length of claims, with "irregular deposits occurring here and there throughout the entire zone, which lies in a granitic formation." Little work has been done on the claims. Average sample taken from the first 150 tons ore mined said to yield \$35 gold and silver; 12% lead; 16½% zinc per ton.

The Glenora group: 3 claims, located 5 miles from Glenora, 150 miles up the Stikine river from Wrangel, Alaska, said to cover 4,500' along the strike of vein. **Ore:** chalcopryite, containing gold and silver. No work has been done except a little open-cutting.

The Jumbo group, 4 claims, located on Copper Creek, at the end of Tofino Inlet, Clayoquot mining division, Vancouver Island, B. C., said to show 1' to 4' of chalcopyrite in a limestone formation, with diabase hanging-wall. **Development:** 65' shaft with 80' drift and several short tunnels.

The Dewdney, or Indian Chief mine of the Tidewater Copper Company at Sydney Inlet, Vancouver Id., is reported to be fully equipped. **Ore:** said to run 50% copper and \$20 in silver. A 300-ton concentration mill was under construction in 1917 to treat the 500,000 tons of 2% copper ore, said to be in sight. There is also said to be a cliff of high-grade ore 40' wide.

The Tofino property shows 4' vein of high-grade ore, which will be mined when a 600' tram line is completed. Company reports "in two tunnels alone there is an estimated profit of two and a half million dollars on the copper ore in sight now. Additional tonnage is being opened up every day." Shipped 600 tons of 4% ore to Tacoma, Dec. 1916. A 3-year contract with the Tacoma smelter calls for 1,500 tons per month. Two shipments made to May, 1917, netted \$17,000. Employs 30 to 40 men.

See Ann. Report Minister of Mines, B. C., 1916, pp. 337 and 361.

TRAIL or ROSSLAND DISTRICT

See Geology and see Deposits of Rossland, B. C., by Chas. W. Dryden. Mem. 77, Canadian Geol. Survey.

CONS. MG. & SM. CO. OF CANADA.

BRITISH COLUMBIA

Secretary and office: J. Kitto, Room 1202, C. P. R. Bldg., Toronto, Ont. **Works office:** Trail, Trail district, B. C.

Officers: W. D. Matthews, pres.; Geo. Sumner, v. p.; Jas. J. Warren, managing dir.; preceding, with E. B. Osler, Chas. R. Hosmer, H. S. Osler, W. L. Matthews, J. C. Hodgson and Wm. Farwell, directors; Robt. Holden Stewart, cons. eng.; Selwyn G. Blaylock, asst. mgr.; T. W. Bingay, compt.; James Buchanan, smelter supt.; J. F. Miller, refinery supt.; M. E. Purcell, supt. Centre Star mines; F. S. Peters, supt. Le Roi mines; J. K. Cram, supt. St. Eugene and Sullivan mines; Fred Chapman, supt. construction at smelter; W. M. Archibald, mines eng.; and E. H. Hamilton, metallurgical mgr.

Inc. 1905 as Canadian Consolidated Mines, Ltd. **Cap.**, \$15,000,000; \$25 par; issued \$10,477,450; increased from \$5,500,000 in 1909 to \$7,500,000, and again in Dec., 1915, to present amount. Company's fiscal year ends Sept. 30. Annual meeting, third Tuesday in December.

Transfer agents: Toronto General Trusts Corporation, and Royal Trust Co., Montreal.

For fiscal year 1916 net profits were \$996,496, and surplus account showed a balance of \$2,278,459. **Dividends:** for fiscal years—\$234,940 in 1906; \$480,005 in 1907; \$66,940 in 1908; \$464,352 in 1913; \$464,376 in 1914; \$464,398 in 1915; \$776,338 in 1916 and 1917, making \$3,677,786 to 1918.

An 8% dividend rate was resumed July 2, 1913, when 2% was paid; changed Jan. 1, 1916 to 10% per annum, payable quarterly.

Sales of refinery products in 1916 amounted to \$7,203,807.

Property: company was formed to take over the following properties, either by direct ownership, or by stock control; War Eagle Consolidated Mining & Development Co., Ltd.; Centre Star Mining Co., St. Eugene Consolidated Mining Co., The Rossland Power Co., and the Trail smelter, formerly operated by the British Columbia Southern railroad. In 1907, the Iron Mask, Idaho and Enterprise mines at Rossland were purchased and the Phoenix Amalgamated Copper Mines, Ltd.; also the Keystone and

Four Ace claims adjoining the Phoenix, located at Phoenix, B. C. In 1910 the company acquired the La Plata, or Molly Gibson group, near Nelson, and the No. 7 group in the Boundary district. In 1911, company purchased control of the Fort Steele Mining & Smelting Co., Ltd., owning the Sullivan silver-lead mine, near Fort Steele; Le Roi Mining Co. at Rossland; the Virginia and Abe Lincoln Mines. In 1915, company purchased the Monte Christo, Paul Boy, Eddie J. and the Iron Horse mines, all at Rossland, and acquired a controlling interest in the Silver King Mines.. Ltd., at Nelson. Also the No. 1 and the Highland groups in Ainsworth. In 1913, the Deer Park, Grand Prize and Mabel in Rossland were taken over and the Ottawa Mine near Slocan City purchased. Control was purchased in the Quatsino Copper Co., operating on Vancouver Island.

Late in 1917 the company acquired properties in the Camp McKinley and Fairview districts, near Keremeos, B. C., and Molson, Wash. Properties contain silicious flux.

The **Le Roi-Centre Star** group, on the southern slope of Red mountain, at Rossland, is the principal property. Country rock is a series of effusive and fragmentary volcanics of the Paleozoic age, intruded by an elongated mass of monzonitic-porphry. This monzonitic mass, with its adjacent rocks, has been intruded by a large number of nearly vertical dikes, from a few feet to 250' wide, with generally N.-S. trend, the dikes being basaltic, and occasionally slickensided, larger dikes cutting off the veins completely, with the more important orebodies occurring at the points of intersection, and having a series of faults, mainly parallel to the dikes. Ore occurs in shoots of 3 to 50' width, and 50 to 600' length, widening at intersections of veins with dikes. Ore is strongly auriferous and fairly argentiferous chalcopyrite, associated with pyrite, and pyrrhotite with gangue of silicious altered country rock, ore ranging 0.5 to 2% copper and \$8 to \$20, and occasionally up to \$100, gold per ton. Pay shoots extend, in some cases, from wall to wall, and form local enrichments, wall in some cases being very indistinct, and ore shading into the country rock. There are several veins, the more important being the Centre Star, Le Roi and War Eagle, on which the mines are opened, these being shear zones, carrying chalcopyrite disseminated mainly in pyrrhotite, with some pyrite and occasional arsenopyrite.

The Rossland group, which now has a total acreage of about 775 acres, includes the Le Roi, Centre Star, War Eagle and Iron Mask mines, which are practically one, all connected by drifts and crosscuts, with about 56 miles of workings. For fiscal year 1915-16, new openings were 10,290', with 17,271' of diamond drilling. Mines are worked by overhand stoping, partly on the shrinkage system and partly timbered with square sets, cut from round timber. There is an electric haulage throughout, with 13 electric locomotives hauling 2-ton side dumping cars to the underground ore pockets of the Centre Star shaft. The ore pockets are on the hanging-wall side of the shaft, 2 on each level, 1 directly behind the other, the front bin, of 70 tons capacity, being for waste, and the 150-ton back bin for ore.

The water from the lower levels of the Le Roi and the other connected workings is handled through the Centre Star, the pumping equipment consists of a No. 6 Cameron on the 16th level, a No. 7 Cameron on the 14th level, a 4" centrifugal driven by a 50 h. p. induction motor on the 12th, a triplex 7½"x15" plunger driven by a 50 h. p. motor on the 10th, a quintuplex 4x12" plunger driven by a 50 h. p. motor on the 6th, a triplex 7"x10" plunger driven by a 50 h. p. motor on the 5th level, while a 7½"x10" triplex plunger driven by a 75 h. p. motor on the 9th level

Le Roi handles the water from the levels above to the Black Bear adit.

The Centre Star mine has a 2,200' three-compartment shaft, sunk at about 68°, with 16 levels opened, at intervals of 125 to 175'. The shaft timber has been replaced with concrete from the 12th level to the bottom. The Centre Star has 8 or 10 different orebodies, but mining is principally from the Centre Star vein, the ore of which averages 0.6% copper, 0.3 oz. silver and \$8 to \$10 gold per ton. Development in this mine last year was fairly satisfactory.

The mine has a 106' wooden head frame, with 11' sheave wheels, a 24x36" Jenckes-Farrel crusher of 100 tons hourly capacity, driven by a 75 h. p. alternating motor; shaft storage bins of 450 tons capacity, sorting and sampling plant with pan and Link Belt conveyors, carrying ore to the shipping bins of 1,200 tons capacity. The engine room has an 1,100-h.p. 28x60" Nordberg hoist, with two 10' drums of 5' face, good for 10-ton loads to the depth of 3,000' at a speed of 2,000' per minute, using a 1¼" plow-steel hoisting rope, hoist cages 10' high, having hinged bottoms that are turned back when hoisting ore, with 4-ton skips swung under.

Buildings include carpenter shop, smithy and machine shop.

In the Centre Star-War Eagle- Iron Mask group, ore is mined from the 3 Centre Star veins, viz., Main, North and South, as well as from the Iron Mask, War Eagle, Josie, Poorman and Mugwump veins.

The War Eagle 1,300' three-compartment shaft, sunk at 50°, is now used only for handling men, timber and supplies, a 8¼"x12" air hoist having been installed on the No. 2 level for the purpose, after the destruction by fire of the original surface equipment. The War Eagle mine has 11 levels opened.

Exploration in the deepest levels of War Eagle in 1916, obtained no definitely satisfactory results as to the continuation of orebodies existing on No. 16 level.

The Le Roi group is producing ore from the Le Roi main South. Intermediate, North Peyton and Hollywell veins. The Le Roi mine has a 1,650' five-compartment shaft, connected underground with the Star shaft; the Le Roi Workings are also connected on the 15th, 1,650' and 1,850' levels with those of the Centre Star.

A sulphide orebody containing copper was opened in 1916 on the level corresponding with No. 13 in the Centre Star.

The Le Roi shaft is equipped with a Fraser & Chalmers hoist, good for 3,000', and there is also a smaller hoist having 6' drums, two 40-drum air compressors and other necessary equipment.

Electric power for the complete operation of the mines is taken from the Bonnington Falls plant of the West Koteenay Power & Light Co., 35 miles distant, at 60,000 volts, stepped down at the mine to 2,000 volts for distribution and use. The compressor room has a 120-k.w. direct-current generator, driven by an alternating current motor, supplying current at 250 volts for electric motors on surface and underground, and for lighting. Air for drilling is furnished to all the mines through one system. The Centre Star plant has two 40-drum compressors, one a Canadian-Rand Corliss duplex compound 2-stage compressor, with 22" and 40" steam cylinders and 48" stroke, with 28x32" air cylinders, but the steam cylinders have been disconnected, and compressor is rope driven by a 650-h.p. Westinghouse induction motor. The other compressor is a hybrid, built over from an Ingersoll straight-line into a duplex machine having Canadian-Rand cylinders, rope-driven by a 600-h.p. Canadian Westinghouse synchronous motor.

The Le Roi compressor working on the same system is a Rand 2-stage

air compound steam 40-drill machine, with steam cylinders cut out and air cylinders bushed to 3,000 cu. ft. capacity, rope-driven from a 400-h.p. synchronous motor. A second 2-stage air compound steam 40-drill Rand machine is in reserve, with battery of boilers sufficient to drive both machines.

Operations at Rossland, 1915-16 have been extensive, 310,720 tons of gold-copper ore having been shipped.

These mines are broadly gold rather than copper producers.

The **Richmond-Eureka** mine, at Sandon, B. C., has argentiferous lead and zinc ores, developed by tunnels aggregating $1\frac{3}{4}$ miles in length. Ore is transported to bin on C. P. R. R. tracks at Sandon by 4,000' aerial tram.

The **Sullivan** mine, at Kimberly, is a lead-zinc producer, whose ore occurs in replacement deposit, in a fine grained argillaceous quartzite. Ore is a mixture of fine grained galena zinc blende and iron sulphides, the ore shoot showing a maximum stope width of 125'. **Development:** principally by tunnels and raises. Workings total $6\frac{1}{4}$ miles. Production: 1916, 91,130 tons, double that in 1915.

Equipment: consists of an hydraulic installation, comprising 30' concrete dam, 5,000' of 30" wood stave pipe delivering water under a head of 200' to 3 Pelton wheels operating a 120-k.w. alternating current generator; 2,200 volts, and driving a 3,000 cu. ft. Rand 2-stage compound steam air compressor, steam cylinders disconnected. An auxiliary steam plant of sufficient capacity to operate the machine at full load was installed to provide against water shortage. Electric current from the 120-k.w. generator is carried to the mine over 7,000' transmission line. There is also an auxiliary air plant at the mine comprising a 6-drill, 2-stage compound steam Rand air compressor, and sufficient boiler capacity to operate.

A 6,000' aerial tramway carries ore from the mine rockhouse to the loading bins on the C. P. R. R. tracks. About 100 men are employed.

The **Molly Gibson** mine, bought 1910, formerly owned by Molly Gibson Mining Co., Ltd., and later by La Plata Mines, Ltd., has a regular fissure vein in granite containing highly argentiferous lead-zinc ore. Developed by over two miles of tunnels. An aerial tram 2 miles long connects the mine and mill, while a second, five miles long, connects mill and loading bins, 5 miles from Kootenay lake. The mine is equipped with 100-ton mill, operated by water power, and two air compressors. Employs a small force. Mill was not operated in 1916.

The **St. Eugene** mine, at Moyie, has produced over 1,000,000 tons of silver-lead ore. The mine has about 20 miles of workings, is equipped with a 500-ton mill, but considerable of its equipment has been dismantled. Now being operated by a small force and shipments of crude ore are regularly made.

No. 1 Group, at Ainsworth, 400 acres, has a contact deposit between dolomite and a dark lime schist. The ore consists largely of oxides of iron, zinc and lead in a silicious lime gangue. Principal value is in silver. Development, by tunnel and winze, totals $1\frac{1}{2}$ miles. Equipment includes a 2-stage, 11x16x18" Jenckes air compressor, driven by belt from 150-h.p. 2,080-volt motor, power being supplied from a 350-k.w. generator at Highland Mill, Cedar Creek, 9,000' distant; and an aerial tram, connecting mine ore bins with loading bins, on shore of Kootenay lake. Storage capacity at mine and lake bins is about 700 tons.

Highland Group, 240 acres, has a series of fissure veins. Ores are silver-lead and development is by $2\frac{1}{2}$ miles of tunnels. Equipment includes 6-drill air compressor, driven by water power, and a single rope aerial tram 4,000' long, connecting mine ore bins with 150-ton mill at Kootenay lake.

Power for mill is from a 350-k.w. generator, driven by a Pelton wheel under a head of 1,000'.

The **Ottawa** mine has a fissure vein in granite. Development by $\frac{1}{2}$ mile of tunnel and winze. Principal metal is silver, associated with copper, lead and zinc sulphides, some barite in gangue.

The **Silver King** mine on Toad mountain, back of Nelson, purchased in 1912, was unwatered in 1913, the surface plant repaired, machinery installed and made ready for production. The mine works well mineralized fissure veins in granite, yielding high-grade silver-copper ores. Development by $3\frac{1}{4}$ miles of tunnels and winzes. Equipment includes single rope aerial tram $4\frac{1}{2}$ miles long, connecting ore bins at mine with shipping bins on C. P. R. R. tracks at Nelson, 2 single stage straight line Ingersoll air compressors, driven by motors, a double drum-g geared electric hoist, using current at 220 volts and a 7"x10" triplex plunger pump. Mine not operated in 1915-16; all development operations have been curtailed after outbreak of European war.

The **Trail Smelter**, located near the International boundary line, treats both copper and lead ores and does an extensive custom business in addition to treating the company's ores. Smelter was closed down in Nov., 1917, on account of labor troubles.

There are two sampling mills, equipped with crushers and Vezin samplers; No. 1 mill, for copper ores, has 200 tons hourly capacity; No. 2, for lead ores, has 100 tons hourly capacity.

The smelter has a calcining department, and blast-furnace departments for copper and lead. All the copper ores are bedded and hauled from the beds by electric locomotives to the charge bins, and from charge bins to the blast furnaces. The lead ores for roasting department are delivered to beds by a system of belt conveyors and drawn from these beds by a belt conveyor over an electric scale to the roasters.

The calcining department consists of three 22' 6" 7-deck Wedge roasters, and five 26' Godfrey roasting furnaces. The roasted ore is sintered in 34 Huntington-Heberlein sintering pots and 2 Dwight-Lloyd sintering machines, fumes being passed through the Cottrell electric precipitator.

The 1,800-ton copper smelter has 5 blast furnaces, largest 45"x420", all taking a 32-oz. cold blast. Ore was treated crude in the blast furnaces, making a first-fusion product of 10 to 15% copper tenor, which is cooled, crushed and smelted with silicious ore and 4% coke to a matte of 35% copper, and shipped to Tacoma for conversion. Two 12' Great Falls type converters were installed during 1916, and in future all matte will be converted here.

The 350-ton lead smelter has one 45x180" and three 45x180" blast furnaces, with mechanical feed, taking mainly calcined ores, crude lead ores, being roasted in seven 26' Godfrey furnaces, which reduce the sulphur from the original tenor of 16% to only 8%, and these calcines are re-roasted in fifteen 9' Huntington-Heberlein sintering pots, yielding a product carrying only $4\frac{1}{2}\%$ sulphur. The fully sintered ore, carrying 30 to 50% lead, is smelted in the blast furnaces, each making 50 to 85 tons of lead bullion daily, with about 4% matte fall. This matte is roasted and again put through the blast furnaces, and slags are granulated. Blast furnace gases are passed through a Cottrell precipitator.

In connection with the smelters is an electrolytic lead refinery, handling anodes cast from the silver-lead bullion. This plant, of 100 tons daily capacity, was the first electrolytic lead refinery ever built, and uses the Betts process. The lead is of exceptional purity, with average assay of about 99.997%, which means that a short ton of lead carries only about 1 oz. of impurities, which is marvelously successful work.

The silver refinery, taking silver sludge from the electrolytic lead tanks, has a water-jacketed reverberatory furnace for the production of doré metal, and the necessary kettles, tanks and bluestone plant for parting the precious metals with sulphuric acid, also furnaces for melting and casting the silver and gold bullion. Products are silver 0.999 fine, and gold 0.995 fine.

An electrolytic zinc plant was erected in 1916, and is now producing from 25 to 50 tons of spelter daily. The Sullivan and other mines supply the ore.

The process is similar to that used at Anaconda, Mont., but is the direct result of the operation of an experimental plant treating ore from the Sullivan mine and producing 1,000 lbs. of zinc per day.

Power for the reduction works is electric throughout, brought 30 miles from Bonnington falls, on the Kootenay river, received at the transformer station at 22,000 volts, and there stepped down to 550. The installed electric capacity gave a revenue producing load of 11,152 h.p. during 1916. No. 2 power house was enlarged. A 20,000 h.p. distributing station was erected at Smelter, B. C.

Blast is supplied at 32 oz. for all furnaces, by one No. 9, and one No. 9 1/27, one No. 11 and one 400 cu. ft. Root blower, and one 200 cu. ft. Connorsville blower.

The works have a central heating station and well-equipped machine, carpenter, boiler and electrical shops. The assay office, which handles an unusual variety of work, in great detail, is exceptionally commodious and well equipped.

In the past three years the smelter has had many betterments, both in the lead and copper smelting departments. In 1915 these included an additional lead furnace, charge bins equipped with conveyors and weighing hoppers for the lead furnace department, wash houses for the men, an additional 20-ton crane in the roasting department, new lead ore sampling mill, copper converters with necessary equipment, beds for bedding copper ores, and additional tanks at the lead refinery.

In 1916 a briquetting plant was added to the lead smelter; lead sampling mill was completed, and an ore bedding system. The sulphuric acid plant was erected, with 15 tons daily capacity; also the hydrofluosilicic acid plant. For casting copper anodes a reverberatory was built. A 17-ton electrolytic copper refinery was completed.

Production:

Year	Tons, Ore Smelted	Gold Oz.	Silver, Oz.	Lead, Lbs.	Copper, Lbs.	Zinc, Lbs.
1916.....	447,017	98,314	2,285,631	39,974,411	4,446,080	3,088,199
1915.....	447,064	148,891	2,230,500	40,177,910	5,306,184	.....
1914.....	374,771	129,083	2,568,301	34,617,318	3,645,997	.....
1913.....	407,124	186,017	3,224,458	43,325,252	3,454,814	.....
1912.....	.....	129,789	1,765,992	26,072,074	2,914,181	.....
1911.....	.....	119,067	1,458,758	24,026,015	4,421,988	.....
1910.....	.....	137,614	2,162,406	42,368,816	5,974,959	.....
1909.....	.....	114,920	2,443,475	43,675,077	4,637,631	.....
1908.....	.....	121,380	2,224,888	32,157,139	4,004,468	.....
1907.....	.....	69,186	1,100,271	20,380,083	3,433,310	.....

Considering that the Centre Star and War Eagle mines were reported worked out when taken over, the company has made a signal success. The management is enterprising and thoroughly competent.

Company at present is the only one in the world producing electroly-

tically refined copper, gold, lead, silver and zinc at one plant, also making sulphuric acid, hydrofluosilicic acid, and manganese dioxide. Trail is a metallurgical center using the latest processes known.

Owing to labor troubles in November and December, 1917, production for this year will be reduced.

FIFE MINES, LTD.

BRITISH COLUMBIA

Address: Rossland, B. C. Chas. Dempster, gen. mgr..

Property: the Hattie Brown claim at Rossland and the Dykehead, Ben Hur, Three Bells, and Fife claims at Fife, near Christina lake, 12 miles E. of Grand Forks, Boundary district, B. C. Claims show a vein up to 30' in width, carrying about 6' of smelting ore, with a balance of concentrating grade, developed by a glory hole, an 80' shaft and a main tunnel having a 235' winze.

Ore: contains chalcopryrite, carrying gold and silver values, claimed to average 3 to 6% copper and \$4 to \$8 gold per ton.

Equipment: includes necessary mine buildings and a 5-drill Rand air compressor. Property considered promising. Idle.

LE ROI NO. 2, LTD.

BRITISH COLUMBIA

Secretary's address: F. A. Labouchere, 539 Salisbury House, London Wall, London, E. C., England. **Mine office:** Rossland, Trail district, B. C.

Directors: Lord Ernest W. Hamilton, chairman; A. B. Dealtry, H. G. T. Hawes, H. W. Morrison and Major C. H. Campbell. Ernest Levy, mine mgr.; Alex. Hill & Stewart, cons. engs.

Inc. June, 1, 1900, in Great Britain. **Cap.,** £600,000; shares £5 par; fully issued and fully paid. Dividends: 5s in 1901; 5s in 1902; 2s in 1904; 3s in 1905; 8s in 1906; 3s in 1907; 6s in 1908; 6s in 1909; 6s in 1910; 5s in 1911; 1s in 1912; 2s in 1915-16. Total dividends to end of 1916 were £2 12s per share, or £312,000. For fiscal year ending Sept. 30, 1916, and presented March, 1917, there was a loss of £12,860, after writing off £13,024 depreciation, and £26,475 on misc. shares and bonds. Balance carried forward, £22,327.

Costs: for mining, 1916, were \$5.25 per ton; smelting, \$6.60, which, after adding development and depreciation charges, total \$15.12 per ton, as compared with \$12.22 in 1915.

Property: 120 acres, including the Josie No. 1 and Annie mines, on Red mountain; also 8 claims near the old mine, 2 claims near the Velvet mine, and 5 claims in the Ymir district of British Columbia.

Company is developing the adjoining Giant-California mine by diamond-drill and tunnel. 7,433' of the drilling has been done and a total of \$41,994 spent to date on property.

In 1915-16, 273 tons of ore were shipped at a cost of \$4.88 per ton.

Ore: Josie mine has 5 main veins. Ore is mostly chalcopryrite, associated with pyrite and pyrrhotite, in a silicious gangue, averaging 2.25% copper, 0.45 oz. gold, and 1 oz. silver per ton. Giant-California mine has three of the Josie veins. Ore averages 0.48% copper, 0.14 oz. gold, and 0.25 oz. silver per ton.

Development: by the 1,300' Josie main shaft, and by 3 tunnels, 2 on the Josie and 1 on the Poorman claim. New underground openings made were 3,729' in 1914; 4,092' in 1915; also 7,434' of diamond-drilling.

Apart from some high-grade shoots, results generally were not especially good.

Equipment: includes a 150-h.p. electric hoist, a machine shop, framing shop, smithy, superintendent's dwelling, etc.

The mill, across a small gulch from the Josie shaft, is of 50 tons rated daily capacity, having Blake and Gates crushers, 2 Chilian mills, 3 Jencke

sizers, and 6 Wilfley tables. An Elmore oil concentrator, fully described Vo. IV., was installed 1903, proving a technical, but not a commercial success, and was superseded by Wilfley tables. Concentrates average 0.59% copper; 0.83 oz. silver and 1.02 oz. gold per ton.

In 1916, mill treated 2,730 tons of ore assaying 0.24% copper and 0.13 oz. gold.

Production: largest copper production was 3,001,027 lbs. in 1902. Recent production has been as follows:

Year (a)	Tons, Ore Prod.	Copper, Lbs.	Gold, Oz.	Silver Oz.
1916*	19,231	730,015	7,258	17,675
1915	15,681	870,268	7,961	23,788

*Ore ran \$20.625 per ton from the Josie mine.

1914	29,679	.....	.....	.....
1913	35,553	.....	.....	.....
1912	.....	507,499	14,157	12,281
1911	.....	864,500	22,725	19,219
1910	.....	970,966	26,447	24,078

(a) Fiscal year ending Sept. 30.

Property considered valuable and management good.

ROSSLAND KOOTENAY MINING CO., LTD. BRITISH COLUMBIA

Idle since 1904.

Office: 325 Crown Court, Old Broad St., London, E. C., Eng. **Mine office:** Rossland, Trail district, B. C.

Officers: C. Williamson Milne, chairman; Dr. G. Schack-Sommer and Lionel W. Harris, directors; W. S. Gregg, sec.

Inc. May 17, 1902, in Great Britain, as a reconstruction of Rossland-Great Western Mines, Ltd., and Kootenay Mining Co., Ltd. **Cap.**, £150,000; shares £1 par; issued, £148,607.

Property: 171 acres, at Rossland carrying auriferous and argentiferous copper ores, of low grade, and 113 acres placer at West Kootenay. The company also owns 2,615 shares of the Santa Eulalia Development Co., Ltd., owning the Nueva Chihuahua property at Santa Eulalia, Chih., Mex. Revolutionary conditions have prevented any work for several years in Mexico.

SILVER CROWN MINING CO.

BRITISH COLUMBIA

Office: 505 Rookery Bldg., Spokane, Wash. **Mine office:** Trout Lake, B. C.

Officers: Fred Hamilton, pres.; A. C. Bartels, v. p.; A. Herman, sec-treas., with Geo. Skore and H. C. Weyerhoist, directors.

Inc. Feb., 1917, in Washington. **Cap.**, \$125,000; shares 10c. par; assessable; 852,250 issued.

Property: 3 claims, 150 acres, in West Kootenay mining division, B. C.

Geology: fissure vein in granite and limestone, dipping 45° and pitching N. W. Shoots are from 18 to 36" wide. Ore contains silver and lead, assaying \$125 per ton.

Development: by 1,300' tunnel to depth of 550'.

Production: in 1917 was \$65,000.

TRAIL SMELTER

BRITISH COLUMBIA

See Consolidated Mining & Smelting Co. of Canada, Ltd.

WAR EAGLE MINE

BRITISH COLUMBIA

Rossland, B. C. See Consolidated Mining & Smelting Co. of Can.

Inc. 1903, in Maine. **Cap.**, \$3,000,000; shares \$1 par; 1,984,150 issued. Bonds, \$5,111,000, twenty year, 6%.

Balance sheet: for 1916 showed assets of \$12,702,834, which included plant and property, \$10,947,169; and current assets, \$1,755,665; current liabilities, \$961,141; profit and loss account, \$3,018,689. **Operating statement** shows total operating profit, \$2,802,767; depreciation and interest, \$1,227,906, leaving a net profit for 1916, of \$1,574,861, as compared with \$194,238 for the previous year. Over \$1,000,000 was expended in 1916 for construction and equipment.

Property: all the stock of the Britannia Mining and Smelting Co., Ltd., which in turn, owns its subsidiaries, the Britannia Power Co. and the Howe Sound Power Co.

Also 53,800 shares of the total issue of the El Potosi Mining Co., which, in turn, owns a large majority of the stock of the Chihuahua Mining Co.

Britannia Mining & Smelting Co., Ltd.

Property holdings at end of 1916, shows 250 crown granted mineral claims and 17 beach lots of 11,639 acres; 198 mineral claims of 9,000 acres; 8 timber licenses of 4,366 acres; a total of 25,005 acres. During the year, \$63,000 was spent on prospecting, surveying, crown granting, etc.

The orebodies consist of a series of roughly parallel lenses of chalcopyrite and pyrite in schist, and large masses of silicious material through which chalcopyrite and pyrite are irregularly disseminated. The bulk of the work during 1916 was confined to the series of lenses, the average grade for the year being 2% copper. All the orebodies developed thus far are confined to about 100 acres, the remainder of the company's holdings being but little prospected.

Development: by large glory holes and by a number of tunnels at elevations below the outcrop of 500', 600', 700', 850' and 1,050', the latter being known as the 1,000' level. A new low-level tunnel, 4,336' long, completed July, 1913, to this distance, but which will eventually be driven on through the mountain, gives a depth of 2,200' on the orebody and 1,200' below the old workings. It is now the main working tunnel and is known as the 2,200' level. At 3,922' from the portal a raise was driven to the 1,050' level and later enlarged to a 3-compartment shaft. Tunnels 9'x13' are also being driven at the 2,700' and 4,100' levels, the intention being to make them part of the future transportation system whereby the ore will be taken underground to the top of the mill, the portal of the 4,100' tunnel being just above the mill bins. The distances already driven are 1,431' and 1,678', respectively, at a cost of \$103,000. Underground work in 1916 totaled 19,705' as compared with 2,595' in 1915.

Ore reserves: estimated Jan. 1, 1917, in Britannia mine: broken ore in stopes has been increased 339,730 tons, increasing the total stored to 919,322 tons of 3.08% copper; total ore developed, 6,462,780; probable ore, 6,756,350; possible ore, 4,616,050; total, 18,754,502 tons. Average grade is given as 1.97% copper.

Equipment of the shaft includes a double-drum electric hoist on the 1,050' level and a Gates crusher in the rock-raise between the 1,050' and 2,200' levels, placed on the 1,800' level and run by a 75 h. p. motor. This rock raise, 200' east of and connected with the shaft, serves as a storage bin for ore, with capacity of 4,000 tons above the 1,800' level and 2,000 tons below the 1,800' level. The raise is lined with 12" by 12" timbers. Electric motors haul the ore from the chute to the portal of the tunnel. From the portal the ore is hauled 3 miles by electric railway to head of a 33% incline, 5,500' long, vertical drop of 1,450', which leads to the bins of the concentrator at the water's edge. Other similar raises, to be equipped with

crushers, are being driven in different localities to give flexibility to the operation.

By system of dams, intakes and pipe lines, Britannia Creek has been harnessed to produce over 8,000 h. p. during most of the year, and it is expected that the work done in 1917, to develop Furry Creek, will produce over 2,500 h. p., which will be increased by additional installations in the future. As reserve power, there is a steam turbine plant of over 3,000 h. p. capacity located at the beach.

Equipment: includes 8 compressors, some driven by water wheels, some by steam, and some by either steam or water-generated electricity, with total capacity of nearly 20,000 cubic feet of free air per minute.

The four units of the new mill are in operation, and although originally designed to handle 2,000 tons daily, are enabled by improvements and additional machinery to care for 2,500 tons. The old mill, originally capable of treating 800 tons daily, will be dismantled and all available units transferred to the new mill. This will bring the capacity of the new mill to approximately 3,000 tons.

In general the system of milling consists of coarse crushing, jigging by Hancock jigs, fine crushing in tube mills and Hardinge mills, and flotation in Minerals Separation machines. The ratio of concentration for 1916 was 9½:1, and the average recovery was 91½%. Shipments of concentrates to the smelter, resulting from mill operations, amounted to 55,126 dry tons and assayed per ton, .014 oz. gold; 1.67 oz. silver; 14.76% copper; 3.22% zinc.

There are 2 townsites in connection with the company's operations, one at Britannia Beach, on the shore of Howe Sound, and the other, known as the Mine Townsite, laid out at the portal of the new tunnel. It has all necessary buildings for equipment and men, the mine buildings being the best and most comfortably equipped in British Columbia. There is a large company store at Britannia Beach.

When the new mill is operating at full capacity the company estimates costs per ton as follows: Mining, 50c; milling, 35c; transportation, 5c. These are exceptionally low, and it is doubtful if they can be attained. Total tonnage milled in 1915, 212,158 tons; cost per ton, \$0.63; mining costs, including development and crushing, \$1.77 per ton. Concentrates assayed 15.04% copper, 1.67 oz. silver and 0.013 oz. gold. Net cost of producing copper said to be 7.3c per lb.

Production was suspended Oct., 1907-1910. Production since 1909 is as follows:

	Copper, Lbs.	Gold, Oz.	Silver, Oz.	Total Value
1916.....	16,288,835	791	91,905	(a) \$6,042,538
1915.....	9,058,045	397	50,306	1,616,133
1914.....	11,841,232	213	68,515	1,640,379
1913.....	13,167,000	89	72,300	2,052,188
1912.....	14,300,000	....	76,500	2,383,285
1911.....	8,685,000	....	46,000	1,074,334
1910.....	520,000	1,000	7,500	64,000

(a) includes lead and zinc values.

The Britannia proved a hard problem to handle for years, but has made money under the present management, which is thoroughly capable. A successful future seems certain, and the results are a tribute to the far-seeing judgment and persistency of Mr. G. B. Schley.

Mexican properties: the El Potosi and Chihuahua mining companies

comprise 415 acres, in the Santa Eulalia mining district, 18 miles from Chihuahua City, where the company's narrow gauge railroad connects with the National Lines of Mexico. The Santo Domingo, the producing claim of the Chihuahua Mining Co. adjoins the 200 acre claim of the Potosi Company. Other claims are within a two mile radius of the Santo Domingo. A new cave of ore was discovered in Nov., 1916, which, with another extensive deposit forms an orebody 100' wide at the north end, 400' at the south, 600' on its dip, and still strong in the floor. Making allowance for the tonnage shipped during the year, 75,000 tons have been added to the ore reserve. About 5,200' of development work were done in 1916.

The production of the mines was shipped to the A. S. & R. Co.'s plant. The mine workings and development for the past 2 years have been in charge of Mexican foremen; the American organization of the company, owing to disturbed conditions, were drawn out of Mexico and held in El Paso under pay. W. J. Quigley is manager in charge of operations.

COPPER MOUNTAIN MG. & DEV. CO. BRITISH COLUMBIA

Office: 5406 Union Ave., South Tacoma, Wash. Mine near Quatsino, B. C. Reported sold, 1917. Fully described Vol. XII.

LADYSMITH SMELTING CORPORATION, LTD.

BRITISH COLUMBIA

Address: F. A. Sieberling, Goodrich Tire & Rubber Co., Akron, Ohio.
Operating office: Col. W. L. Stevenson, mgr.; H. W. Aldrich, gen. supt., Ladysmith, Vancouver Island, B. C.

Property: 1,247 acres; including 13 claims, crown granted, 342 acres, a 45-acre smelter site and 800 acres timber lands. Owns the Ladysmith Smelter, and mineral lands on Mt. Sicker, purchased from the Tyee Copper Co., in Dec., 1916, for \$275,000.

The Tyee mine, on Mt. Sicker, in the Somenos district, 11 miles N. W. of Duncans, and about 80 miles from Victoria, yielded only 1,200 tons of ore 1907, and has been idle since. The orebody was rich, but shallow, and although it was explored thoroughly, nothing of value was found.

Smelter: known as the Ladysmith works, is well located, on a 45-acre site on Oyster harbor, and treated custom ores from as far N. as Alaska and as far S. as Mexico. The smelter was remodeled and practically rebuilt 1909-1910. There is a 40x210' wharf, having an electric hoist, connected, by an elevated incline trestle, with the smelter bins, which are of 5,400 tons capacity. The works are terraced throughout, permitting handling of material by gravity, and have a capacity of 500 tons daily.

The furnace building has 42x120" and 48x160" Allis-Chalmers blast furnaces, of 200 and 300 tons daily capacity, respectively.

Smelter production was 3,604,474 lbs. copper in 1903; 5,045,000 lbs. in 1904; 3,039,398 lbs. copper, 103,474 oz. silver and 5,952 oz. gold in 1905; 3,173,431 lbs. copper in 1908; 2,148,058 lbs. copper in 1909; 45,758 tons of ore, yielding 3,392,901 lbs. copper, 41,128 oz. silver and 10,041 oz. gold in 1910. In 1911, 42,030 tons of custom ore were treated. Closed down, 1911.

The 250-ton mill was remodeled and flotation installed, 1917.

LASQUETI ISLAND MINING CO., LTD. BRITISH COLUMBIA

Vancouver, B. C.

Officers: R. A. Mather, pres.; A. D. Tennant, v. p.; John D. Mather, sec.; Geo. E. Winter, treas.; Percy Williams, mgr., at last accounts.

Inc. 1910. Cap., \$500,000; shares 25c par.

Property: 3 claims, 150 acres, on Lasqueti Island, on the S. W. end of Texada Island, on the Gulf of Georgia, 55 miles from Vancouver.

Development: by a tunnel, on a 20' vein known as St. Joseph, having 4

paystreaks, of 6 to 24" width, said to carry ore averaging 10% copper and \$20 gold per ton.

Closed down.

LITTLE BILLY OPERATING CO.

BRITISH COLUMBIA

Van Anda, Texada Island, B. C., J. C. Taylor, supt.

Property: the Little Billy mine is said to have an orebody of 8' estimated average width, developed by a 260' shaft, with a 35' headgear.

Equipment: includes an 80 h. p. boiler, single-drum hoist, and a 5-drill air compressor. There is a crude concentrating mill, with sorting tables, and a 500' trestle with double-track gravity tram to a shipping bunker on tidewater. The Granby Co. did some prospecting on the property in 1914. Idle since.

MARBLE BAY MINE

BRITISH COLUMBIA

Owned by Tacoma Steel Co., which see.

MINNEAPOLIS & TEXADA COPPERITE CO., LTD.

BRITISH COLUMBIA

Offices: 1311 Washington Ave., N., Minneapolis, Minn., and Vananda, Texada Island, B. C.

Officers: C. F. Stremel, pres.; E. E. Rorem, 1st v. p.; John Kraft, 2nd v. p.; A. E. Barker, sec.; Wm. Bofferding, treas.; above, with Eden Schmidt, Hilmer Olson, B. F. Lafin and W. H. Curtis, directors.

Inc. in Ariz. Cap., \$1,000,000; shares \$1 par; 400,000 issued.

Property: 5 claims, 240 acres, on Texada Island, 47 miles N. W. of Vancouver, said to show 2 main veins, the Swan and the Paxton, containing copper ore with gold and silver. Paxton vein is said to be traceable 1,500' on surface. Three of properties held under lease have been purchased and paid for. Claims show good ore in 25 test shafts.

Development: 200' shaft, with 300' of drifting; also a number of test pits. On Alladin claims, shaft is being sunk to reach contact of 2 veins at 500'. Considerable mill ore extracted in this work, reported to average 4% copper, 2% lead, and \$5 per ton in gold and silver.

MOUNT SICKER & B. C. DEV. CO., LTD.

BRITISH COLUMBIA

Idle. Office: 30 George Square, Glasgow, Scotland. Fred I. Smith, chairman; John D. Steel, sec.

Inc. Oct. 20, 1898, in Great Britain. Cap., £125,000; shares £1 par. Lands are on Mt. Sicker, Vancouver Island, B. C.

NORSEMEN EXPLORATION CO.

BRITISH COLUMBIA

Office: 1048 McKnight Bldg., Minneapolis, Minn. **Mine office:** Alladin Camp, Vananda, Texada Island, B. C.

Officers: E. E. Rorem, pres.; W. H. Curtis, v. p.; C. A. McKenzie, sec.; Allen T. Rorem, treas.; B. F. Lafin, A. E. Barker and Eden Schmidt, directors; Robt. Forbes, cons. engr.; Jas. Forbes, Sr., supt.

Inc. in Arizona. Cap., \$500,000; shares \$1 par; issued, \$375,000.

Property: 23 claims, 1,200 acres, 730 patented, on Texada Island, B. C. is heavily timbered and shows contact deposits between limestone, granite and diorite. Copper occurs as chalcopyrite and bornite, with gold and silver values. The Capsheaf claim has an 80' vertical shaft, said to show 10' of ore, carrying 14% copper and \$11 in gold in samples reported as taken from surface down to 59'. Ore expected by manager to average 4% copper and \$6 gold and silver. Test shafts along the vein for several hundred feet show a continuity of the vein, and crosscutting is said to have proved it to be about 25' wide. The Cameron claim, adjoining the Texada iron mine, owned by the Puget Sound Iron Co.—on which extensive development is now in progress, has a capping of magnetic iron with large lenses of chalcopyrite. The vein is reported to be over 180' wide.

An open cut on the face of the Iron mine is 8 to 10' from the line of the Cameron claim, which rises to a height of about 170'. The Cameron is thought to average 4% copper. The Aladdin claim carried silver-lead ores. It has a 212' vertical shaft with about 250' of crosscutting. The Aladdin, De Ore, and Blizzard claims are leased to the Minneapolis & Texada Copperite Co., Ltd., which is now developing. The company's Em and Hazel Ruth claims, lie close to and are on the same vein as the Cornell mine.

Company's property runs about 4 miles along the various veins, convenient to tide water transportation and about 20 miles from a smelter. During the past year considerable prospecting has been carried on proving several new and promising veins. Management is conservative and the property considered promising.

PTARMIGAN MINES, LTD.

BRITISH COLUMBIA

Address: care H. H. Johnson, Victoria, B. C.

Property: 8 claims at 5,300' elevation, 15 miles inland from the mouth of Bear River, on Bedwell Sound, Vancouver Island. Considerable development work was contemplated on this property, but all work was suspended shortly after the outbreak of the European war.

Claims are on Big Interior mountain and show gossan outcrops underlain by chalcopyrite-magnetite ore.

QUATSINO COPPER CO.

BRITISH COLUMBIA

Dead. Succeeded 1916 by Coast Copper Co., which see.

TACOMA STEEL CO. BRITISH COLUMBIA & WASHINGTON

Office: Provident Bldg., Tacoma, Wash. **Mine offices:** Van Anda Island, B. C., and Darrington, Snohomish Co., Wash.

Officers: Joshua Pierce, pres.; E. M. Shelton, v. p.; A. Y. Eastman, sec-treas. and gen. mgr.; Alex Grant, supt.

Inc. with cap. \$5,000,000, reduced later to \$3,000,000. Paid a \$35,000 dividend April 2, 1907.

Property: a mine at Darrington carrying gold-copper ore, idle for some years, 4,000 acres of coal-bearing properties in Washington, 208 acres of iron ore lands on Redonda Island, B. C., and the Marble Bay mine, 640 acres, crown-granted, near Marble Bay harbor, at the northern end of Texada Island.

The Marble Bay mine, about one-fourth mile from the Cornell and Copper Queen mines, has ore of similar nature occurring as lenticular shoots, carrying argentiferous chalcopyrite, with bornite, in a garnetiferous marble near a contact between diorite and limestone. The mine is developed by a 1,350' three-compartment shaft, showing, on the lower levels, a vein of 18' width, with copper values unchanged and gold values gaining with depth. Recent development work mainly between the 1,200' and 1,300' levels.

Development: work in 1916 was mainly by diamond drill, boring between 13th and 15th levels at 1,160' and 1,360' vertical depth, respectively. Full descriptions of mine workings and geology will be found in Annual Rept. of Minister of Mines of British Columbia for year 1916, pp. 351-3.

Equipment: includes steam and electric power, with 5 Lidgerwood hoists, 5-drill Ingersoll-Rand, small Canadian-Rand and 10-drill Allis-Chalmers-Bullock air compressors. Buildings include a power house, machine shop and there is a wharf, on Marble Bay, having large ore bunkers, connected with the mine by a ground tram. In connection with the mine there is a limestone quarry and 4 kilns, with daily capacity of 300 bbls. of lime.

Production: shipped mainly to the Tacoma smelter, was 6,237 tons of ore, yielding 293,269 lbs. fine copper in 1907; 11,438 tons of ore, estimated to

have yielded 1,250,000 lbs. fine copper, in 1909; 22,500 tons averaging 5% copper in 1911; 17,870 tons in 1912; 12,600 tons in 1913, containing 2,216 oz. gold; 22,400 oz. silver; 1,031,009 lbs. copper.

Mine considered valuable and management good.

TYEE COPPER CO., LTD.

BRITISH COLUMBIA

Smelter and assets sold in Dec., 1916, to the Ladysmith Smelting Corporation, Ltd., which see.

Office: 80 Bishopsgate St., London, E. C.

Officers: T. H. Wilson (chairman, with J. A. D. Hancke, H. Von Berg, directors. W. Gardner, sec.

Inc. April 4, 1900, in Great Britain. Cap., £180,000, increased 1901 from £120,000; shares £1 par; fully issued and paid.

Accounts: for year ending April 30, 1916, show a debit balance of £124,098; cash, £523; debtors, £18,519; creditors, £1,985. Reserves for royalties owing, £17,333; mortgage on property, £20,000.

Dividends: 10%, or 2 shillings in 1904; 10% in 1905; 5% in 1906; 7½% in 1907; none since.

VAN ANDA COPPER & GOLD MINES CO., LTD.

B. C.

Inactive. H. W. Treat, gen. mgr., and L. Goodacre, trustees; Jas. Raper, agt., Van Anda, B. C. Company is presumably still alive, but not operating.

Property: 20 claims, crown granted, 840 acres, including the Cooper Queen and formerly the Cornell mines has been bonded from time to time to various operators who have held it for short periods. Property was under option to the Granby Cons. M. & S. Co., Ltd., in 1914, but option not exercised.

The Cornell mine has lenses of rich ore, mainly hornite, with some chalcopyrite along a diorite limestone contact. The deposit has one main ore-shoot, 150' long and 30' wide and two lesser shoots. No commercial ore has been found below the 360' level, though extensive drifting was done on the 460' level. The Copper Queen ores are similar in character and occurrence. See Texada Id., B. C., by R. G. McConnell, Geol. Survey Canada Memoir 58, 1914, pp. 56-64.

The Copper Queen shaft is 600' deep with a winze 240' deep on the 500' level.

WESTERN MINING & DEVELOPMENT CO. BRITISH COLUMBIA

An organization of Fred J. Rowland's of Spokane, Wash.

Inc. July, 1915, to take over the Yreka group, Quatsino Sound, Vancouver Is., B. C., but succumbed to infantile paralysis.

YALE DISTRICT

ARGO MINING & TUNNEL CO., LTD.

BRITISH COLUMBIA

Office and mine: Greenwood, Yale district, B. C.

Officers: Ole Lofstad, pres. and gen. mgr.; A. S. Black, sec.-treas.; preceding officers, John Williamson, Jerome McConnell and Oscar Hartman, directors.

Inc. June 10, 1909, in British Columbia. Cap., \$125,000; shares 25c par.

Lands: the Argo Mine, near the British Columbia smelter, developed by 1,150' tunnel, at a vertical depth of 500', with portal about 500' from track of the Canadian P. R. R. A vein of milling quartz, 10' wide, shows in face of tunnel, a 4' body of concentrating ore, on the foot-wall, talc. Property under development and expected to make shipments to smelter in 1916. Four men employed at last accounts.

AUFEAS MINES, LTD.

BRITISH COLUMBIA

Idle and no replies to letters sent to Hope, B. C. See Vol. XII.

MANITOBA.

The Flin-Flon Lake district attracted much attention during 1916 and 1917 because of the large size and richness of the copper deposits found there. It is situated 650 miles N. W. of Winnipeg and 90 miles N. W. of The Pas, northern Manitoba, so that transportation is expensive. Several well known American exploration companies are developing properties, but little is as yet known regarding the results of their work.

According to J. W. Callinan at the Pas, ore worth \$45,000,000 has been proved in two properties by drilling. The rocks are greenstones, conglomerates, etc., intruded by quartz-porphry dikes and masses. The ores are sulphides and carry copper, gold and silver, with some zinc.

CALUMET-CORBIN MINES CO.**MANITOBA**

Main office: 35 Congress St., Boston, Mass. **Mine office:** Gold Lake, Manitoba, Can. Wm. Bracken, pres.; J. K. Heath, v. p.; Erik Hunteker, sec.-treas.; preceding officers are the directors.

Inc. Jan. 11, 1915, in Me., as a reorganization of the Calumet-Corbin Mng. Co. **Cap.**, \$2,500,000; shares \$1 par. Paul Revere Trust Co., Boston, registrar. Shares in the old Calumet-Corbin Co. are exchangeable on certain terms for those of the new company. Listed on Boston curb.

Company has a lease on the Gold Seal and Gold Pan claims, 102 acres in Gold Lake mining district, Manitoba, Can. Free gold occurs in a vein of gray quartz, in porphyry and schist. Samples evidently not representative of the quartz as a whole, are reported to show from \$600 to \$4,880 per ton gold with no silver contents. Property is a prospect on which development work is said to have begun 1916.

It appears that the Gold Lake lease covers a swamp in which quartz is found. Such quartz exposures are known at a great many places in Western Canada, but so far as known none of them are now commercially worked.

The New Era mine near Idaho Springs, Colo.; taken under lease for \$150,000, was lost through default of semi-annual payments of \$7,500 in 1914, with local debts of \$10,000. The Montana holdings were previously abandoned.

It appears that the company has no real property and its stock represents nothing but paper whose only value is that it is saleable at about 5c per share to Curb speculators. The sponsors for the stock are apparently interested in stock dealing, not mining, and caveat emptor applies to all stock buyers.

DOMINION GOLD MINING CO.**MANITOBA**

(See Calumet-Corbin Co.) **Office:** 802 Pioneer Bldg., St. Paul, Minn.

Officers: Bernard Noon, pres.; J. P. Fetsch, v. p.-treas.; Jas. E. Liebe, sec.; with N. L. Watson and George Warner, directors.

Inc. Oct. 5, 1915, in Ariz. **Cap.**, \$2,500,000; outstanding Dec., 1915, \$1,500,000; shares \$1 par. Registrar & Transfer Co., New York, registrar and transfer agt. Cash on hand, Nov. 8, 1915, \$5,500. Listed on New York curb as a prospect. Outstanding shares, 1,500,000, used in the purchase of property. Of this amount 1,000,000 shares were set aside to be given to stockholders of the Calumet-Corbin Mines Co., of Maine, in exchange for stock of that company, received by them in exchange for stock of the old Calumet-Corbin Mining Co., of Ariz., when the reorganization was effected early in 1915. "Reason for the gift of this stock to the stockholders of the Calumet-Corbin Mines Co. is stated by those giving it to be because they feel a certain measure of responsibility for the failure of the old Calumet-Corbin Mining Co., to make good; and because their efforts to

bring it to a successful issue through its reorganization into the Calumet-Corbin Mines Co. failed." If the whole 1,000,000 shares are exchanged it will make the Dominion Gold Mining Co. a stockholder of the Calumet-Corbin Mines Co. to that extent.

Property: 6 claims, 280 acres, held by location, not contiguous, in the Gold Lake mining district, 100 miles N. E. of Winnipeg, Manitoba. Nearest P. O. is Manigotagan, at mouth of Manigotagan River, on eastern shore of Lake Winnipeg. Mine reached by boat to Manigotagan from either Selkirk on Red River, 23 miles north of Winnipeg, or from Gimil, or Icelandic Riverton, on the Gimil branch of the C. P. R. R.

The Gold Seal and Gold Pan claims, which were said to belong both to this company and to the Calumet-Corbin, are reported "abandoned 1915" at the office of the New York Curb.

The property is practically undeveloped. The country generally is covered by a swamp. Claims are said to show quartz veins "well exposed at the surface, except where covered by the swamp," and to contain considerable free gold. Management intends to do development work on the veins, ascertaining if veins and values continue to depth. Stock is a rank gamble.
GREAT SULPHIDE CO. MANITOBA

Address: D. C. Jackling, Hobart Bldg., San Francisco, Cal.

Property: the Hammill mine at Flin-Flon lake, 90 miles N. W. of The Pas, northern Manitoba. On the surface the lode is said to be 2,000' long and near the lake 300' wide, assaying in places \$10 per ton in gold, silver and 1½% copper.

Drilling in 1916-17 is said to have proved over 3,000,000 tons of \$10 ore; while 30,000,000 tons is considered a possibility, if not a probability. Water power is abundant and is an offset to expensive transportation.

MANDY MINING CO.

MANITOBA

Address: H. C. Carlisle, supt., The Pas, Manitoba, Can.

Subsidiary of the Tonopah Canadian Mines Co. (holds 85% of shares), which is controlled by Tonopah Mining Co., of Nevada, with head office at Bullitt Bldg., Philadelphia, Pa.

Property: at Schist lake, north of The Pas, Manitoba. About 20,000 tons of high-grade (20%) copper ore developed in a shoot 200' long. Shaft 100' deep. Shipments being made to Trail, B. C. Property promising with great possibilities.

NORTHERN MANITOBA MINING & DEV. CO.

MANITOBA

Controlled by Makeever Bros., New York.

Property: the Moosehorn and Rex gold claims on Herb lake, via The Pas, northern Manitoba. In August, 1917, an 80' shaft in the former had opened 30" of ore, while at 110' in the latter there was 49" of \$36 ore.

A 40-ton mill, copper plates and concentrators were being erected 1917, also 2 boilers, 55 h. p. engine, compressor and houses.

STAR LAKE GOLD MINES, LTD.

MANITOBA

Office: 509 Merchants' Bank Bldg., Winnipeg, Manitoba, Can.

Officers: W. R. Milton, pres.; J. H. Hicks, sec.; J. W. Harris, treas.; with E. R. Potter and John Smith, directors.

Inc. Nov., 1915, to purchase the property of the Penniac Gold Reef Mines, Ltd. Terms of purchase were as follows: owners agreed to take 333,333 shares of stock and to set aside 33,333 shares for development purposes. Stockholders in the Penniac Mines to receive 200,000 shares and to pay to the Star Lake \$25,000 to liquidate liabilities of old company, amounting to \$15,000, and leave a surplus for development work. Star Lake Co. agreed to have \$100,000 in treasury within 6 months from Nov., 1915, otherwise vendors could cancel agreement. 125,000 shares offered to public at \$1 par.

Cap., \$1,000,000; shares \$1 par; non-assessable; 500,000 issued. "An extraordinary 'speculative investment' is offered to the public for a limited number of 6% preferred shares at par, to be redeemed later at 15% above par," is the wording of a recent circular.

Property: 6 patented claims, 200 acres, on Star Lake, eastern Manitoba, said to show a quartz vein in a shear zone of Keewatin conglomerate near a contact between granite and schist. Vein minerals include quartz, gold-bearing pyrite and arsenopyrite. Samplers cut for 10 to 15' across the vein said to carry \$3.50 to \$5.80 per ton. The Penniac company is reported to have spent \$100,000 on development work, consisting solely of test pits and a 90' shaft, said to disclose two lodes. The main shear zone is said to be 200' wide, with two main and several lesser parallel quartz veins with strike N. 35-45° E. and dip N. W., all showing gold values in payable quantities. Property reported on by Prof. R. C. Wallace, University of Manitoba; W. H. Jeffrey, W. J. Tretheway of Toronto, and J. Tait Milliken of Colorado.

Development: by 95' shaft and 150' tunnel. Reserves estimated at 3,000,000 tons.

Equipment: includes a 5-ton mill, office and several buildings. Management plans extensive development and banks on platinum content of the ore to make large profits.

NEW BRUNSWICK.

EASTERN CANADIAN COPPER CORPORATION, LTD.

Office: 14 St. John St., Montreal, Quebec, Canada.

Officers: Howard R. Richey, pres.; E. A. Baynes, v. p.; with Chas. Brandies, A. M. Vici and E. A. Reilly, directors; A. H. Thomson, treas.; Geo. W. Dow, sec.

Inc. Dec. 28, 1915, in Ottawa. Cap., \$990,000; shares \$10 par; 30,000 shares deposited in escrow with Security Trust & Registrar Co., New York, transfer agt. and registrar, for the benefit of the company. Listed on New York Curb.

Statement of March 1, 1916, shows assets of \$990,000 mining rights in St. John Co., inclusive of buildings and equipment. Free of debt.

Property: covers 1 sq. mile, including the Vernon copper mine on the north shore of the Bay of Fundy, St. John Co., New Brunswick, reached by both the Intercolonial and C. P. R. R. to Sussex and thence by driving 32 miles to Goose Creek. Can also be reached from St. John, N. B., by boat, being 45 miles E. of St. John and 1¼ miles from Goose Creek Harbor. Holdings on a steep mountain rising 550' above the bay are said to show copper ore. Country rock is diorite, schists and slates, crossed by diabase dikes.

Development: 7 tunnels, from 50' to 170' long, said to show a quartz-calcite vein, containing bornite and chalcopyrite, 45' long where exposed in lower tunnel, 6'-10' wide, and assaying 13.4% copper; tunnel No. 4, 45' E. of No. 1, is said to show several quartz veins, "ramifications of the vein exposed in the above 3 tunnels." The other 3 tunnels are inaccessible at present.

Equipment: includes a shipping dock, blacksmith shop and quarters for the men, but little mining equipment.

Company was planning to renew development work in 1916 with the object of attaining "an average daily output of 100 tons of ore," a feat which was not accomplished, we assume. No later information.

INTERCOLONIAL COPPER CO.

NEW BRUNSWICK

Office: P. O. Box 294, Pawtucket, R. I. **Mine office:** Dorchester, Westmoreland Co., N. B.

Officers: Darius L. Goff, pres.; T. J. Edwards, sec.; F. J. Powers, treas. Inc. 1899 in Arizona. **Cap.**, decreased, 1906, to \$2,000,000, shares \$5 par, in preferred and common shares, latter with restricted voting privileges.

Property: 250 acres freehold and 1,100 acres held by leasehold from the Crown, show a blanket vein carrying carbonate and sulphide ores, claimed to average 3 to 4% copper. Has shafts of 40', 75' and 150', also a 1,500' drainage tunnel, with about 8,000' of underground workings.

Works include a 200-ton concentrator, leaching plant and electrolytic refinery. The electrolytic plant has 550 lead cathodes and 550 lead anodes, 22x33" each, giving a plating surface of 5,000 sq. ft., for the deposition of electrolytic copper. Plant also includes tanks for precipitation of metal on scrap iron. Reduction plant proved unsatisfactory after making about 50 tons fine copper.

In 1916 the property was leased to the National Chemical Co. (F. B. Homer, treas.), 248 Mt. Vernon St., West Newton, Mass. Lessee is erecting a flotation plant under direction of W. E. Greenawalt, of Denver. The mine is reported to be in better condition than for years and was producing 50 tons of 3% ore per day in July, 1917. Lessee supplied money needed and gives half the profits to the lessor.

NOVA SCOTIA.

BRADFORD MINES, LTD.

NOVA SCOTIA

Halifax, Nova Scotia.

Officers: E. F. Heffler, pres.; A. E. Abrams, v. p.; W. C. Milner, sec-treas.; with Paul Sigel, Jr., 37 Wall St., New York, and G. J. Partington, Halifax, directors.

Inc. Oct. 3, 1914, in Nova Scotia. **Cap.**, \$500,000; shares \$1 par; outstanding, 440,000 shares. Transfer office and registrar, Security Reg. & Transfer Co., New York. Listed on New York Curb.

Property: at Sheet Harbor and Tangier, Nova Scotia, contains ore with gold and silver values.

CAPE BRETON COPPER CO., LTD.

NOVA SCOTIA

Mine near Coxheath, Cape Breton Co., N. S.

Cap., \$2,000,000.

Property: the old Coxheath mine and adjoining lands, 10 miles from Sidney, Cape Breton, shows several cupriferous veins, of which the principal, averaging 10' width, traverses felsite and diorite, carrying argentiferous and auriferous chalcopryrite, in a silicious gangue, ore averaging about 4.5% copper. Deepest shaft, 420'. Idle many years.

CHETICAMP COPPER CO., LTD.

NOVA SCOTIA

Idle. **Office:** 37 Sackville St., Halifax, N. S. **Mine office:** Cheticamp, Inverness Co., N. S.

Officers: Edward Staris, pres.; John W. Regan, sec.-treas.; Milton V. Grandin, supt., at last accounts.

Inc. May, 1904, in Nova Scotia. **Cap.**, \$3,000,000; shares \$1 par, as a merger of the Eastern National Copper Co., Ltd., and 3 other corporations.

Property: 950 acres, freehold, also a 200-acre mill and smelter site, 1,000 acres timber lands, and 200 acres water frontage, with a government license for exploring and locating mines on 50 sq. miles.

Property shows a mineralized zone, in micaceous schist, of 350' width, traceable 1½ miles, carrying 4 orebodies, of which 3 are developed by a 200' shaft and by tunnels of 25', 35' and 115', claimed by company to show 250,000 tons of exclusively sulphide ore, averaging 2.5 to 3.5% copper, 18% lead, 80 oz. silver and \$2 to \$30 gold per ton. Nearest railroad is 38 miles, but

mine is 5 to 6 miles only from tidewater. Property considered promising, though estimates of tonnage and values are excessive.

DOMINION MINING CO.

NOVA SCOTIA

Tangier, Halifax Co., N. S. W. J. Prinsk, mgr. Company owns a gold mine at Tangier. Production, 1914, amounted to 419 tons ore, yielding 57 oz. gold.

GOLDENVILLE CONSOLIDATED MINING CO., LTD.

NOVA SCOTIA

Agency: 185 Summer St., Boston, Mass. **Mine office:** Goldenville, Guysboro Co., N. S., Can.

Officers: D. E. Makepeace, pres.; D. S. Howard, v. p.; E. B. Estes, sec.; J. A. Floyd, treas.; foregoing, with A. C. Post, J. A. Sherman, W. E. Bremner, G. F. Rooke, G. A. Bridges and H. N. Wright, directors.

Inc. June 16, 1916, in Nova Scotia, as a reorganization of the Goldenville Mining Co., Ltd. **Cap.**, \$2,400,000; shares \$1 par; 2,000,000 outstanding. Bonds authorized, \$60,000; \$32,000 outstanding.

Property: 501 acres on St. Mary's river, Goldenville, N. S., said to show narrow quartz veins in quartzite, with E.-W. course. Pay ore occurs both as shoots and streaks. Gold is coarse.

Development: by vertical and incline shafts to 750' depth. Workings total 5,200'.

Equipment: 50 h. p. electric hoist, 1,000 cu. ft. compressor, turbo-pump, 40 stamps (20 dropping) using amalgamation. Seems a promising mine, but results are withheld.

Production: 41,854 tons to 1917. No yield given, but recovery is 90%.

GOLDENVILLE MINING CO., LTD.

NOVA SCOTIA

Reorganized in 1916 as the Goldenville Consolidated Mining Co., Ltd., which see.

GREAT BRAS D'OR MINING CO.

NOVA SCOTIA

Baddeck, Victoria Co., N. S. **Mine office:** Middle River, Victoria Co., N. S. D. J. Patriquin, mgr. Operates a gold mine. Last production reported was 775 tons ore, yielding 262 oz. gold.

LAKE COPPER MINING CO., LTD.

NOVA SCOTIA

Idle. Office: care Dr. H. Mackay, New Glasgow, N. S. **Mine office:** Polson's Brook, Antigonishe Co., N. S. A. G. Baillie, gen. agt.

Inc. Jan., 1908. **Cap.**, \$2,500,000; shares \$1 par.

Property: 6,400 acres, on Polson lake, said to show a vein 5' thick, traceable a mile and carrying auriferous and argentiferous copper ore. Mine has a 103' shaft with 554' of workings.

LOON BROOK MINING CO., LTD.

NOVA SCOTIA

Office: 1 Leys Ave., Letchworth, Herts, Eng. **Mine office:** Montague, N. S. E. Romilly Smith, mgr.

Operating a gold property and 10-stamp mill with cyanide unit in Montague district, N. S.

Production: for year ending Sept. 30, 1914, was 118 tons of ore, which yielded 400 oz. gold.

No recent returns.

TOMMY BURNS GOLD MINES, LTD.

NOVA SCOTIA

Controlled and operated by Tommy Burns Gold Mining Co., which see. Was a promotion of Pope and Cheppu, who failed, 1917.

Property: 134 acres, ½ mile from Brookfield, the nearest R. R. station, said to show a fissure vein, 2½-3½' wide, running E.-W., with dip 30°, and traceable at surface for 900'.

Development: by 108' shaft, sunk on the vein and drifts on the 50' and 100' levels.

Equipment: includes a 5-stamp mill, boiler, hoist and pump. A pleasing prospect.

According to T. A. Rickard, who made a report on the gold deposits of Nova Scotia for the provincial government, none of the Nova Scotia gold deposits can be relied upon to carry their values to any great depth.

WENTWORTH COPPER CO., LTD.

NOVA SCOTIA

Idle. **Address:** Wentworth, Cumberland Co., N. S.

Inc. 1907, to acquire lands, bought at foreclosure sale, of the Cumberland Copper Co. Company apparently holds property for speculation purposes as no work has been done since purchase.

WEST GORE ANTIMONY CO.

NOVA SCOTIA

Address: N. O. Carpenter, mgr., West Gore, N. S.

Property: the Rawdon mine, opened 1884, worked intermittently until Oct., 1914, and regularly since then. Company is closely allied with the St. Helen's Smelting Co., Manchester, England, which refines the product.

The main deposit is up to 4' wide and has been opened for 200' on one level. The ore consists of stibnite and native antimony, associated with pyrite, quartz and calcite. Country rock is a soft slate.

Development: by shafts, the main one, 502' deep, with a 332' winze below this level.

Production: about 1,200 tons of ore monthly, yielding 110 tons of concentrates containing 38 to 45% antimony.

ONTARIO

This section includes the Ontario mining companies of Algoma, Massey and other districts. Cobalt, Porcupine and Sudbury districts are grouped in separate sections immediately following this one.

ALEXO MINES, LTD.

ONTARIO

Address: Porquois Junction, Ontario.

Officers: Maj. E. F. Pullen, pres.; G. F. Hanning, v. p.; H. N. Roberts, sec.-treas., with Capt. Frank Pullen, Alex. Kelso, Maj. C. W. Allen, directors. Wm. Anderson, mgr.

Inc. Jan. 3, 1913, in Ontario. **Cap.**, \$40,000; shares \$1 par; 30,005 shares issued.

Property: the Alexo mine, in Dundonald twp., Timiskaming district, discovered in 1908 and active work starting in 1912. The ore, a nickeliferous pyrrhotite, averages 4% nickel and is shipped to the Mond Nickel Company's smelter.

Development: by 200' shaft, crosscuts and drifts.

Production begun in 1913, amounted to 8,288 tons in 1916, totaling to date, 34,650 tons. About 20 men employed.

ALGOMA CUSTOM SMELTING & REFINING CO., LTD. **ONTARIO**

Idle several years. **Works office:** Thessalon, Algoma, Ont. See Vol. XI, Copper Handbook.

ALGOMA STEEL CORPORATION

ONTARIO

Subsidiary of the Lake Superior Corporation.

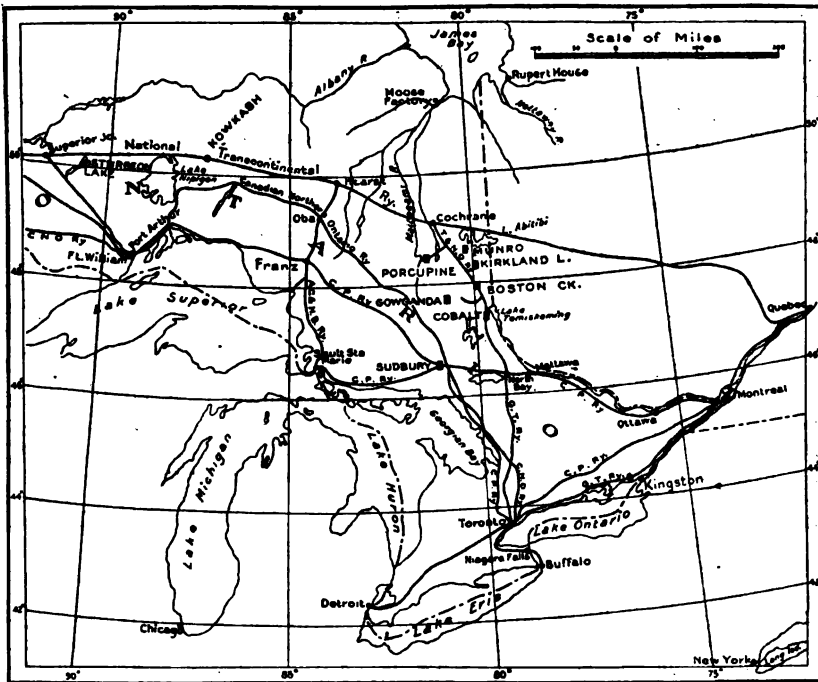
Gen. office: Sault Ste. Marie, Ont. **Secretary's office:** Traders' Bank Bldg., Toronto, Ont. J. Frater Taylor, pres. and gen. mgr.; Chas. E. Duncan, gen. supt.

Property: the Helen and Magpie iron mines, old producers, at Michipicoten, Ont., with blast furnaces at Sault Ste. Marie. The Helen, opened in 1899 and developed to vertical depth of 641', is a steady producer of iron ore, which occurs as goethite with some hematite.

The Magpie, opened up in 1911, is developed by a 4-compartment shaft to depth of 250', with main levels at 125' and 205'. The orebody, mainly

siderite, is said to be 50' wide over a distance of 1,500' and when roasted makes a fair Bessemer ore.

Production: at the Magpie, 208,163 gross tons in 1916, with total production since 1913 of 424,816 tons; at the Helen, 85,241 gross tons iron ore and 6,624 gross tons pyrites in 1916, with total shipments since 1900 amounting to 2,409,971 gross tons iron ore and 40,690 gross tons pyrites. The Helen high-grade sulphur ore is mixed with Magpie raw ore and roasted, product being a very desirable Bessemer ore, which runs 52% iron and 0.044 phosphorus. Employs about 250 men when working to capacity.



MAP SHOWING MINING DISTRICTS OF ONTARIO

ALLIE ISLAND COPPER MINE.

ONTARIO

Office: 225 Water St., Kenora, Ont., Can. Owned by F. W. Moore et al.

Property: 4 claims, the S 777, K 312, K 314 and K 315, 156.64 acres in all, at the east end of Allie Island, about 15 miles from Kenora.

Geology: claims cover an outcrop of serpentine, or chlorite-schist, carrying small pellets or crystals of native copper. Country rock is dolomite, altered traps and greenstones. Ore body claimed to be ½ mile long with a maximum width of 700'.

Development: is surficial only, 40' and 20' pit holes, showing ore in bottom. Ore said to average 1½% copper. Owners plan development work.

BOSTON-PARRY SOUND COPPER CO.

ONTARIO

Mine office: Parry Sound, Parry Sound district, Ont. Inc. June, 1908, in Maine. Cap., \$1,000,000; shares \$1 par.

Property: 200 acres, in the vicinity of the Willcox and McGowan

mines. Idle some years, but owners are well-to-do and expect to reopen property some day. Is a close corporation.

BRANT MINES, LTD.**ONTARIO**

Address: W. M. Macdonald, mgr., Gowganda, Ontario.

Officers: J. C. Cohoe, pres.; E. L. Goold, v. p.; O. Hall, sec.-treas., with F. L. Mapes, W. H. Whittaker, C. W. Leeming and C. H. Waterous, directors.

Inc. 1917, in Ontario. **Cap.**, \$1,500,000; shares \$1 par; 1,000,000 issued.

Property: 87 acres, formerly owned by the Mapes-Johnston Silver Mines Co., in Meickle township, in Silver Lake district, and near the Miller Lake-O'Brien mine.

Development: by new 350' shaft and other workings. On 320' level, ore assaying 2,000 oz. silver per ton was reported as being mined. A car-load of rich ore was to be shipped as soon as possible.

Equipment: includes hoist, compressor, machine-drills, and accessories. Shares quoted at 57c early in Nov., 1917.

BRUCE MINES, LTD.**ONTARIO**

Dead. Mines sold to Mond Nickel Co. in 1915.

CALUMET & ALGOMA MINING CO.**ONTARIO**

Secretary's address: Lucas Hermann, 109 Fifth St., Calumet, Mich. Mine near Massey, Algoma, Ont.

Officers: Christian Schenck, pres.; Jos. Vertin, v. p.; Lucas Hermann, treas.

Inc. 1905. **Cap.**, \$1,000,000; shares \$5 par, assessable; issued, \$100,000, paid in, \$1.75. Was a reconstruction of the Copper Queen Mining Co., Ltd. At last accounts had no debts, with \$600 in the treasury.

Property: 957 acres, freehold, shows a 45' fissure vein, traceable about 3 miles, carrying medium-grade chalcopryite ore, more or less auriferous, with occasional bornite and malachite, giving assays of 5 to 25% copper. Has 2 shafts, No. 1 being 138' deep, and 2 tunnels, longest 195'. Lands are heavily timbered and well watered. Idle several years.

CANADIAN EXPLORATION CO.**ONTARIO**

Offices: 28 Victoria Sq., Montreal, and Naughton, Ont.

Officers: Geo. E. Drummond, managing director; R. W. Brigstocke, supt.

Property: Long Lake gold mine, near Naughton, Ont. Orebody consists of an elliptical mass of quartzite, carrying considerable mispickel and pyrite with gold values.

Development: 225' shaft with levels at 80 and 180', and development below the 180' by means of a winze.

Equipment: 20-stamp mill, daily capacity 120 tons, cyanide plant, and compressor and steam-power. Employs about 100 men.

Production: 5,800 oz. gold in 1913; has been operating since, but production figures not available. Present method of treatment said to have increased profits.

CANADIAN SMELTING & REFINING CO.**ONTARIO**

Office: Orillia, Ont.

Officers: J. B. Tudhope, pres.; Geo. Hayward, treas.; W. L. Vail, sec.; M. B. Scott, metallurgist; C. Doolittle, supt.

Inc. Oct., 1914, in Canada, and took over the assets of the Canada Ref. & Sm. Co.

Works at Orillia have been partially rebuilt and an additional blast furnace added. Capacity of the cobalt refining department has been increased to 2 tons of oxide per day. Products shipped are refined silver and arsenic, and the oxides of cobalt and nickel. Company employs 75 men.

CART LAKE SILVER MINES, LTD.

ONTARIO

Operated the Gould lease on Cart Lake during 1914 with a production of 150,000 oz. silver. Production for 1915 not available. Ore came from the extension of the Seneca-Superior vein.

Development: in 1914 amounted to 1,003'. No. 2 shaft is 195' deep with 400' of workings on the 185' level, at last accounts.

CHENEY COPPER CO., LTD.

ONTARIO

Office: 5-7-9 Melinda St., Toronto, Ont.

Officers: D. M. Robertson, pres.; R. P. Gouch, v. p.; G. Taylor, sec-treas.; preceding with J. S. King, G. P. McCallum, J. L. Coffee and G. Waldron, directors, all of Toronto.

Inc. in Ontario. Cap., \$2,000,000; shares \$1 par, fully paid and non-assessable. No bonds. Security Transfer & Registrar Co., 66 Broadway, New York City, registrar and transfer agent.

Property: 700 acres, of which 400 are held by Crown patent and the balance under Mines Act of Ontario, 28 miles from Thessalon, Ont., on C. P. railway and 40 miles east of Sault Ste. Marie.

Geology: Lands show a series of three parallel veins exposed by outcrops, trenches and open cut for 1½ miles, with width of 4' to 12'. Strike is north 16° west with dip of 75° to south. Veins are mostly quartz with pockets or lenses of specular iron, iron pyrites and copper minerals.

Development: by a 105' shaft and crosscuts and surface pits.

A promotion by a firm of New York brokers whose extravagant statements about the property are at variance with the facts given by their consulting engineer.

COLUMBIA COPPER MINING CO.

ONTARIO

Idle. Office: 510 Chamber of Commerce, Detroit, Mich. Mine near Parry Sound, Ont.

Officers: Dr. A. H. Côté, pres.; Dean S. Fleming, v. p.; S. S. Southerland, sec.; Dr. W. P. Dick, treas.; Alex. Dick, cons. engr.

Cap., \$3,000,000; shares \$1 par, non-assessable. Authorized, 1910, a \$10,000 bond issue.

Lands: 200 acres, adjoin the McGowan claim of the Parry South Copper Co., 1 to 2 miles from Parry Sound.

CONSOLIDATED COPPER CO. OF PARRY SOUND.

ONTARIO

Office: 705 Palladio Bldg., Duluth, Minn. **Mine office:** Parry Sound, Parry Sound district, Ont.

Officers: Robt. Forbes, pres.; Robt. Millard, v. p.; J. G. Harris, sec-treas.; preceding, with A. C. Le Richeux, Frank Cox, E. E. Rorem, Dr. J. D. Budd and C. J. Jackes, directors.

Inc. Feb., 1902, in Ontario. Cap., \$5,000,000; shares \$1 par; issued, about \$3,100,000. No stock for sale.

Lands: 1,500 acres, patented, carry considerable standing timber, in Foley, McDougall, Hagerman and Cowper townships. Part of property formerly was held by Hattie Belle Gold, Copper & Nickel Co. and the Valentine Mica Mining Co.

Ores: occur as contact deposits between slate and quartzite, and as fahlbands, ore being mainly chalcopyrite, with occasional bornite and chalcocite, mainly low in grade, but with occasional seams of high-grade ore. There are 18 different orebodies, shown by test pits and stripping, of which 4 are somewhat developed. The fahlbands are said to show a width of more than 1,000', carrying 7 bands of fairly good ore, of 200' estimated aggregate width, between which is low-grade ore, part of which may be amenable to concentration. Ores assay 1.5 to 12% copper, 3 oz. silver, and from a few cents up to \$8 gold per ton.

Development: by 180' vertical shaft, and about 25 pits of 10 to 100' depth. The Spider Lake mine has a shaft house, and steam hoist good for 500', with necessary mine buildings. A considerable orebody has been exposed by trenching.

The Lefex mine, about 220 acres, has shafts of 90' and 40', showing nothing of particular promise. The Lefex has an iron gossan, carrying up to 2% copper and \$2 to \$3 gold per ton. A 600-lb. test shipment, from the 65' level, returned 30% copper, and various samples have shown from 1.5 to 3% nickel, and from nothing to \$20 gold per ton. Property is now under option for development.

The land situated in the township of McDougall, Ont., has been sold to an operating company, the consolidated company retaining a large interest. Shipments of mica are expected to be made in 1917.

CORDOVA MINES, LTD.

ONTARIO

Office: Sun Life Bldg., Toronto, Ont., Canada. **Mine office:** Cordova Mines, Peterboro Co., Ont.

Officers: P. Kirkegaard, pres.; Wm. H. Price, v. p.-treas.; Edw. Willan, sec.; with C. M. Kirkegaard and M. Garvey, directors.

Inc. 1911, in Ontario. **Cap.,** \$500,000; shares \$5; \$50,000 in treasury. Company is operated as a close corporation.

Property: 678 acres, owned in fee simple, in Belmont Twp., Peterboro county. Ore occurs in diorite in veins, said to be from 4'-30' wide and from 50'-400' long, carrying quartz, calcite and iron sulphides.

Development: shafts of 160', 400' and 500' depth, with a total of 6,000' of underground workings.

Equipment: the rock and shaft houses and the mill were wiped out by fire, March, 1917. Buildings for a counter current decantation cyanide plant are being built. Ore is said to be well adapted to that process; two 1,500' compressors, hydro-electric power plant developing 900 h. p., pumps and 1,800' tramway. Power plant was enlarged in spring of 1916. Company has no appreciable ore reserve.

DELORO SMELTING & REFINING CO., LTD.

ONTARIO

Deloro, Ont., Can. Toronto office, C. P. R. Bldg.

Officers: M. J. O'Brien, pres.; Thos. Southworth, v. p.; S. B. Wright, gen. mgr.; S. F. Kirkpatrick, cons. metallurgist; F. A. Bapty, sec.-treas.

Company is the successor, 1917, of the Deloro Mng. & Reduction Co., with same officers and management.

Owns a smelting plant and refinery at Deloro. Output consists of bar silver, arsenic, nickel oxide and metal, cobalt oxide and metal. Also manufactures "stellite," a high-speed cutting metal.

Company aims to finish all products at the Deloro plant. Employs about 250 men.

DOMINION MOLYBDENITE CO.

ONTARIO

Address: Wilberforce, Ont.

Organized by J. J. Gray, W. J. L. MacKay, P. J. Dwyer and Dr. Lowrey.

Property: at Wilberforce, Ont. Reported in August, 1917, that development had exposed a large deposit of molybdenite, for which a mill is being erected.

GALETTA MINE

ONTARIO

See James Robertson, Ltd.

HERMINA MINING CO.

ONTARIO

Office: 109 5th St., Calumet, Mich. **Mine office:** Massey, Ontario, Canada.

Officers: Edw. J. Hall, pres.; Chas. Schenk, v. p.; Lucas Hermann,

sec.; W. B. Anderson, treas.; preceding, with Ole Olson, Frank Schroeder, Paul Tritschler, J. S. Pickell and T. H. Pollack, directors.

Inc. June, 1903, in Ontario. **Cap.**, \$2,500,000; shares \$12.50 par; \$8 paid and \$4.50 assessable. Total assessments to date, \$2.35 per share; 71,000 shares issued. Annual meeting, fourth Tuesday in June.

Property: 1,040 acres near Massey, Ont., on which shafts were sunk and ore developed. In 1910 company extracted small quantities of copper, but has been idle since then.

HURONIAN BELT CO., LTD.

ONTARIO

Office: 310 Dominion Express Bldg., Montreal, Canada.

Officers: F. H. Hamilton, chairman; with E. Turk, E. T. McCarthy, H. B. Hooper, directors.

Inc. March, 1914, in Ontario. **Cap.**, £200,000. Company acquired, in 1914, all the interests of the Huronian Belt Syndicate, Ltd.; controls the North Thompson Gold Mine, Ltd. Also has claims in Northern Ontario and near Great Slave Lake.

The Siberian Syndicate, Ltd., of England, has a substantial holding in this company and in a report states that over 100,000 tons of ore has been developed to No. 5 level in its Porcupine property.

INTERNATIONAL MOLYBDENITE CO., LTD.

ONTARIO

Address: J. L. Murray, Renfrew, Ont., pres.; G. P. Grant, mgr.

Has a mine and 100-ton plant for concentrating molybdenum-bearing ore near Renfrew; also a refinery at Orillia for making molybdenum compounds. Electric furnaces are used.

Production: in 1916, was 24 tons of molybdenite from 2,350 tons of ore, which averaged 1.3% MoS₃.

JAMES ROBERTSON, LTD.

ONTARIO

Address: Montreal, Can.

Mine at Galetta, Ont.

Owns the Galetta or Kingdon lead mine on Chats Island, in the Ottawa river, 5 miles E. of Arnprior, Ont. Mine shows a 10' fissure vein in a fault in schistose rocks. The ore consists of galena, disseminated in clusters and crystal aggregates in crystalline calcite and barite.

Developed: by two shafts, 1,000' apart.

Property: has a concentrating mill and a small lead smelter blown in October, 1916, and turning out 15 tons of lead daily. (See W. E. Newman, Lead Mining & Smelting at Galetta, Ont., Trans. A. I. M. E., Oct., 1917.)

KENYON COPPER MINES, LTD.

ONTARIO

Address: Massey, via Sudbury, Ont.

Property: the Massey mine, discovered in 1900, was equipped with an Elmore flotation plant, which was unsuitable. Mine acquired from the Massey Station Mining Co. and reopened in 1917, and Callow flotation plant started in July. Daily capacity of mill, 200 tons.

Geology: an area of quartzitic greenstone tuff schists, in contact with gneiss and granite. Ore contains chalcopyrite with pyrite, magnetite and specularite, in white, milky quartz, and occurs in a sheer zone parallel to the schists.

Development: to 530' depth. At 3 places No. 1 shaft is 76° incline and has 7 levels, showing step-faulting of surface. Vein changes to one straight body at depth. Ore is 4' wide, averaging 3½% copper for all workings.

KING EDWARD MINE

ONTARIO

Owned by J. S. Dobie and Mary C. Dobie, Thessalon, Ont.

Property: 1,000 acres, patented, in Rose Township, includes Sec. 14 and

part of 11 and 24. Openings on areas are a mile apart. The two properties, King Edward and Canada Verdi, adjoin, and are a mile long. The latter claim shows a 16' vein, said to be traceable 2 miles, in diabase; it has steep southerly dip, and carries ore streaks, one 3' thick showing 3% copper and 2 oz. gold. Examined 1915 by C. G. Bateman and C. Rollins.

Development: by shaft and numerous shallow pits. Was under option to King Edward Mining Co. Idle in 1916.

MAPES-JOHNSTON SILVER MINES CO. ONTARIO

Property acquired late in 1917 by Brant Mines, Ltd., which see.

MASSEY STATION MINING CO., LTD. ONTARIO

Office: 801 Dominion Bank Bldg., Toronto. Mine near Massey, Ont.

Officers: Wallace Nesbitt, pres.; S. H. P. Pell, v. p.; Britton Osler, sec.; preceding, with Robt. Means Thompson and Miss I. M. Innes, directors.

Inc. April 24, 1901, in Ontario. **Cap.,** \$300,000; shares \$100 par; non-assessable; fully issued. Company is said to have expended about \$300,000 on development and equipment.

Property: 840 acres, crown granted, including 480 acres timber land, in Salter township, Sudbury district, about 3 miles from a railway. Lands show schist and quartzite carrying lenticular orebodies in E.-W. zones with 75° dip. There are 3 parallel lenses, 2 developed averaging 10' in width in an ore zone traceable about a mile. Ore carries finely disseminated chalcocite and gray copper ores in quartzose gangue changing in depth to bornite, and that in turn to chalcopyrite, estimated by management to average 3 to 5% copper and \$1 to \$2 gold per ton, with about 50,000 tons in sight.

Geology: described by F. C. Lincoln in Eng. & Min. Jour. of Aug. 4, 1917.

Development: by a 600' shaft and 150' tunnel.

Equipment: includes a 200 h. p. steam and electric plant, with 2 Lidgerwood hoists, a 6-drill compressor and 15 buildings.

The ore not being adapted to wet concentration, owing to excessive sliming, a 50-ton experimental mill was built, using the Elmore vacuum oil flotation process, with Blake and centrifugal crushers and 3 Jenckes and Wilfley tables. Property closed down in 1909 owing to failure of mill to make expenses.

Property was acquired by the Kenyon Copper Mines, Ltd. (which see), at the beginning of 1917. An experimental Callow flotation unit is being tried out, and company contemplates installation of a larger plant, hydro-electric power.

METALS CHEMICAL, LTD. ONTARIO

Address: Welland, Ont. J. H. Charles, mgr.

Operates a plant for the treatment of cobalt ores, near Welland.

Equipment: includes two blast furnaces, two roasting furnaces, one reverberatory furnace, 22 leaching vats, 12 filter-presses, one crystallizing plant, 2 bag-houses. Electric power is used. Company employs 85 men. Output is silver, arsenic, oxides of cobalt and nickel, and various cobalt and nickel salts.

METALS MNG. CO. ONTARIO

See Sheldon Mng. Co.

MILLER LAKE O'BRIEN MINE ONTARIO

K. D. Woodworth, mgr., Gowganda, Ont. Is a privately owned property and has been one of the leading silver producers in the Gowganda district. Vein said to be 10' wide and to contain five 5" streaks assaying 3,000 oz. silver per ton. Developed by shafts; No. 2, the deepest, 450', at last accounts.

Equipment: includes hoists, 20-drill compressor, and a mill; a hydro-electric plant between Gowganda and Burke Lakes is equipped with 2 turbines and a 900 h. p. generator.

Production: 52 tons of high-grade ore in June, 1917.

Considerable ore reported blocked out in 1916.

NICHOLS CHEMICAL CO., LTD.

ONTARIO

Subsidiary of General Chemical Co.

Office: 222 St. James St., Montreal, Canada.

Officers: E. S. Pincott, mgr.; H. V. Smythe, mine supt.

Property: the Northern Pyrites mine on Vermillion Lake at North Pines, Ont., Canada, shows veins averaging 45' in width for 1,000' in length, with strike N. E. and dip 55° N. W. Mine said to have the largest pyrite deposit under development in Canada.

Equipment: includes 2-mile Leschen aerial tramway, Lambert hoist, compressor and concentrating mill. Shipments to the United States are made via Graham on the Grand Trunk Pacific R. R. and the Great Lakes. Employs 130 men. Company does not publish financial or statistical reports. Property reported on by Walter Harvey Weed.

Output in 1915 was about 95,000 tons of pyrite.

NORTHERN PYRITES CO.

ONTARIO

Property owned by the Nichols Chemical Co., which see.

ORE CHIMNEY MINING CO., LTD.

ONTARIO

Office: 100 Clyde Block, Hamilton, Ont. **Mine office:** Northbrook, Frontenac Co., Ont.

Officers: A. E. Fletcher, pres.; F. E. Misener, v. p.; O. E. Dores, sec-treas.; preceding, with C. H. Siple, Capt. W. D. McClinton, H. A. Baldwin, R. W. Thomas, Chas. Zinn and S. A. Fletcher, directors. W. G. Anderson, gen. mgr.

Inc. Oct. 11, 1909, in Ontario. **Cap.**, \$600,000; shares 40c par; non-assessable. Annual meeting, last Tuesday in October. The property was bought of the president for 850,000 shares of stock.

Property: 500 acres, in the Eastern Ontario mining district, 50 miles from Kingston and about 11 miles from Kaladar, the nearest C. P. R. R. station. Claims show conglomerate, quartzite and schist, and are reported by the management to have a vertical interbedded, jasper vein, the so-called "iron formation" 2' to 18' wide on the surface, with hornblende (amphibolite) schist on the hanging to N. E. and conglomerate and quartzite to S. E., and a basaltic footwall.

The vein shows gold and silver values in an ore carrying galena and chalcopyrite.

Development: by 403' shaft, with total workings of 2,000'. Crosscut at 400' is reported to have disclosed a vein of sulphide ore carrying galena.

Equipment: includes three 100 h. p. tubular boilers, two 1,000 cu. ft. compressors, a hoist, 20-stamp mill with amalgamating plates, tables and a magnetic separator. The mill capacity is about 200 tons a day. Company expected to start milling in Autumn of 1917.

ORE EXTENSION MINING CO., LTD.

ONTARIO

Vineland, Ont., Canada.

Officers: David Fretz, pres.-mgr.; S. Spiece, v. p.; Geo. Laws, sec-treas., with J. O. Moore and S. R. Lupton, directors.

Inc. Nov. 1, 1913, in Ontario. **Cap.**, \$1,500,000; shares 50c par.

Transfer office: 354 Hudson St., Buffalo, N. Y. Annual meeting, 2nd Thursday in January.

Property: 167 acres at Northbrook, Lennox and Addington counties, Ontario, said to show gold-silver-lead-zinc-copper ore, in six veins, from a

few feet to 40' wide, in diorite and schist. Developed by a 2-compartment shaft 53' deep. Work retarded owing to lack of working funds. A prospect.

PARRY SOUND COPPER MINING CO., LTD.

ONTARIO

Office: 500 Germania Life Bldg., St. Paul, Minn. Mine office: Parry Sound, Ont.

Officers: Frank Johnson, pres.; Otto Monson, sec.-treas.; preceding, with John Ogren, A. Linderholm and F. X. Benning, directors.

Inc. March 23, 1899, in Ontario. Cap., \$5,000,000; shares \$1 par; issued, \$4,500,000. Liabilities are given at \$45,000 floating indebtedness, and a \$3,000 mortgage at 6% on 200 acres of land. Annual meeting, second Tuesday in August.

Property: 10 claims, 1,000 acres, one-half freehold and one-fifth held subject to a \$3,000 mortgage, on the eastern shore of Georgian bay, property including the McGowan and Wilcox mines.

The Wilcox mine has outcroppings of 4 parallel veins in a width of about a quarter mile, with a 145' shaft on a 20' vein in granite-gneiss, traceable 1,000', carrying auriferous and argentiferous bornite, assaying 2.8 to 11% copper. There also is an open-cut, 20x150', 18' deep, showing 3% chalcopryrite.

The McGowan mine has shafts of 100', 100' and 250', and a 150' crosscut tunnel, showing bornite and occasional chalcopryrite, with quartz gangue. A smelter shipment of 240 tons of selected ore returned 17% copper and \$5 per ton in combined gold and silver values.

Equipment: includes a 10-stamp mill, hoisting machinery and several buildings. Idle, but management plans further work.

Reported to have sold the Wilcox mine, Sept., 1917, for \$30,000.

SUPERIOR COPPER CO., LTD.

ONTARIO

Idle. Office: Sault Ste. Marie, Ont. Mine office: Superior Mine, via Algoma Central Railway, Algoma, Ont.

Officers: G. R. Nicholson, pres.; C. H. L. Jones, v. p.; Emory W. Clark, sec. and treas., with E. L. Fisher, Capt. John Mitchell, Geo. T. Arnold, J. W. Staley, Geo. Kemp and Capt. Benj. Boutell, directors.

Inc. Sept. 13, 1901, in Ontario. Cap., \$3,000,000; originally \$1,500,000; increased, 1903, to \$2,000,000, and again July 29, 1907; shares \$10 par; issued, \$2,402,160. The company was organized with non-assessable stock, but a special act of the provincial parliament of Ontario rendered the stock assessable. Total assessments to Dec. 31, 1910, were \$132,080.52. Security Trust Co., Detroit, registrar and transfer agent. Annual meeting, second Thursday in June.

Property: 11 claims, crown granted, 800 acres, in an unorganized mining district of Algoma, shows granite and chloritic schist carrying fissure veins of 10' and 70' estimated average widths, traceable 7,000'. The quartz veins carry chalcopryrite with a little chalcocite, estimated by the management to average 4% copper, 1 oz. silver and 40c gold per ton.

Development: amounting to 1,233', includes a 400' shaft and 949' tunnel with 5 shallow shafts, a 189' tunnel and many surface cuts.

Mine is reported to show 4,000' tons of ore on the dump, with 140,000 blocked out, apparently a serious over-estimate.

Equipment: includes, a 150 h. p. steam plant, 12-drill compressor engine house, changing house, boarding house, machine shop, smithy, office, store and dwellings, and a 50-ton concentrator.

The mine has been idle since Dec., 1908.

TIP TOP MINE

ONTARIO

Col. S. W. Ray, owner, Port Arthur, Ont. Mine near Kashaboiwe. Thunder Bay district, Ont.

Property: 4 claims, freehold, 336 acres, locations K62, K63, K64 and K65, 6 miles by rail S. W. of Kashaboiwe station, Canadian Northern railway. The claims are near Round Lake, near Moss Twp., and show schist, greenstone and quartz porphyry of Keewatin age, with folded quartzite cut by quartz porphyry dikes. The ore occurs disseminated in dikes of flesh-colored felsite and quartz porphyry. There are several lenses of this chalcopyrite and pyrite ore, stoped for 8 to 25' wide and 70' long, giving average assays of 7% copper, 5 to 12 oz. silver and \$1 to \$2 gold per ton.

Development: by a main incline shaft, dipping 70° N. of 208' depth, with about 900' of workings, on 4 levels, about 190' of drifting on each level. This work is estimated to show 45,000 tons of ore, of 4 to 6% copper, on a vein ranging up to 60' width.

Equipment: includes a 150 h. p. steam plant, with 50 h. p. hoists, and a 6-drill Ingersoll-Sergeant air compressor. See Ontario Bureau of Mines Report, 1911, p. 209.

Shipping 50 tons of ore daily in May, 1917.

TWO LAKES COPPER MINING CO., LTD.

ONTARIO

Idle. **Office:** Oil City, Pa. **Mine office:** Sowerby, Algoma, Ont.

Officers: Dr. E. L. Dickey, pres.; S. F. Amsler, v. p.; D. G. Bailey, sec.; J. C. Wilkins, treas.; F. W. Bailey, gen mgr.; preceding, with J. W. Russell, C. W. Coulter, G. W. Freeman and Edw. Schwabenbauer, directors.

Inc. Oct. 12, 1906, in Ontario. **Cap.**, \$500,000; shares \$1 par; non-assessable; issued, \$270,000. Annual meeting, first Tuesday in November.

Lands: 8 claims, 1 fractional, 300 acres, freehold, including the Robinson and Tupper mines, 8 miles from Thessalon, and 4 from a railway. The property shows pre-Cambrian rocks, slate, conglomerate and greenstone, carrying a number of fissure veins, of which 3, under development, are of 2 to 10' estimated average width, carrying sulphide ores of about 4.5% copper, with small quantities of silver and gold.

Development: by shafts of 50', 25' and 10'.

Equipment: includes a 60 h. p. boiler and 35 h. p. hoist. There are 8 small buildings. At last reports the management was planning further development as soon as the financial situation improved, but is apparently still adhering to a "watchful waiting" policy.

WASAPIKA GOLD MINES, LTD.

ONTARIO

Address: Isbell, Plant & Co., Standard Bank Bldg., Toronto, Ont.

Cap., \$1,000,000; shares \$1 par.

Property: the Ribble claims, near Wasapika Lake, in the Sudbury division, Ont. Examined in March, 1917, by G. R. Rogers, who reported that the main vein is a contact between andesite and rhyolite porphyry. Ore is gray quartz with a schistose filling impregnated with iron pyrite, with some free gold. So far 1,800' of ore, averaging 49" wide, is reported to have been uncovered; 18 samples in one section gave \$10.40, and 58 in another gave \$8 per ton. Reserves were estimated at 3,077 tons of \$9 ore, plus 7,173 tons if a shaft is sunk 80' and drifts driven.

In Sept., 1917, 10 men were employed sinking a shaft.

MINING COMPANIES OF COBALT AND VICINITY

ADANAC SILVER MINES, LTD.

ONTARIO

Office: Standard Bank Bldg., Toronto and Cobalt, Ont., Can.

Officers: H. E. Larkin, pres.; J. P. Bickell, treas.; D. McArthur, sec. with C. M. Bushnell, A. A. Sangster, directors. Geo. O. Randolph, supt.

Inc. March, 1915, in Ont. **Cap.**, \$2,500,000; shares \$1 par.

Property: In Coleman Twp., Cobalt district, Ont., adjoins the Temiskaming, showing smaltite, niccolite and a little silver.

Development: by 400' shaft. Work now concentrated on vein at 400' level. Property is in the prospect class.

ALADDIN COBALT, LTD.

ONTARIO

Address: Frank F. Fuller, sec., 638 Salisbury House, London Wall, London, E. C., Eng. **Mine address:** Cobalt, Ont.

Directors: D. H. Herbert, Chairman, Lt. Col. Chas. Gold, Capt. C. R. E. Jorgensen, and S. B. Peech.

Registered April 23, 1913. Acquired all the capital of the Aladdin Cobalt Co., Ltd., registered in Canada with a capitalization of \$500,000, shares \$5 par. Canadian shareholders received 5 fully-paid £1 shares for every two \$5 shares held.

In addition the Canadian company was allotted 58,000 fully-paid shares in order to enable it to acquire 1,160,000 shares, \$1 each, in the Chambers-Ferland Mng. Co., Ltd. Shares have since been issued for the acquisition of remaining outstanding shares of the Chambers-Ferland Co. at the rate of one fully-paid £1 share for every twenty Chambers-Ferland shares. For services rendered in organization of the company, 134,351 shares were allotted to H. B. Sedgwick and C. R. Jorgensen.

Cap., £500,000; shares £1 par; 499,993 shares issued. Stock is to be listed on Toronto Exchange. Balance sheet for fiscal year ending April 30, 1916, shows expenditures, £12,432 and a deficit of £28,758.

Aladdin Cobalt Co., Ltd.

J. A. McVichie, mgr. Balance sheet for fiscal year ending April 30, 1916, shows, **Assets:** £511,598, which includes property £453,608; plant and buildings, £14,419; ore on hand, £18,962; cash, £22,297. **Liabilities:** capital stock, £103,092; sundry creditors, £7,406; reserve, £398,027. Operating profit for the year amounted to £2,618.

Dividends: ½% paid Jan. 24, 1916; 2% paid Feb. 28, 1917.

Property: adjoins the Nipissing at Cobalt, Ont., and is supposed to have the extension of the Nipissing vein system. Faulting has made necessary a thorough system of crosscutting.

Ore: silver, in veins of calcite. Property supposed to have good chances of becoming a large producer, but the output has been comparatively small.

Development: work on the whole has been disappointing. Late in 1915 a 3" vein of high-grade silver ore was cut in a winze from the 350' level and stoping on this vein on the 426' level has yielded some shipping ore. Up to Sept., 1916, the vein has been drifted on for over 42'. The winze is 750' from the shaft and 37' from the Nipissing boundary line. A crosscut was started Oct., 1916, from the main shaft on the 425' level to connect up with No. 15 crosscut north at this level and is expected to cut the Nipissing No. 64 vein about 400' from the west line of the property. Total development from May, 1915, to Sept., 1916, amounted to 3,046', of which 2,634' was drifting and cross-cutting.

Equipment: new equipment installed includes double-drum hoist, 125-ton crusher, 125-h. p. boiler, ore bins and an ore house with engine.

Production: for fiscal year ending April 30, 1916, amounted to 72,363 oz. Estimated production from May 1, 1916, to Sept. 30, 1916, amounted to 390,523 oz.

ALGUNICAN DEVELOPMENT CO.

ONTARIO

Haileybury, Ont., Canada. Holding company of the Jualin-Alaska Mines Co., which sec. Also has done development work on a molybdenite property in Brome Twp., Renfrew Co., Ont. Hector Drolet, mgr.

BAILEY COBALT MINES, LTD.

ONTARIO

John L. Woods, pres.; Floyd Weed, supt.

Inc. Aug. 15, 1906, in Ontario. **Cap.,** \$5,000,000, shares \$1 par. Trust &

Guarantee Co., Ltd., Toronto, Can., transfer agt. and registrar. In 1914 company, being deeply in debt, including about \$90,000 owing to E. A. Benson, former president, a permanent liquidator was appointed. A Protective Committee was formed by Buffalo stockholders to guard their interests. It is said that E. A. Benson, former president, and other promoters issued 4,250,000 shares of stock to themselves, retaining 750,000 in the treasury for financing the property. This promotion stock, it is claimed, was disposed of, and the treasury stock remained unsold, with the foregone result of such practice. Company now in hands of liquidators.

Reorganization Committee: Because of the financial condition of the company and appointment of liquidators by Supreme Court of Ontario, the following consented to act as a committee and prepare the plan for reorganization: Albert G. Wheeler, Jr., chairman, Wm. E. Stevenson and H. S. Langdon, with Walter Laier, sec., 22 William St., New York. Lawyers' Title Insurance & Trust Co., New York, is depository.

Reorganization Plan: The plan issued by the above committee is dated Oct. 13, 1914, and provides for the formation under the laws of the Province of Ontario of a new company with \$600,000 capital stock, of a par value of \$1 a share. Holders of existing stock consenting to plan shall receive one share of new stock for each ten shares of old. The remaining new stock shall be offered for subscription to stockholders at par, in proportion to their present holdings. New company shall have the power to issue 6% First Mortgage bonds covering its property to Edwin A. Benson, of Chicago, in payment of judgment of \$90,789 held by said Benson against the company.

The proceedings brought by the Protective Committee of Buffalo against the former directors of the Bailey Company in Canada resulted in a default judgment being obtained by the liquidators, all of these directors being Americans and none of them appearing in the proceedings. The Buffalo committee has requested the liquidators to institute like proceedings in the United States, which they have up to the present time refused to do.

The judgment obtained by E. A. Benson was purchased by the Profit Sharing Construction Co. of New York, and the Reorganization Committee, headed by A. G. Wheeler, Jr., is negotiating with the Profit Sharing Construction Co. as the owner of the judgment, for the purpose of bringing about a reorganization. The Buffalo Protective Committee has opposed this action which is responsible for the delay. The Reorganization Committee is also negotiating for the purchase of a mill in the event of a reorganization being made.

Property: 38 acres, adjoining the Penn Canadian mine in Coleman Twp., Nipissing district. Several veins have been opened up, from which shipments have been made at different times. Developed by shaft. Lowest workings on the fifth, or 280' level. In 1913 underground work totaled 1,370'.

Property in charge of caretaker since 1914.

BEAVER AUXILIARY MINES CO.

ONTARIO

Three-quarters of stock is held by Beaver Cons. Mines, Ltd., which see. H. Donaldson, supt.

Property: 120 acres, at Elk Lake, Ont., carries silver ore, mainly of milling grade. **Development:** 330' main shaft, crosscuts and drifts. **Equipment:** hoist and surface buildings.

BEAVER CONS. MINES, LTD.

ONTARIO

Lumsden Bldg., Toronto, Ont. **Mine office:** Cobalt, Ont.

Officers: F. L. Culver, pres.; F. C. Finkenstaedt, v. p.; H. E. Tremain, sec.-treas.; preceding officers, Wm. T. Mason, F. L. Lovelace, W. E. Stevenson, J. H. Black, directors; J. W. Moffett, supt., c/o Beaver Mine, Cobalt.

Inc. Feb., 1907. Cap., \$2,000,000; shares \$1 par, fully paid, all issued.

Union Trust Co., Toronto, and Security & Registrar Co., New York, transfer offices. Annual meeting in April.

Earnings in 1916 were \$499,690, compared with \$351,124 in 1914. Balance sheet of Feb. 28, 1917, showed assets of \$2,780,819, which included accounts receivable, \$7,042, due from smelters, \$90,316, ore on hand or in transit, \$63,876, Beaver mine, \$1,000,000, Beaver Auxiliary Mines stock, \$143,250, Temiskaming Mng. Co.'s stock, \$12,207. Liabilities showed accounts payable, \$15,271, depreciation account, \$118,376, profit and loss balance, \$639,822. Company expended \$113,967 on capital account and had bullion in storage and due from smelters aggregating an estimated value of \$154,193, Feb. 28, 1917.

Dividends: \$60,000 paid in 1914; \$120,000 in 1915; \$60,000 in 1916.

Property: 2 claims, patented, 60 acres, in Coleman Twp., Cobalt district, adjoining the Temiskaming mine, and 120 acres, James Twp.; also 12 months' option from Nov. 1, 1915, on Kirkland Lake Mining Co., Teck Twp., and a $\frac{3}{4}$ interest in the Beaver Auxiliary Mines Co.

Ore: silver, cobalt, and arsenic in narrow calcite veins, in diabase and the Keewatin formation. Ore occurs as high-grade in pockets and shoots, or as milling ore.

Development: by vertical shaft, 1,650' deep at end of 1916, which encountered the diabase-Keewatin contact at a depth of 1,570'. During 1916, underground work totaled 6,619'. Ore extraction was kept at a minimum, due to low price of silver.

The discovery of high-grade ore in 1916 on the 1,600' level, the deepest occurrence of such ore at Cobalt, may make a new mine of the property. All other development work in 1916 was above the 700' level.

Equipment: includes a 150-ton concentrator, giving an extraction of about 80%, blacksmith shop, dwellings, etc.

Production:

Year	Tons Milled	Tons Concts.	Oz. Ag. in Concts.	Total Oz. Ag. Prod.	Earnings
1916.....	34,766	394	340,549	566,964	\$499,690
1915.....	30,093	474	349,900	746,310	351,124
1914.....	26,724	348	415,707	900,000	158,465
1913.....	25,256	324	379,764	782,699	168,630

The company made a third payment on its option on the stock of the Kirkland Lake Gold Mining Co., September, 1917, leaving \$75,000 to be paid. This company owns 362 acres of mineral land in Kirkland Lake district, but development is confined to the 35-acre McKane lot, showing a ledge with free gold, traceable 1,100'. The shaft was deepened from 70' to 600' with 166' drift at 160'. On the 300' level a crosscut and 207' of drifting opened a 5' vein of \$11 ore with 10' of porphyry assaying \$7 per ton between it and a second 12' vein averaging \$12.80 per ton. On the 400' level an orebody 110' long was opened for 120', proving up 11,660 tons of ore valued at \$209,600. Total ore developed in mine is valued at \$350,000.

BUFFALO MINES, LTD.

ONTARIO

Office: 14 Wall St., New York. **Mine office:** Cobalt, Ont., Can.

Officers: Chas. L. Denison, pres.; Robt. W. Pomeroy, v. p.; H. B. Crandall, 2nd v. p.; G. C. Miller, sec.-treas.; preceding, and A. W. Johnston, directors; M. A. Golden, asst. sec.; Thos. R. Jones, supt.

Inc. 1906, in Ont. **Cap.,** \$1,000,000; shares 75c par; listed on N. Y. Curb. U. S. Mortgage & Trust Co., transfer agent. Transfer offices: Imperial Trust Co., Toronto, and U. S. Mortgage & Trust Co., New York. Registrar, Imperial Trust Co., Toronto. Annual meeting in May.

The Buffalo has been one of the largest producers in Cobalt, yearly output

being about 2,000,000 oz. It is said that the greater part of the high-grade ore has been mined, but there remains a large tonnage of low-grade ore capable of being worked at a profit.

Income statement: year ending April 30:

	Total Income	Net	Dividends	Surplus	Total Surplus
1916.....	\$439,757	\$231,344	.....	\$230,920	\$610,889
1915.....	372,260	79,690	\$50,000	27,158	379,968
1914.....	858,825	386,990	660,000	270,218(a)	352,810
1913.....	1,258,864	891,193	650,000	233,450	623,028

(a) Deficit.

Balance sheet for year ending April 30, 1916, shows: assets of \$1,738,996, which includes cash and accounts receivable, \$16,986; ore and bullion, \$605,311; plant and equipment, \$204,309; mining rights, \$907,092; liabilities include notes and accounts payable, \$108,351.

Property: 40 acres, in the town of Cobalt, includes the Buffalo mine.

Development: vertical shafts. Total work to Nov. 1, 1916, comprised shaft work, 2,009'; drifting and raising, 19,389'; stoping, 2,914,192 cu. ft.

Ore reserves: estimated Oct. 31, 1916, as 21,188 tons of broken ore and 24,587 tons unbroken ore, and 8,000 tons in stock pile containing a total of 1,288,375 oz. of silver. In addition, company estimates 1,780,000 oz. in tailings.

Production: years ending April 30:

	Tons Milled	Oz. Ag. per Ton	% Rec.	Tons Cyanided	Oz. Ag. per Ton	% Rec.	Tot. Prod. Oz. Ag.
1916.....	30,079	19.8	.....	8,078*	25.46	.....	684,274
1915(a).....	51,667	19.50	72.22	8,385	9.86	82.28	822,791
1914.....	77,616	25.31	76.14	13,388	10.13	77.80	1,637,809
1913.....	55,783	45.83	82.64	10,320	15.45	74.70	2,235,853

(a) Concentration mill and cyanide plant closed for 4 months.

*Treated by flotation, not cyanidation.

About 13,465 pounds of high-grade ore went direct to refinery, thus making a total of 705,055 oz. produced. Mechanical concentration is being converted to oil flotation to treat 600 tons daily.

CALUMET & MONTANA CONSOLIDATED MINING CO. ONTARIO

Office: Cobalt, Ont.

Officers: H. A. Oswald, Minneapolis, pres.; Jas. A. Patterson, v. p.; John Boyle, sec.-treas.; above with W. W. Sloan, C. H. Collins, Wm. Weichel, directors. Geo. G. Thomas, gen. mgr.; W. W. Mulholland, supt.

Inc. 1912, in South Dakota. **Cap.**, \$5,000,000; shares \$10 par; outstanding, 200,000 shares. Annual meeting, second Tuesday in October.

Company is a reorganization of the Calumet & Montana Mining Co., which see. At last accounts the company had one claim of 51 acres in Coleman Township, Cobalt, Ont., said to show fissure veins in diabase carrying silver ore. Developed by 225' vertical shaft with 500' of underground workings. In June, 1916, operations were reported to be in full swing and ore hoisting to have begun.

CARIBOU COBALT MINES CO.

ONTARIO

Offices: 61 Broadway, New York, and Cobalt, Ont.

Officers: Herman Cook, pres.; F. M. Loper, v. p.; E. H. Westlake, sec.-treas., with J. H. Susmann and Sam A. Lewisohn, directors.

Inc. Sept. 29, 1913, in Maine. **Cap.**, \$1,000,000; shares \$1 par, all out-

standing, of which 837,498 shares were owned by the Kerr Lake Mining Co., Aug. 31, 1915. The Caribou Cobalt Mines Co. owns the entire capital stock of Cobalt Comet Mines, Ltd., which is the operating company.

CASEY-COBALT MINING CO., LTD. **ONTARIO**

Office: Balfour House, Finsbury Pavement, London, E. C., Eng.

Officers: W. R. P. Parker, pres.; J. P. Watson, v. p., with G. M. Clark, R. E. G. van Cutsem and Graeme Watson, directors.

Inc. in April, 1907, in England, to acquire 99,995 fully-paid shares of \$1 each, being the entire issued capital, with the exception of 5 shares of the Casey Cobalt Silver Mng. Co., Ltd., of New Liskeard, Ont. Consideration was 199,993 in fully-paid shares, vendors agreeing to provide £15,000 working capital. Company paid total dividends of \$203,249 to end of 1914.

CASEY COBALT SILVER MINING CO., LTD. **ONTARIO**

Head office: 15-20 Traders Bank Bldg., Toronto. **Mine office:** New Liskeard, Casey Township, Ont.

Officers: W. R. P. Parker, pres.; J. P. Watson, v. p., with G. M. Clark, Capt. R. E. G. van Cutsem and Lieut. Graeme Watson, directors. John W. Shaw, mine engr. Company controlled by the Casey Cobalt Mng. Co., Ltd. q. v.

Property: 40 acres in Harris Twp., and the Casey-Cobalt mine in Casey Twp., 9 miles N. E. of New Liskeard.

Development: work totaled 2,194' in 1916. On Aug. 22, 1916, a disastrous bush fire swept across the property during a high wind storm, and destroyed all surface property, including the mill. Rebuilding and dewatering have been carried on as rapidly as possible.

CHAMBERS FERLAND MINING CO., LTD. **ONTARIO**

See description under Aladdin Cobalt, Ltd.

COBALT COMET MINES, LTD. **ONTARIO**

Office: 61 Broadway, New York, and Cobalt, Ont. Same officers as Caribou Cobalt Mines Co., which company owns the entire capital stock of Cobalt Comet Mines, Ltd.

Inc. April 16, 1913, in Ont. **Cap.**, \$1,000,000; shares \$5 par; all outstanding. Annual meeting, 2nd Thursday of Feb.

Property: 2 part claims, patented, in Coleman Twp., Temiskaming mining district, formerly known as the Drummond mine.

Ore: silver in fissure veins, occurs in shoots of variable widths. Ore minerals are native silver and cobalt-nickel sulpharsenides.

Development: by two shafts, 100' and 200' deep.

Equipment: includes an air hoist, electric pump, compressed air and electric power. Employs 50 men.

Production: in 1916 amounted to 203,777 oz. silver. Practically all ore in sight has been removed and future earnings depend on further discoveries of ore. Low-grade ore is treated by the Dominion Reduction Co.; high-grade ores are shipped.

COBALT PROVINCIAL **ONTARIO**

Cobalt, Ont. Adjoins Nipissing. Reopened Sept., 1917, by John Redington, who is sinking a shaft on a vein at S. W. end of tract. Reserves estimated at 148,000 oz. silver.

COBALT REDUCTION CO., LTD. **ONTARIO**

See Mining Corporation of Canada. Ltd.

CONIAGAS MINES, LTD. **ONTARIO**

St. Catherines, Ont., and Cobalt, Ont.

Officers: R. W. Leonard, pres. and gen. mgr.; Alex. Longwell, v. p. with R. P. Rogers, F. J. Bishop and W. D. Woodruff, directors; J. J. Mackan, sec.-treas.

Inc. Nov. 24, 1906, in Ont. Cap., authorized and outstanding, \$4,000,000; \$5 par. Toronto General Trusts Corp., transfer agt. Annual meeting in December. Listed on Toronto Stock Exchange and New York Curb. Owns entire \$4,000,000 (par \$5) stock of the Coniagas Reduction Co., Ltd., which handles this company's product. Also controls the Redington Rock Drill Co. and the Mines Water Supply Co., Ltd., besides owning 6,054 shares of \$1 each, of a total issued of 40,000 shares of stock of the Wabi Iron Wks., Ltd.

Income Account, Fiscal Year Ending Oct. 31

Year	Gross Income	Net Income	Dividends & Bonuses	Surplus for Year
1915-16.....	\$1,192,424	\$840,791	\$600,000	\$240,791
1914-15.....	1,013,513	658,730	600,000	58,730
1913-14.....	1,407,877	968,387	1,320,000	351,613(a)
1912-13.....	2,186,664	1,693,583	1,640,000	53,583
1911-12.....	2,172,967	1,676,953	1,440,000	236,953
1910-11.....	1,947,566	1,612,464	1,440,000	172,464
1909-10.....	1,010,414	752,389	240,000	512,389
1908-09.....	691,678	473,534	360,000	113,534
1907-08.....	727,195	501,718	440,000	61,718

(a) Deficit. During year ending Dec. 31, 1914, paid 33% in dividends and bonuses. Total dividends paid to Oct. 31, 1916, \$3,440,000.

Balance sheet as of Oct. 31, 1916, shows assets, \$5,583,027, which includes: mine, \$3,985,700; machinery, plant and buildings, \$228,913; Coniagas Reduction Co., Ltd., stock, \$249,400; cash in bank and on hand, \$226,472; ore in transit, \$257,999; accounts receivable, \$22,307; silver account, \$525,862. Liabilities include surplus, \$1,363,430.

Property: the Coniagas mine, 40 acres on the townsite of Cobalt, Coleman Twp. In 1915 the company purchased 198 acres of Lot 15, Con. 1, Bucke Twp., known as the Agaunico mine, in which considerable development work was done a few years ago on a promising vein of cobalt and nickel ore. No work is now being done save on the Anchorite property in Deloro Twp. The Coniagas mine contains a large number of small but very rich veins carrying silver with small amounts of nickel, cobalt and arsenic. Bought Maidens McDonald property, adjoining the Ankerite, for \$20,000 in September, 1917.

Development: totaled 29,712' of underground workings Oct. 31, 1916. This included shafts 875', drifting 17,611' and 9,527' of crosscutting. Underground work for year ending Oct. 31, 1916, amounted to 1,974', as compared with 2,735' in preceding year. Development work was confined to following of small stringers and development on the 4th level. No important new orebodies were developed during the year, though considerable tonnage of low-grade ore was disclosed.

Ore reserves: Oct. 31, 1916, estimated as 134,852 tons containing 5,943,000 oz. silver and 117,000 tons of sand tailings and 40,000 tons of slime tailings which contain 859,500 oz. silver. A re-survey of the mine and re-estimation of ore reserves has given a much lower estimate. In 1915 it was 215,995 tons, containing 12,894,380 oz. silver.

Mill: 60 stamps, daily capacity 160 tons and a small cyanide plant. The cyanide plant was built to cyanide about 6 tons per day of low-grade canvas table concentrates and decomposed gouge from the mine, whereby an estimated daily saving of \$100 per day will be made. For year ending Oct. 31, 1916, mill treated 56,973 tons ore, an average of 3.04 tons per stamp per 24 hours, compared with 55,437 tons, an average of 3.02 tons per 24

hours for the previous year. Mill heads averaged 25.76 oz. silver per ton, compared with 23 oz. for the previous year.

There were shipped during the year 1916, 492 tons dry weight of high-grade concentrates averaging about 2,276 oz. silver per ton and 152 tons of low-grade slime of about 330 oz. silver per ton. A recovery of 131 tons of slime concentrates was made by canvas table plant and contained 26,966 oz. silver. Cyanidation of these concentrates began February, 1916, and 87.3 tons of about 206 oz. silver per ton were cyanided; also 889 tons of mine slimes of about 82 oz. were treated. This contained 81,916 oz., from which 71,731 were recovered. Three and a half tons of precipitates averaged 20,494 oz. silver per ton; 193 tons of 2,716 oz. per ton were shipped from the mine.

Number of men employed in mine and mill averaged 120.

Production (for Year Ending Oct. 31)

Year	Tons		Cost per Oz. Silver		Ounces	Price, Oz.
	Mine Ore	Concls.	(a)	(b)	Silver	Silver
1916.....	193	648	15.24c	4.27c	1,773,286	63.11c
1915.....	267	607	13.62c	3.25c	2,002,053	49.25c
1914.....	435	688	12.44c	3.58c	2,497,394	56.75c
1913.....	735	1,034	8.76c	4.32c	3,252,566	60.55c

(a) Includes all expenses except shipping, smelting, refining and marketing charges which are under (b). Total production of mine to Oct. 31 amounted to 23,935,729 oz.

Ore and concentrates are treated by the Coniagas Reduction Co., Ltd., which see below.

Coniagas Reduction Co., Ltd.

Entire stock issue owned by the Coniagas Mines, Ltd., except 6 shares of stock issued to directors to qualify.

Inc. in Canada. Cap., \$250,000; shares \$100 par.

Owns a smelter and refinery at Thorold, Ont. R. L. Peek, supt.

During fiscal year ending Oct. 31, 1916, company shipped 3,952,672 oz. silver and treated 3,183 tons ore dry weight. Company produces silver, arsenic and the oxides of cobalt and nickel. An average of 122 men employed in 1916.

The cyanide mill erected in 1916 and 250-ton flotation plant finished 1917, but to be enlarged, assures continued production and dividends for some time to come.

Coniagas is one of the big producers of Cobalt, having yielded 27,000,000 oz. silver and paid \$8,740,000 in dividends in 11 years. Ore reserves of Coniagas, Jan. 1, 1917, were 7,000,000 oz. of silver.

CROESUS GOLD MINES, LTD.

ONTARIO

Address: J. M. Cohen, mgr., Cobalt, Ont., Canada.

Officers: D. M. Steindler, pres.; E. L. Steindler, sec.-treas., also directors.

Inc. Sept. 21, 1912, in Ontario. Cap., \$2,000,000; shares \$1 par; 200,000 issued; non-assessable. Is a close corporation, finances not published. Stock owned by Dominion Reduction Co.

Property: the Walsh & Dobie claims in Munro township, Ont., Canada.

Geology: quartz vein in diabase. Gold occurs free and in sulphides. Spectacular gold ore exposed on Dobie outcrop was protected by steel plate and locks.

Development: by 350' incline shaft. Rich ore opened recently at 300'

and 500'. Shaft produced \$1,000 for each foot in sinking. Gold is all coarse and free.

Equipment: includes 50-ton mill, with Hardinge mill, picking belt and amalgamation plates.

Produced \$1,000,000 in first 6 months' operation.

CROWN RESERVE MINING CO., LTD.

ONTARIO

Offices: Dominion Express Bldg., Montreal, Que.; 59 Victoria St., Toronto, Ont., and Cobalt, Ont.

Officers: John W. Carson, pres.; W. J. Gear, 1st v. p.; J. G. Ross, 2nd v. p.; Jas. Cooper, sec.-treas.; preceding officers, C. A. Smart, J. W. Ross, A. G. Gardner, R. W. Reford, F. S. Meighen, Ziba Gallagher, directors; S. W. Cohen, gen. mgr.

Inc. Jan. 16, 1907, in Canada. **Cap.**, \$2,000,000; \$1 par; outstanding, Jan. 1, 1916, \$1,999,957, of which \$231,143 is held by trustees for the benefit of the company and bears no dividends. Crown Trust Co., Montreal and Toronto, transfer office and registrar. Annual meeting, fourth Wednesday in January. Listed on Montreal Stock Exchange. Dealt in on unlisted department of Toronto Stock Exchange and on New York and Boston curbs.

Dividends: 20% in 1908; 71% in 1909; 60% in 1910-12; 48% in 1913; 24% in 1914; 8% in 1915; 5% in 1916; total dividends to Jan. 1, 1917, \$6,190,849.

Balance sheet for 1916 shows assets of \$2,839,957, which includes mining lands, plant and equipment, \$2,032,366; supplies, \$2,613; ore in transit and on hand, \$84,500; cash, \$191,182; investments in other companies and properties, \$571,533; accounts receivable, \$37,184. Liabilities show: accounts payable, \$10,446; surplus, \$770,534. The property accounts, which stand at \$2,032,366, were slightly written down. It appears that, according to the last balance sheet, the company had net quick assets of something like \$837,010 applicable to the stock, or about 42c per share.

Income Account Essentials—Years Ended Dec. 31

	Ore Sales	Oper. Exp.	Net Earnings	Other Income	Total Income	Div.	Year's Surplus	Total Surplus
1916.....	\$ 193,240	\$190,267	\$ 2,973	\$145,414	\$ 148,387	\$ 88,440	\$ 59,947	\$770,534
1915.....	339,425	326,189	13,236	178,578	191,814	106,128	22,227	793,938
1914.....	740,093	536,314	203,799	147,832	351,611	424,515	†72,904	771,712
1913.....	1,056,272	555,296	500,976	*318,213	819,189	795,966	23,223	84,461
1912.....	1,692,061	583,815	1,108,746	9,084	1,117,830	1,061,288	56,541	821,393
1911.....	1,833,517	677,681	1,155,836	10,318	1,166,154	1,061,288	104,865	764,852
1910.....	1,757,824	592,082	1,165,742	6,258	1,172,000	1,061,288	110,712	659,986

* Includes \$144,000 (1913, \$308,877) profit on Porcupine Crown, Ltd., investment.

† Deficit.

The Crown Reserve Co. owns 60% of the stock of the Porcupine-Crown Mines, Ltd., from which it received \$144,000 in dividends in 1915. It owns jointly with Kerr Lake Mining Co., Ltd., the Drummond Fraction property from which it received a profit of \$9,844 in 1916. It also operates the Silver Leaf mine of the Silver Leaf Mining Co., Ltd.

The company has paid total royalty to the government of \$880,315; this was at a 10% rate. Beginning Jan. 1, 1916, only the regular tax of 3% is levied.

Property: original holdings at Cobalt consist of 23 acres in Kerr Lake, developed by the Crown Reserve mine, which has been one of the heaviest producers in Cobalt, but the end of this property is in sight. The company co-operated with the Kerr Lake Mining Co. in the draining of Kerr Lake, but results were disappointing to Crown Reserve in that no new valuable veins were found. The pumping out of the lake made it possible to obtain ore containing over 2½ million oz. silver, which otherwise could not have been extracted, and the small veins discovered, not in themselves of great importance, are sufficient to pay for the whole cost of the opera-

tion. Total amount of mud and water removed to Jan. 1, 1916, was about 700 million gallons.

Development: in 1916 amounted to 3,200', making 32,786' to date.

Production—Years Ended Dec. 31

Year	Ore Prod. Tons	Silver Prod. Gross Oz.	Gross Value	Net Value	Results per Ounce		
					Gross Cents	Cost Cents	Profit Cents
1916.....		274,470	\$193,240	\$191,822	70.40	69.30	1.10
1915.....	94.10	657,395	344,596	339,425	52.40	45.01	7.39
1914.....	307.70	1,425,320	740,093	722,873	51.92	28.95	22.97
1913.....	312.60	1,766,878	1,056,271	1,040,117	59.45	23.02	36.43
1912.....	512.00	2,714,766	1,692,060	1,638,191	62.32	14.02	48.30
1911.....	1,048.59	3,430,902	1,833,516	1,751,300	53.46	10.67	42.79
1910.....	2,753.00	3,248,196	1,757,824	1,633,716	54.10	11.97	42.13
1909.....	3,093.00	4,034,325	2,080,156	1,895,484	51.56	10.31	41.25
1908.....	650.78	1,798,954	910,350	854,788	50.64	7.50	43.13
Totals..	8,772.77	19,361,006	\$10,608,109	\$10,067,722	54.78	15.73	39.05

Development during 1916 showed that conditions on the lower levels under the diabase sill were disappointing; but an important discovery was made on the N. side of the property, a raise above 500' level, cutting conglomerate at 170' above the level. This is 60' deeper than previously for this formation, which produced the large orebodies in the Crown Reserve. Possibilities are good for new shoots. The mine should continue to show a small profit for some time to come; this, in addition to the assets on hand at the time of dissolution, would seem to warrant somewhat better prices for its stock than those now prevailing of between 25c and 30c per share. The future of the Crown Reserve Mining Co. beyond the life of the two mines it now controls, depends upon its ability to acquire new properties. It was in following this policy that in 1915 it exercised an option on the property of the Globe Cons. Mining Co. in Trinity Co., Cal. (see Globe Cons. Lease, Inc.), but as results were not satisfactory, work was stopped. An option on gold claims in the Boston Creek district of Ontario was given up, owing to poor developments. About 90% of the shares in the Reward mine, Inyo Co., Cal., was purchased. There is \$250,000 of refractory ore blocked out, and with a flotation plant the mine is being operated at a profit. A return of purchase price is assured, and a good profit on the investment. A joint option is held with the Dominion Reduction Co. on the Cochrane mine at Cobalt.

Crown Reserve is financing the Newray mine in the Porcupine district
DOMINION REDUCTION CO., LTD. **ONTARIO**

Offices: 42 Broadway, New York City, Cobalt, Ont.

Officers: D. M. Steindler, pres.; Mortimer B. Davis, v. p.; E. P. Steindler, sec.-treas., with A. A. Allen and H. Victor Brayley, directors. P. L. Blodgett, supt.

Inc. 1912, in Ontario. Cap., \$2,000,000; shares \$1 par; \$1,600,000 outstanding. Nearly all stock is held by the directors.

Company took over the Nova Scotia mill at Cobalt. Mill has 40 stamps, rated capacity 200 tons per day, and treats custom ore, including low-grade ore from the Kerr Lake and Crown Reserve mines, with which the mill is connected by an aerial tram. All ore is purchased outright and reduced to bullion; payment is made in cash or in bullion. Company also owns and operates the property of the Croesus Gold Mines, Ltd., in

Munro Twp., 50 miles E. of Porcupine; has an interest in the St. Anthony, or Thunder mine, at Sturgeon Lake, and operates the Nova Scotia mine.
GENESSEE MINING CO., LTD. ONTARIO

Head office: Cobalt, Ont. Executive office: 442 Powers Bldg., Rochester, N. Y. L. F. Steenman, mgr.

Officers: R. H. Gorsline, pres.; C. F. Crandall, v. p.; Alexander Russell, sec.-treas.; above, with A. H. Drury, C. D. Van Zandt and L. F. Steenman, directors.

Inc. 1915, in Ontario. Cap., 1,000,000 shares; \$1 par.

Company has a 6 years' lease on the U. S. claim, north of the north claim of the Chambers-Ferland. Property has been idle 6 years, but recent developments in the Chambers-Ferland have given hope to the Genesee management, which intends to sink 60' shaft to 600' depth. This shaft shows a 4" vein of low-grade silver ore.

At the end of Sept., 1917, the vertical shaft was down 572' towards the contact. Crosscutting and driving was started during July. As the Beaver and Temiskaming mines in this district have opened good ore on the lower contact, the Genesee should stand a chance.

GLEN LAKE COBALT MINES, LTD. ONTARIO

Inc. July 9, 1914, in Ont. Has a lease on the Foster mine of the Foster Cobalt Mng. Co., Ltd., about 40 acres on and under Glen Lake, Ont. An oreshoot, small but high-grade, was found on the 50' level in March, 1916. A long crosscut has been run from the old Foster shaft out under Glen Lake to within 40' of the Bailey line. The management expects to run another crosscut parallel to the Bailey line with the hope of finding extension of the Bailey veins.

Company is operating on a royalty basis of 15% for 200 oz. ore and under, and 25% for higher grade ore.

HARGRAVE SILVER MINES, LTD. ONTARIO

Office: Excelsior Life Bldg., Toronto, Ont. Mine address: Cobalt, Ont.

Officers: Geo. H. Sedgwick, pres.; Jas. Ritcheson, sec.; J. T. Shaw, mgr.

Inc. 1908, in Ontario. Cap., \$2,500,000; shares \$1 par; all issued. Stock listed on New York Curb.

Property: 40 acres in Porcupine district and 40 acres in Cobalt district, adjoining the Kerr Lake mine on the east and on the south, and said to carry the extension of the Kerr Lake No. 3 vein. Drifting on this vein reported to have disclosed ore assaying 5,000 oz. silver per ton.

Development: by two shafts connected on the 255th level with approximately 1 mile of lateral workings.

Under former management property is credited with production of 500,000 oz. silver. The workings are to be deepened to 500'.

Recent work has been on the 125' level. About 30 men employed. Shipping about 1,000 tons of dump ore to the Dominion Reduction Works, October, 1917.

Cobalt mine was closed down at the end of 1913 after a report made by the former manager, who stated that all known orebodies had been exhausted down to 375' depth. After three years, in January, 1917, when silver prices rose to 70c, mine was reopened and some very rich ore found at 75', 375' and 250'.

HUDSON BAY MINES, LTD. ONTARIO

New Liskeard, Ont.

Officers: Geo. Taylor, pres.; A. A. McKelvie, v. p., with Thos. McCamus, F. L. Bapst, W. H. Kinch, S. S. Ritchie and C. L. Sherrill, directors. F. L. Hutchinson, sec.-treas. G. G. Thomas, mgr.

Inc. July 16, 1909, in Ontario, to acquire from the Temiskaming & Hudson Bay Mining Co., silver properties at Cobalt; it is the operating company of the latter. Cap., \$3,500,000; shares \$1 par, outstanding Sept. 1, 1915, \$3,200,050. Controls Dome Lake Mining & Milling Co., Ltd., through ownership of 894,045 shares.

Balance sheet for year ending Aug. 31, 1917, shows assets, \$3,374,825, which includes: mining claims, at Cobalt, \$2,953,228; at Gowganda, \$44,900; claims in Teck & Lebel Twp., \$18,193; plant, concentrator and equipment, \$43,318; accts. receivable, \$80,465; ore on hand, \$43,147; 894,045 shares Dome Lake M. & M. Co. stock, 187,506; stock of Mines Water Supply Co., \$2,943.

Liabilities show: accts. payable, \$4,102; bills payable the Temiskaming & Hudson Bay Mng. Co. and Dome Lake M. & M. Co., \$67,936; wages due, \$2,503; capital stock, \$3,200,050.

Receipts, 1917, were \$190,993, ore sales giving \$189,696. Expenditures were \$96,043, leaving a profit of \$94,949, plus balance of \$5,284 from 1916, a total of \$100,233.

Dividends: total to 1916, \$778,909; last one of 2½% paid Aug. 31, 1913.

Property: 9 claims, 340 acres, at Cobalt. No. 1 mine was re-opened in June, 1916, and stoping operations started. Several promising veins were found carrying high silver values, and are being further developed, 1917.

Ore reserves: estimated at 8,299 tons milling ore with silver content of 107,614 oz.; against 13,000 tons and 260,000 oz. in the previous year. During 1916-17, 1,652' of new work was done.

No. 2 mine was closed down in March, 1916, after \$10,000 had been spent in development work. If examination of property proves satisfactory, work will be resumed.

No work was done on the Gowganda property, and only assessment work on claims in Lebel & Teck Twp. and Kirkland Lake.

Company acquired additional interest in the Ferguson mine, now owning two-thirds. Property adjoins the Lake Shore mine on the east, and is one-half mile west of the Tough Oakes mine.

For work done at the Dome Lake M. & M. Co., Ltd., see under that title.

Production: the mill treated 18,247 tons of 17.3 oz. ore, extracting 262,864 oz. silver. The recovery was 83.2%, at a cost of 14.5c per oz.

KERR LAKE MINES, LTD.

ONTARIO

Succeeds Kerr Lake Mining Co., which see.

KERR LAKE MINING CO.

ONTARIO

Office: 61 Broadway, New York.

Officers: Adolph Lewisohn, pres.; Sam A. Lewisohn, v. p.; E. H. Westlake, sec.-treas., with J. J. Steindler, D. M. Steindler, S. S. Rosenstamm, J. Parke Channing, J. H. Susmann and Wm. B. Joyce, directors.

Inc. Sept. 14, 1905, in New York. Cap., \$3,000,000; shares \$5 par; all outstanding. Federal Trust Co., Boston, Bankers Trust Co., New York, transfer agts.; Equitable Trust Co., New York, Old Colony Trust Co. Boston, registrars. Annual meeting, 4th Monday in September. Stock listed on Boston and Toronto Exchanges; traded in on New York and London Curbs.

Is holding company, owning stock of Kerr Lake Mining Co., Ltd., of Ontario, the operating company. Company was dissolved Nov. 12, 1917, and shareholders are to get stock, share for share, in Kerr Lake Mines, Ltd., a Canadian corporation, to own entire assets of present company. This plan avoids present double and unnecessary taxation.

Balance sheet as of Aug. 31, 1917, shows: assets, \$3,018,211, which includes Kerr Lake Mining Co., Ltd., stock, \$3,000,000; 150,000 shares Wettlaufer Lorrain Silver Mines, Ltd., stock \$7,500; 837,400 shares Caribou

Cobalt Mines Co. stock, \$3,125; and cash, \$2,586. Current liabilities include: reserve, \$1,250; Kerr Lake Mng. Co., Ltd., \$2,000; profit and loss, \$7,760. Total receipts for the year were \$726,175, of which \$666,000 was received in dividends from the Kerr Lake Mng. Co., Ltd. Expenditures totaled \$21,175.

Dividends: paid quarterly at the rate of 20% annually, last payment of 5%, June, 1917. Payments have been as follows:

1917.....	\$1.15	1910.....	\$2.00
1918.....	1.00	1909.....	1.15
1915.....	1.00	1908.....	.75
1914.....	1.00	1907.....	.40
1913.....	1.00	1906.....	.22½
1912.....	1.65	1905.....	.02½

A special dividend of 15c per share was paid on Aug. 10, 1917, to be devoted to Red Cross work; included in above total. This makes 237%, or \$7,110,000.

Company is a holding company owning the entire stock issue of the Kerr Lake Mng. Co., Ltd., and controls the Cobalt Comet, Ltd., through majority stock ownership in the Caribou Cobalt Mines Co., the holding company for the former. The operating companies are separately described.

KERR LAKE MINING CO., LTD.

ONTARIO

Office: 61 Broadway, New York. H. A. Kee, gen. mgr., Cobalt, Ont. Is controlled through ownership of entire stock issue by Kerr Lake Mng. Co., of New York, which see.

Balance sheet of Aug. 31, 1917, shows assets: \$1,875,350, which includes mining property, \$80,000; ore on hand, sold and in transit, \$335,141; cash, \$658,292; short term bonds, \$202,150; Kerr Lake Mng. Co. of New York, \$2,000; liabilities: 400 shares of capital stock at par, \$100, \$40,000; accts. payable, \$20,530; accrued wages, \$6,340; reserve for outstanding liabilities and taxes, \$97,434, leaving a surplus balance of \$1,711,045 after payment of \$666,000 in dividends.

Dividends: to August, 1917, amounted to \$7,117,000. Payments are at the rate of \$1 per share annually. Total proceeds from ore sales were \$1,887,118; operating expenses were \$297,303 for production and development; \$170,766 for shipment and treatment, \$14,892 for general expenses; written off on property acquired, \$83,078. Operating profit for the year was \$1,343,474.

Property: one patented claim and two fractional claims, 57 acres in Coleman Twp., Nipissing district, Cobalt, Ont., Can. For description of geological features see Nipissing Mines Co. The ore occurs in several small vertical fissure veins in Huronian slate and conglomerate. The veins and ore are characteristic of the Cobalt district. The oreshoots vary from a few feet to 400' in length and occur in an area of about 8 acres.

Development: comprises several vertical shafts, deepest 487', with a total of 51,450' of underground workings. New development for the fiscal year, 1917, amounted to 3,105', compared with 4,057' in 1916.

During 1916, the winze on the Keewatin vein was sunk 150' below No. 6 level. No. 9 level, the lowest, is 475' below the surface. The entire winze in Keewatin formation below the diabase contact, and work on No. 7, 8 and 9 levels shows the vein to be weaker and less mineralized as it leaves contact, so possibilities below No. 6 are not good. Ore is probably confined to the diabase near or above the contact. Results of explorations at 7 shaft were fairly satisfactory. In stoping, the Fleming vein was

found to be 30' wide in places, the Main East 20', and No. 10, 15 and 8 came together to form a stope nearly 100' wide.

During 1917, raises on the Keewatin vein above No. 6 level only exposed encouraging ore, which is to be explored near the contact. Work on No. 15, McDonald southeast and Fleming veins at No. 7 shaft resulted satisfactorily. On the 175 and 225' level, various veins developed from good to disappointing ore.

Thirteen veins contributed to the 1917 output of 1,729,889 oz. of high-grade ore; No. 10 yielding 20%; No. 3 Lake, 12%; Fleming, 17%; Main East, 6%, and McDonald, 5%. Old stope fillings on No. 3 were partly drawn, producing 12,466 oz. of high-grade ore and 1,444 tons of 20 oz. ore. Dumps were also profitably worked, giving 4,080 tons of 17 oz. ore. A total of 55,376 tons of rock was hoisted in 1916.

Drummond Fraction claim was operated in a small way, mostly on a smaltite vein in the lake basin, yielding 67,112 oz.

Ore reserves: in about 15 veins and dumps are estimated at 2,221,500 oz. of high-grade and 52,400 tons of 25 oz. ore, a total of 3,120,000 oz. silver, which is 720,000 oz. less than in 1916, the latter 345,000 oz. less than in 1915.

Production: for year ended Aug. 31, 1917: 347.3 tons ore averaging (with bullion), 4,455 oz. silver, 57.30 tons averaging 498.39 oz., 303.6 tons averaging 469.81 oz., and 31,281 tons of mill ore containing 26.26 oz. silver per ton. Shipping ore yielded 1,729,889 oz. of the total, 2,551,346 oz. silver. Cobalt yield was 89,454 lb. silver. Cost of production was 26.75c per ounce.

Equipment: includes 12-drill air compressor, 10x12 Jenckes hoist, sorting and jigging plant of 125 tons daily capacity, fully equipped machine shop and a pot melting furnace to melt the rough metallics into bullion, installed in 1915.

Property: is apparently exhausting ore reserves, although in 1917 they were not decreased to the full extent of production, and new veins are not likely to be found, although stoping widths have increased and the lake bottom is producing ore. The physical condition appears to have improved compared with 1916. Silver output in Aug., 1917, was 200,855 oz.

LA ROSE CONSOLIDATED MINES CO.

ONTARIO

Office: 260 St. James St., Montreal, Quebec.

Officers: D. Lorne McGibbon, pres.; Shirley Ogilvie, v. p.; Edwin Hanson, v. p.; S. J. Le Huray, sec.-treas., with E. W. Nesbitt, V. E. Mitchell, W. M. Dobell and W. A. Black, directors.

Inc. May 22, 1908, in Maine. **Cap.** \$7,500,000; shares \$5 par; 1,400,000 shares issued. Bankers Trust Co., New York, Toronto Gen. Trust Co. and Montreal Trust Co., transfer agts. Guaranty Trust Co., of New York, Toronto Gen. Trusts Corp. and Montreal Trust Co., registrars. Annual meeting last Monday in April.

Owns entire capital stock of the La Rose Mine, Ltd., Lawson Mines Ltd., and Violet Mng. Co.; also 7,262 shares of University Mines Ltd.

The report of La Rose Cons. Mines Co. for the year ended Dec. 31, 1916, shows: Total receipts, \$328,000; dividends, \$299,725; balance, \$28,275; administration expenses, \$26,428; surplus, \$1,847; previous surplus, \$7,536; total surplus, \$9,416.

The balance sheet as of Dec. 31, 1916, shows:

Assets: stock of subsidiary companies, \$7,493,135; distribution, \$2,137,214; furniture and fixtures, \$1,537; due from La Rose Mines receivable, \$1,734,165; January, 1917, \$80,000; cash in banks and on hand, \$6,278; total, \$9,734,165.

Liabilities: Capital stock, \$7,493,135; depreciation, \$2,153,214; dividends payable Jan. 20, 1917, \$74,931; surplus, \$12,884; total, \$9,734,165.

Dividends: total to Feb., 1917, \$7,235,410. Present rate 5c quarterly.

Production: total to 1917, 35,820 tons, yielding 23,727,329 oz. silver, with net smelter returns of \$12,000,405.

Results of 1916 operations compare with previous year as follows:

	Prod. Oz.	Net Value	Cost Prod. per Oz.	Net Sell. Price per Oz.	Net Profit	Dividends	Surplus
1916..	740,065	\$449,734	46.39c	64.89c	\$164,774	\$299,725(4%)	\$740,353*
1915..	1,135,142	526,996	31.84c	50.88c	230,662	299,725(4%)	937,490
1914..	1,368,247	637,555	37.2c	53.92c	217,979	749,313(10%)	1,040,380

*Combined surplus of holding and operating companies.

Indicated earnings for first 6 months in 1917 are \$62,875. Net cash on hand, July, 1917, \$640,181.

Property: 6 patented claims, 359 acres, in Nipissing district, Cobalt, Ont., include the La Rose, Princess, Lawson, University and Fisher-Eplett, all practically worked out. Work was discontinued in 1914 on the Princess and Fisher-Eplett claims after extensive development work failed to locate new orebodies, but exploratory work continues on the La Rose and Lawson. The new shaft was down 350' and 256' of diamond drilling from this level to reach the Keewatin formation was done, 1916. Development work totaled 7,982' in 1916.

(For geology of district see description of Hollinger Gold Mines, Ltd.)

Company has options on a copper mine in New Brunswick, the Hurd gold mine, in Kirkland Lake and on the Maidens MacDonalld gold mine in Porcupine.

Production: 740,065 oz. silver in 1916 was from mine dumps, pillars, walls and backs of old stopes. The same sources will yield a revenue in 1917, but La Rose is a liquidating proposition unless valuable new properties are acquired.

LAWSON MINES, LTD.

ONTARIO

Subsidiary of the La Rose Cons. Mines Co., Ont.

LORRAIN CONSOLIDATED MINING CO.

ONTARIO

Officers: D. M. Steindler, pres.; J. Cohen, mgr.; J. G. Harkness, supt., Cobalt, Ont., Canada.

Mark Harris & Co., Standard Bank Bldg., Toronto, Can., are underwriters of 250,000 shares of stock.

Property: at Cobalt is said to show a vein 5-8" wide of calcite and smaltite on which 260' shaft has been sunk. At about 65' vein dipped out of shaft but it was again found at 263'. No commercial ore encountered yet.

Development: work in progress, 1917, but stock is considered a speculation pure and simple.

McKINLEY-DARRAGH-SAVAGE MINES, LTD.

ONTARIO

Offices: Canada Life Bldg., Toronto and Cobalt, Ont.

Officers: J. R. L. Starr, pres.; Thos. W. Finucane, v. p.; J. H. Spence, sec.; Harper Sibley, treas.; Jos. S. Hunn, asst. treas.; with H. W. Sibley and G. L. Thompson, directors; T. R. Finucane, mgr.

Inc. 1906 in Ontario. **Cap.,** authorized \$2,500,000; issued, \$2,247,692; shares \$1 par. Traded on New York Curb.

Comparative General Balance Sheet:

Assets: McK.-D.

	Mine & Plant	Sav. Mine & Plant	Bennett Claim	Current	Inv., etc.	Total
1916.....	\$1,381,560	\$686,055	\$100,000	\$455,073	\$6,600	\$2,628,333
1915.....	1,385,728	689,104	100,000	444,166	7,731	2,626,729
1914.....	1,402,798	694,168	100,000	447,852	7,716	2,652,534

Liabilities:

	Capital Stock	Surplus	Reserve Govt. Tax	Current	Total
1916.....	\$2,247,692	\$264,943	\$17,500*	\$98,197	\$2,628,333
1915.....	2,247,692	280,299	2,500	96,238	2,626,729
1914.....	2,247,692	313,935	4,000	86,907	2,652,534

*Includes \$15,000 for contingencies.

Comparative Statement of Operations:

	Gross Oper. Profit	Deduc- tions	Net Oper. Profits	Interest	Total Net Profits
1916.....	\$304,637	\$28,967	\$275,670	\$6,634	\$282,304
1915.....	260,424(a)	28,991	231,433	5,224	236,657
1914.....	328,850(b)	30,876	297,974	9,678	307,652
1913.....	816,025(c)	53,098	762,927	8,560	771,487

(a) McKinley mine, \$238,216; Savage mine, \$22,208. (b) McKinley mine, \$320,367; Savage mine, \$8,483. (c) McKinley mine, \$649,205; Savage mine, \$166,820.

Dividends: 2% in 1907; 9% in 1908; 10% in 1909; 15% in 1910; 50% in 1911; 50% in 1912; 32% in 1913; 18% in 1914; 12% in 1915; 12% in 1916; 9% to July 1, 1917. Total 226%, or \$5,011,336.

Property: 1 claim, 40 acres, the McKinley-Darragh mine, located at southern end of Cobalt Lake; 1 claim, 40 acres, the Savage mine, on the east side of Cart Lake; 40 acres in Bucke Twp., the Bennet claim. The McKinley-Darragh, which adjoins the Nipissing and La Rose holdings, has been the most important producer; deepest workings are at 400', where the contact with the Keewatin formation is exposed.

Ore reserves: estimated at end of 1916 to contain 1,714,302 oz. of silver, compared with 1,871,280 oz. Jan. 1, 1916. Reduction in reserves is due to exhaustion of the Savage mine.

Costs at the McKinley-Darragh mine:

	Tons Milled	Costs			Total
		Mines	Mill	Mktg.	
1916.....	62,676	\$1.98	\$0.95	\$1.08	\$5.15
1915.....	50,912	1.78	0.93	1.01	4.71
1914.....	45,098	2.22	1.44	1.70	6.99
1913.....	48,761	2.44	1.39	1.88	7.37

Per cent extraction on all ore milled: 86.9 in 1913; in 1914, 85.1 on McKinley ore and 64.1 on Savage ore; 80.9 in 1915.

Recent production.

	Ounces Silver Shipped			Cost per Oz.	Profit per Oz.
	McK.-D.	Savage	Total		
1916.....	1,055,996	.....	.....	\$0.4073	\$0.2664
1915.....	803,717	256,419	1,060,136	.2871	.221
1914.....	1,051,925	208,121	1,260,046	.313	.231
1913.....	1,672,431	556,066	2,228,497	.223	.369

Total ounces silver shipped to Jan. 1, 1917: 16,239,657.

The mill recovered 82.39% of the 14.79 oz. ore treated. A flotation plant for slimes was successfully operated, while one for old tailings was erected recently.

Silver realized 27c per oz. more in 1916 than in the previous year, but

mining costs rose so sharply that the profit per ounce only increased from 22 to 26½c.

Silver and gold properties in Northern Ontario were examined for the company, but none were considered worth buying.

Future of McKinley-Darragh-Savage has been brightened by developments at depth, and property may continue dividends for some time yet.

Development: work in McKinley amounted to 4,097' in 1916. Previously, 250' was considered the full depth of profitable lodes, but a winze sunk on the Cobalt Lake fault to 400' proved that the Keewatin contact was much deeper than supposed. Ore has been developed on the 300 and 400' levels. Footage in the Savage totaled 1,177'; this mine is practically worked out.

MERCER SILVER MINES, LTD.

ONTARIO

Offices: 103 Bay St., Toronto and Cobalt, Ont.

Officers: Harry Worth, pres.; F. W. Zoller, v. p.; R. F. Segsworth, sec-treas.; with R. F. Robertson and W. E. Segsworth, directors. A. C. Bailey, supt.

Inc. July, 1915. Cap., \$1,000,000. Company is closely identified with the Seneca Superior Mines, Ltd. Has a 10-year lease from the Peterson Lake Co., on property adjoining the Seneca-Superior, formerly leased by Gould Cons. Mines, Ltd. The Peterson Lake Co. will receive 25% royalty on smelter returns.

MINING CORPORATION OF CANADA, LTD.

ONTARIO

Office: Traders Bank Bldg., Toronto. **Mines and works:** Cobalt, Ont.

April 1, 1914, the Mining Corp. of Canada acquired the mining properties formerly operated by the Cobalt Townsite Mng. Co., Ltd., Cobalt Lake Mng. Co., Ltd., City of Cobalt Mng. Co., Ltd., and the Townsite Extension Mines, Ltd., total area, 183½ acres, at Cobalt. In 1915, the property of the Little Nipissing Mining Co., 40 acres, was acquired. On Jan. 1, 1917, business and assets of Canadian Mng. Corp'n. were acquired.

Officers: Sir H. M. Pellatt, pres.; J. P. Watson, 1st v. p.; W. P. P. Parker, 2nd v. p.; with G. M. Clark, R. E. G. van Cutsem, D'Arcy Weatherbee and Gracie Watson, directors. W. W. Perry, sec.; C. E. Watson, mgr., Cobalt; M. F. Fairlie, mill mgr.

Inc. March 20, 1914. Cap., \$2,075,000; shares \$1 par; all issued; 1,911,319 shares were held by the Canadian Mining Corp., Ltd., in liquidation.

Capital increased to \$8,300,250, shares \$5 par, in 1917.

Balance sheet for 1916 shows production worth \$3,276,006; operation, \$1,362,126; head office (including \$233,162 taxes, etc.), \$293,624; dividends, \$570,625; leaving \$1,049,631 balance, plus \$1,167,376 balance from 1915 and \$230,574 dividends and interest, making amount carried forward to 1917, \$2,447,581.

The new company paid 12½c per share on March 15, 1917, with 25c bonus, making \$622,519.

Owens entire capitalization, \$250,000, of Cobalt Reduction Co., Ltd., operating a 300-ton mill and 140-ton cyanide plant.

Dividends: paid by this company to Mining Corporation were \$171,516 in 1916.

Ore: silver, occurs in narrow calcite veins in Huronian conglomerate and Keewatin formation. The high-grade ore assays 1,919 oz. silver per ton, the mill ore, 30 oz. silver per ton.

Development: three mines, the City, Lake and Townsite are worked. Exploration in 1916 totaled 14,789', at cost of \$15.41 per foot. Total openings are over 19 miles. Some diamond-drilling was done last year. Underground work cost \$3.87 per ton. Costs in all departments in 1916 totaled

\$13.43 per ton, or 34.46c per oz. of silver, against \$10.15 and 29.57c in 1915, due to increased cost of supplies. Prospects for the Townsite are not very promising, but exploration of new areas in the other mines should reveal orebodies.

Ore reserves: estimated at end of 1916 as 743.7 tons of ore, containing 1,729,800 oz. of silver and 64,008 tons containing 1,505,200 oz., a total of 64-751.7 tons with 3,235,000 oz. silver, compared with 101,135.3 tons and 3,937-995 oz. in 1916. Tailings contain 1,900,000 oz. additional.

Company examined 65 properties in North America during 1916.

Production: ore is treated at the Cobalt Reduction Co. plant. The Lake mill was shut down in July, 1916. Tonnage treated by both plants was 114,392, at cost of \$4.12 per ton. Extraction was 88.73%, the ore yielding 2,993,279 oz. silver; treated 763 tons of high-grade ore yielding 1,464,162 oz. The total silver recovery in 1916 was 4,457,441 oz. Total since 1908 is 23-129,040 oz. Flotation of tailings is a success in the district, thereby making these a valuable asset.

NATIONAL MINES, LTD.

ONTARIO

Operating, under lease, the King Edward mine, which see. Development underway at 1,000' depth and flotation plant erected to treat ore and tailings.

NIPISSING MINES CO.

ONTARIO

Company's assets and business acquired in Sept., 1917, by the Nipissing Mines Co., Ltd., of Ontario.

Office: 165 Broadway, New York. **Mine office:** Cobalt, Ont., Canada.

Officers: E. P. Earle, pres.; Richard T. Greene, sec., with W. H. Brouse, David Fasken, August Heckscher, R. B. Watson, directors. P. C. Pfeiffer, treas.; R. B. Watson, gen. mgr.

Inc. April 6, 1906, in Maine. **Cap.**, \$6,000,000; shares \$5 par; all issued.

Transfer agents: Bankers Trust Co., New York; Old Colony Trust Co., Toronto. **Registrars:** Liberty National Bank, New York; State Street Trust Co., Boston; Toronto Gen. Trusts Corp., Toronto. Annual meeting, last Monday in April. The Nipissing Mines Co. is a holding company, owning the entire stock issue of the Nipissing Mining Co., Ltd., which see.

The annual report, dated Dec. 31, 1916, shows total receipts, \$1,843,036, including \$1,835,000 dividends on stock of Nipissing Mining Co., Ltd., and expenditures, \$1,829,897, including \$1,800,000 paid in 4 quarterly dividends (30%). Assets, Jan. 1, 1917, total \$6,613,139, including capital stock, Nipissing Mng. Co., Ltd., \$6,000,000; dividends receivable from Nipissing Mng. Co., Ltd., \$610,000; cash, \$3,139.

Dividends: paid quarterly; 2 of 5% and 2 of 10% in 1916. Total since 1906 is 259%, equal to \$12.95 per share, or \$15,540,000.

NIPISSING MINES CO., LTD.

ONTARIO

Inc. Sept., 1917, in Ontario. **Cap.**, \$6,000,000; shares \$5 par, all issued.

Company took over assets and business of the Nipissing Mines Co., of Maine, which controls the Nipissing Mining Co., Ltd. (both of which see.) Officers are same as the Maine corporation.

NIPISSING MINING CO., LTD.

ONTARIO

Controlled by Nipissing Mines Co., Ltd.

Office: 165 Broadway, New York, and Cobalt, Ont., Canada. Is controlled through ownership of entire stock issue by the Nipissing Mines Co., which see.

Officers: David Fasken, pres.; E. P. Earle, v. p.; with W. H. Brouse, R. T. Greene and R. B. Watson, directors; A. T. Struthers, sec.; P. C. Pfeiffer, treas.; R. B. Watson, gen. mgr.; Hugh Park, mgr.; J. Johnston, mill mgr.; J. J. Denny, research dept.; Charles Butters, cons. met. engr.

Inc. 1904, in Ontario. **Cap.**, \$250,000; shares \$100 par; all issued.

Comparative General Balance Sheet:

Assets

	Property & Equip.	Investm's	Ore and Bullion	Other Current	Total
1916.....	\$652,605	\$279,123	\$1,198,473	\$962,072(c)	\$3,092,273
1915.....	689,974	33,430	944,932	784,892(a)	2,453,228
1914.....	746,887	69,520	1,129,539	416,350(b)	2,362,296

(a) Includes cash, \$776,854. (b) Includes cash, \$391,292. (c) Includes cash, \$952,082.

Liabilities.

	Capital Stock	Acct's Pay.	Accr'd Exp's	Divid. Pay.	Surplus	Total
1916.....	\$250,000	\$195,515	\$36,632	\$610,000	\$1,980,126	\$3,093,273
1915.....	250,000	103,909	13,058	300,000	1,786,261	2,453,228
1914.....	250,000	190,522	18,998	300,000	1,602,776	2,362,296

Comparative Income Account:

	Income		Cost	Profit	Divid's	Surplus
	From Ore	Total	Production	Net		
1916....	\$3,027,669	\$3,076,228	\$1,024,745	\$2,028,866	\$1,835,000	\$1,980,126
1915....	2,222,256	2,256,432	815,005	1,441,427	1,220,000	183,485
1914....	2,516,065	2,558,733	971,112	1,587,621	1,235,000	343,715

Dividends: paid to July 20, 1917, total \$16,240,000, equal to 264%.

Property: 8 claims, 846 acres at Cobalt, Ontario, Canada, has over 100 fissure veins, from $\frac{1}{2}$ " to 12" in width, occurring in Huronian conglomerate or Keewatin formation. The ore is silver with cobalt and arsenic.

Development: total work in 1916 amounted to 9,128' as compared with 10,496' in 1915. There are 10 working shafts on the property. The lowest, or No. 64 shaft is 1,003' deep. No further work was done there in 1916. Exploration in various parts of the property failed to discover any new veins of importance, but vein 490 opened well. On No. 5 level there is a shoot 500' long, 5 to 6" wide, averaging 800 to 1,000 oz. per ton. There is also 8 to 10' of milling ore containing 30 to 40 oz. per ton. Reserves in this vein are about 2,000,000 oz. silver. Shaft 73 produced most of the ore treated during 1916. Ore reserves here amount to over 4,000,000 oz. silver.

On the Cobalt Lake fault, shaft 81 was sunk to the Keewatin formation and crosscuts were driven to the fault at 425 and 520' below the collar. A total of 2,265' of work was done. There is a strong vein along the fault, with considerable cobalt and some rich ore, but nothing that can be considered an ore-shoot has been found. During 1917 to June, 1,500' had been driven on the vein along this fault at 425' and 520' depth.

Mining costs were \$3.165 per ton in 1916.

Ore reserves: Jan. 1, 1917, 167,394 tons, assaying 55 oz. silver per ton, or 9,153,139 oz. in all.

Equipment: includes a high-grade mill, a low-grade 40-stamp mill, cyanide plant, air compressors, power house, hoists, tramway etc. Flotation plant of 10 Callow cells is treating tailings. The high-grade mill treated 1,064 tons of Nipissing ore assaying 1,800 oz. per ton, while the low-grade mill treated 76,957 tons of 31.96 oz. ore. Recovery was 86.76%, at a cost of \$4.60 per ton, an increase of 69c per ton.

Recent Shipments

	Ore, Tons	Gross Oz. Silver	Gross Value Silver, Cobalt, Nickel & Arsenic Paid For	Net Value Received
1916.....	2,139	3,819,769	\$2,737,569	\$2,686,488
1915.....	191.9	4,623,958	2,422,791	2,381,463
1914.....	434.2	3,999,862	2,226,430	2,207,428
1913.....	1,328.6	4,844,169	2,945,335	2,920,714

In July, 1917, yield was 344,925 oz., valued at \$272,490.

Cost of producing an ounce of silver in 1916 was 24.135c equal to \$12.529 per ton of ore treated. The total cost was \$2.51 per ton higher than in 1915, due to advanced prices of supplies, taxes, and insurance.

Production: since 1904 totals 45,029,007 oz. silver, realizing \$26,168,029 gross and \$24,846,968 net.

Nipissing is the largest company and has the best holdings at Cobalt, and manages to maintain its reserves, the past year showing an increase. With silver at \$1.05 per oz., a profit of 75c can easily be made.

NORTHERN CUSTOMS CONCENTRATOR, LTD. ONTARIO

Office: 702 Excelsior Life Bldg., Toronto, Ont. A. J. Young, pres.; E. J. Booth, v. p.; F. J. Bourne, sec.-treas.-gen. mgr.; A. S. Holmes, supt.; F. J. Bourne, cons. engr.

Operates a 200-ton, 80-stamp concentrating mill north of the La Rose mine, at Cobalt, Ont.

O'BRIEN MINE, THE. ONTARIO

M. J. O'Brien, Cobalt, Ont., owner. J. G. Dickenson, mgr.; D. W. McLeod, supt.

Property: 15 claims, patented, 560 acres, privately owned, at Cobalt and Gowganda, Ont. The O'Brien mine has been a steady silver producer for many years and is reported to have 4 years' ore reserves in sight, 1917.

Ore: occurs in conglomerate and Keewatin diabase and contains silver, cobalt, arsenic, nickel and copper values.

Development: by 6 shafts to depth of 660', with 7 miles of crosscutting, raising, drifting and stoping.

Equipment: includes 200-ton cyanide mill and 200-ton concentrator.

The mill treated 51,892 tons of ore in 1914. Shipments: 1,237,345 oz. silver. Royalty paid to government was \$5,898 in 1914, with total payments to date of \$700,966.

Results of operations and production not made public.

PARAGON-HITCHCOCK MINES, LTD. ONTARIO

Address: Collingwood, Ont., Canada. Mine office: Wabun, Ont.

Officers: Donald McKay, pres.; W. R. Hitchcock, v. p.; David Melville, sec.; W. T. Herrington, treas.; E. H. Hitchcock, C. W. Pitt, W. A. Hamilton, R. Fregehen, J. P. Welsh and T. R. Gilpin, directors

Inc. Feb. 12, 1917, in Ontario. Cap., \$1,100,000; shares \$1 par; 200,000 issued, non-assessable.

Property: 2 claims in Willet and 4 claims in Tudhope Twp., Ont. adjacent to the Cobalt district, with total area of 245 acres. Four claims are ½ mile from the T. & N. O. Ry., and 2 claims are 3 miles from this line, the two groups being 4 miles apart. Reported on in 1911 by A. M. Campbell, in 1913 by E. B. Rider and C. M. Ross, and in 1917 by W. H. Jeffrey.

Geology: the Hitchcock property is a heavily-timbered, low-lying tract with diabase showing as the only rock exposure. Four well-defined silver-bearing veins can be traced through this outcrop. No. 1 vein has been un-

covered for some distance and is considered the strongest. Shaft on this is 110' deep and a drift is said to show some native silver. At the W. end No. 1 joints No. 4 vein. Sinking to 270' is recommended.

At the Paragon, shaft is 160' deep with 2' of good silver ore showing at 94'.

Equipment: boiler, steam hoist, and compressor, pump, and camp accessories.

Is a prospect in a district with a fair production. More money is necessary for development. Some of the circulars issued are peculiar in that they digress from their real object far too much.

PENN CANADIAN MINES, LTD.

ONTARIO

Office: 1011 Chestnut St., Philadelphia, Pa. **Mine office:** Cobalt, Ont.

Officers: Wm. J. Haines, pres.; R. B. Haines, sec.-treas.; with J. D. Haines, E. C. R. Laidlaw, S. D. Wright, A. S. Elliott, directors; B. Neilly, supt.

Inc. 1912 in Ontario. **Cap.**, \$1,500,000.

Property: the Cobalt Central Silver mine at Glen Lake, in Cobalt district.

Development: by 22,152' of drifts, crosscuts, raises and winzes. About 800' of diamond-drilling was done to May, 1916.

Equipment: includes mill with 6 Wilfley tables, ball mills, and a 75-h. p. motor. The mill treated 24,510 tons of ore during fiscal year ending April 15, 1915, and shipments to American and Canadian smelters amounted to 448 tons.

PENNSYLVANIA-COBALT SILVER MNG. CO.

ONTARIO

See Temiskaming Mining Co., Ltd.

PETERSON LAKE SILVER COBALT MINING CO. LTD.

ONTARIO

Office: 909 Excelsior Life Bldg., Toronto, and Cobalt, Ont.

Officers: W. A. Lamport, pres.; S. G. Forst, v. p. and managing director; with I. L. Ernst and C. M. Nickel, directors. P. M. Goff, sec.-treas.; Frank C. Loring, cons. engr.; C. G. Daimpre, supt.

Inc. 1906 in Ontario. **Cap.**, \$3,000,000; issued, \$2,401,820; shares \$1 par. Trusts & Guarantee Company, Ltd., Toronto, transfer agent. Listed in Toronto and on New York Curb. Annual meeting 3rd Monday in May.

Comparative General Balance Sheet: (year ending April 30)

Assets—

	Property	Dev. Expl.	Plant Supplies	Current	Total
1917.....	\$2,309,323	\$136,666	\$15,382	\$49,934	\$2,510,780
1916.....	2,309,323	136,666	16,897	223,920	2,686,807
1915.....	2,463,507	136,666	19,701	177,033	2,642,723

Liabilities—

	Capital Stock	Current	Surplus	Total
917.....	\$2,401,820	\$1,234	\$107,726(a)	\$2,509,546
916.....	2,401,820	7,610	277,377	2,686,807
915.....	2,401,820	8,690	232,213	2,642,723

(a) Profit and loss.

Comparative Income Statement:

	Royalties on Ore	Miscel. Income	Total Expend.	Profit
17.....	\$9,940	\$5,210	\$58,705	\$43,555*
16.....	296,498	6,685	89,892	213,291
15.....	191,156	9,826	60,557	140,424

*Net loss.

Dividends: fiscal year ending April 30, 1915, Nos. 1 to 4 inc., \$168,127; April 30, 1916, Nos. 5 to 8 inc., \$168,127, Nos. 9 to 11 inc., \$126,096. Last c. March, 1916, at rate of 1¼% quarterly.

Property: 224 acres underlying Peterson Lake at Cobalt, almost surrounded by holdings of the Nipissing Co. The most important lease was that of Seneca-Superior, now exhausted. Company is operating the Mercer, Reliance and Peterson Lake mines, the last named in the Nova Scotia section. All leases given by company have now expired.

Development: the Peterson Lake area has been prospected through shafts Nos. 2 and 3 and the Nova Scotia territory opened up; several veins have been found here, but to date commercial ore has not been found in paying quantities. During the year new work totaled 3,556'.

Production: in 1913, 1,230,732 oz. silver; in 1914, 1,608,550; in 1915, 2,220,295; in 1916, 11,204 oz.

The company's property has been well prospected in Nova Scotia territory, but the Little Nipissing & Susquehanna tracts are promising and a large part of the company's ground under Pearl Lake is still unexplored.

In April, 1917, work was started on the Susquehanna section at extreme N. E. end of lake and management hopes to cut the lower contact at 1,000' depth where new orebodies may be found.

Mine was practically closed down from Feb. to April, 1917, when entire management changed. The managing director and Mr. Frank C. Loring believe property can again be made profitable.

PITTSBURG AND LORRAIN SYNDICATE.

ONTARIO

J. A. Rice, mgr. Property: the Currie Mine, adjoining the Wettlaufer, in South Lorrain, Ontario, Canada, said to show rich silver ore in pockets.

Development: is by shaft, to 300' level. Diamond-drilling to 900' depth, 1917. Has leased the Wettlaufer 25-ton mill.

RIGHT OF WAY MINES, LTD.

ONTARIO

Office: Central Chamber, 46 Elgin St., Ottawa, Ont.

Officers: E. Seybold, pres.; A. W. Fraser, v. p.; E. A. Larmouth, sec-treas.; with C. J. Booth, directors. D. H. Angus, mine mgr.

Inc. Sept. 11, 1909, in Ont. Cap., \$2,000,000; shares \$1 par; outstanding \$1,685,500. Transfer office: 46 Elgin St., Ottawa, Ont. Annual meeting in February.

Annual report for 1916 shows gross receipts \$96,084; operating expenses, \$55,372; leaving a net profit of \$40,712.

Adding the previous balance, etc., there was available \$45,926. Depreciation and general expenses reduced this to \$33,267; less \$25,282 for 3 dividends, leaving \$7,985 carried forward to 1917.

Stock selling around 5c per share, 1916, sold in the boom days as high as \$10.50. The company has paid 66½% on the old capital of 500,000 shares and the new capital of 2,000,000 shares.

Property: 3½ acres, adjoining La Rose mine in Cobalt and mining rights under 3½ miles of the right of way of the T. & N. O. Railway. The production of silver for a few years was important, but during the last two years little rich ore has been mined or discovered.

Development: mine is opened up to the 365' level. In 1916 a winze was sunk 50' below the 365' level to prospect the Cobalt Lake fault. So far, results are promising.

Production: in 1916 was 225 tons of high-grade ore, concentrates and metallics, containing 145,064 oz. silver.

SENECA SUPERIOR SILVER MINES, LTD.

ONTARIO

Office: 103 Bay St., Toronto, Can.

Officers: S. H. Worth, pres.; F. W. Zoller, v. p.; R. F. Segsworth, treas.; with W. E. Segsworth and A. H. Dewey, directors. R. H. Lyman, mine mgr.

Inc. Sept. 29, 1911, in Ontario. Cap., \$500,000; \$1 par; 478,884 shares issued.

Dividends: total \$1,579,817, or 326%. The last published costs were 15.77c per oz. of silver produced.

Company had an 8-year lease on part of the Peterson Lake property at Cobalt, Ont. Mine exhausted in 1916, after producing \$2,191,280 between Jan. 31, 1913, and Dec. 31, 1916.

For full description see Vol. XII.

SHAMROCK CONSOLIDATED MINES, LTD. ONTARIO

Cobalt, Ont. **Officers:** P. Kirkegaard, pres.; Malcolm Lang, v. p., with Jos. Montgomery, Louis Wintner and Wm. H. Price, directors. A. M. Bilsky, mgr. **Cap., \$1,000,000.**

Company was formed to reopen the Shamrock mine at Cobalt; considerable development work was done on the property a number of years ago. No recent returns secured.

SILVER LEAF MINING CO., LTD. ONTARIO

Inc. 1906, in Ont. **Cap., \$5,000,000;** shares \$1 par. Owns the Silver Leaf mine, adjoining the Crown Reserve property at Cobalt, and was considered a good prospect at one time. It has not been an important producer and has proven a great disappointment. Mine is operated by Crown-Reserve Mining Co., Ltd., which see.

TEMISKAMING MINING CO., LTD. ONTARIO

Office: 810 Lumsden Bldg., Toronto. **Mine office:** Cobalt, Ont., Can.

Officers: F. L. Culver, pres.-gen. mgr.; W. T. Mason, v. p.; R. Graham, sec.; H. E. Tremain, treas.; with W. E. Stevenson, F. L. Lovelace, J. H. Black, H. E. Tremain and F. C. Finkenstaedt, directors; J. W. Moffitt, supt.

Inc. 1906 in Ontario. **Cap., \$2,500,000;** shares \$1 par; nonassessable; all issued. Company office, Toronto, transfer office. Union Trust Co., Ltd., Toronto, registrar. Annual meeting in March. Listed on Standard Stock Exchange, Toronto.

On Dec. 28, 1917, a meeting of company was to be held to authorize purchase from Beaver Consolidated Mines of 871,525 shares of Kirkland Lake Gold Mining Co., stock at 40c a share, being 50% of the Beaver company's interest. Money is to be advanced equally with the Beaver to continue development and equipment at the Kirkland Lake.

Dividends: 15% in 1908; 6% in 1909; 11% in 1910; 9% in 1911; 12% in 1912; 3% in 1913; none in 1914; 3% in 1915; 9% in 1916 and 12% in 1917 to Oct. 24. Total to date is \$1,984,000.

Comparative General Balance Sheets:

Assets—

	Current	Property	Constr'n	No. Dome	Hospital	Total
1916.....	\$579,599	\$2,427,802	\$259,168	\$320,408	\$2,120	\$3,589,097
1915.....	462,488	2,581,884	105,192	320,408	2,120	3,472,091
1914.....	83,501	2,580,658	104,616	317,908	2,120	3,070,923

Liquid assets on Oct. 31, 1917, were: cash, \$441,862; and silver, 298,555 oz.

Liabilities—

	Capital Stock	Depreciation	Profit & Loss	Current	Total
1916.....	\$2,500,000	\$75,591	\$671,000	\$19,978	\$3,589,097*
1915.....	2,500,000	49,674	896,860	25,556	3,472,091
1914.....	2,500,000	23,747	527,996	17,059	3,068,802

*Includes \$322,528 contingent a/c re North Dome property and Cobalt mines hospital shares.

Comparative Operating Account:

	Receipts	Expenses	Profits	Cash Assets
1916	\$708,877	\$355,987	\$352,870	\$579,599
1915	732,263	262,471	469,731	462,487
1914	146,649	228,071	*81,422	85,621
1913	438,455	320,881	117,574	196,920

*Deficit.

Properties: in which the company is directly or indirectly interested: Daigle claim, 20 acres; Gans property; McDonald claims, 40 acres in North Cobalt; Peterson claim, 40 acres; Osland claim, 40 acres: also 40 acres each in McCool, Cook and Barnet townships; the Morrison claims, commonly called the Red Jacket and the North Dome property in the Porcupine mining division. The Red Jacket claim was leased 1916 to a syndicate which unwatered it.

PORCUPINE DISTRICT

Mining companies of the Porcupine District, including Kirkland Lake, Swastika and Boston Creek.

ACME GOLD MINES, LTD.

ONTARIO

See Hollinger Cons. Mines, Ltd.

APEX PORCUPINE MINES, LTD.

ONTARIO

J. A. Jacobs, Traders Bank Bldg., Toronto, Can.

Inc. 1911. Cap., \$2,000,000; shares \$1 par.

Owns 80 acres in southern Tisdale Twp., Porcupine district, Ont. showing pyrite and free gold. Shaft 108'. Shut down 1912-17.

AURUM MINES, LTD.

ONTARIO

Office: 420 Bank of Hamilton Bldg., Toronto, Ont., Canada.

Officers: Sir Henry M. Pellatt, pres.; Col. J. B. Miller, v. p.; with W. B. Reid, A. E. J. Blackman and A. H. Jeffrey, directors. C. H. Manaton, sec.; H. M. Asling, treas.

Inc. in Ontario. Cap., \$1,500,000; shares \$1 par; 800,000 shares outstanding.

Property: 2 patented claims, 80 acres, adjoining the Croesus mine. in Munro Township.

Ore: occurs in quartz and schist veins in basalt, dipping N. W.-S. E.: average value of the gold contents is as yet undetermined. Mine examined by W. J. Trethewey and A. G. Kirby, who recommend diamond drilling in attempt to pick up the Croesus vein.

BOSTON CREEK GOLD MINES, LTD.

ONTARIO

H. D. Symmes, mgr., Boston Creek, Ontario. F. M. Richardson, pres.-mgr., with Ex. Lieut. Gov. Spriggs of Montana and W. B. Albright, directors.

Inc. late in 1916 to take over the holdings of the R. A. P. Syndicate, financed by Sherwin-Williams Paint Co. interests, who spent \$250,000 on the property. Cap., \$2,000,000; shares \$1 par.

Property: 21 claims, 100 acres, in Boston Creek township, 45 miles N. W. of Cobalt and 382 miles N. of Toronto and crossed by the T. & N. R. R. **Ores:** simple gold-quartz, like those of Porcupine, occur in two parallel master veins, 250' apart. The Kenzie vein is of replacement type in a "pillow lava" or greenstone, a few inches to 5' wide, showing spectacular free gold in fine grained greenish quartz, with associated iron and copper pyrites, galena and molybdenite.

Development: by 300' shaft with drifts on vein at 100', 200' and 300' and a winze to 400' level. Brokers letters claim \$1,500,000 worth of ore blocked out and that the company is sacking high grade ore. Equipment includes gas-line and electric hoists and buildings, etc., for 40-50 men employed.

Property considered good and directors are as high grade as the ore, but the stock offered at 50 cts., boosted to \$1.50 and declining to 60 cts., June, 1917, is so extravagantly lauded by various brokerage houses as to beget and foster suspicion.

Property will, it is believed, eventually be a milling proposition, ranking well with the various Porcupine companies.

BURNSIDE GOLD MINES, LTD. ONTARIO

Kirkland Lake, Ont. Inc. July, 1913, in Ont. Cap., \$3,000,000.

Is a subsidiary of the Kirkland Lake Proprietary, Ltd. Owns claims adjoining the Tough-Oakes gold mine at Kirkland Lake.

CANADIAN MINING & FINANCE CO., LTD. ONTARIO

Office: 85 Bay St., Toronto Can.

Company is not now engaged in any mining operations, simply owning a few claims. The several companies that it managed, were formed into the Hollinger Consolidated Gold Mines, Ltd., which see.

DAVIDSON GOLD MINES, LTD. ONTARIO

Porcupine, Ont. Gordon Crean, pres.; D. R. Thomas, mgr.

Property: 5 claims, developed by 350' shaft and claimed to show a 5½' quartz vein, assaying \$7.20 in gold. Diamond drilling below 300' level in 1917.

DOBIE MINES, LTD. ONTARIO

Office: 201 Inspector St., Montreal. H. E. Carmichael, mgr., Porcupine, Ont.

Officers: Frank C. Armstrong, pres., 25 Broad St., New York; S. J. LeHurray, sec.-treas., 260 St. James St., Montreal. Directors: F. C. Armstrong, Geo. C. Loveys, Donald D. Fish, B. Osler, and W. A. J. Chase.

Inc. March 27, 1911, in Ont. Cap., \$1,500,000; outstanding, \$1,200,000. Of the issued stock, \$1,100,000 was given to the owners in payment of the property and \$100,000 stock was purchased by the Tisdale Gold Mng. Co., to provide funds for development purposes. Transfer agents: Toronto General Trust Corp., Toronto; Investment Trust Co., Montreal. Listed on Toronto Standard & Mining Exchange, and traded in on the unlisted department of the Toronto Stock Exchange, and on the New York and Boston curbs.

Balance sheet, March 31, 1917, shows \$31,087 in bank and on hand, and \$63,042 spent on development.

Property: 17 claims, crown patented, in Tinsdale Twp., Ont., taken over from the Tisdale Gold Mng. Co., Ltd. No work was done in 1916.

DOMESTIC EXTENSION MINING CO. ONTARIO

Head office: 36 Toronto St., Toronto, Ont., Can. H. C. Anchor, supt., South Porcupine, Ont.

Officers: W. S. Edwards, pres.; J. S. Tomenson, v. p.; Alex Fasken, sec.-treas, with J. S. Wilson, A. S. Wigmore, directors.

Inc. Jan., 1911, in Ont. Cap., \$3,000,000; par \$1; 2,300,000 shares issued. Annual meeting in May. Listed in Toronto and on New York curb.

Balance sheet of March 31, 1917 shows, cash \$62,286, receipts from stock sales \$542,994. Cost of buildings and plant, etc., \$42,248. Operating expenses at mine, \$135,288. General expense, \$19,895. Miscel. receipts, \$2,373.

Property: 198¼ acres adjoining Dome Mines, Ltd., on the east, in the Porcupine district. Dome Mines, Ltd. took an option on the property, effective until Oct. 15, 1917. Basis of exchange is 50 shares Dome Extension for one of Dome Mines, the Dome Extension to be allowed to develop on its own account.

Development: 3 shares over 200' deep and about 10,000' of underground workings, said to have opened a considerable tonnage of low grade ore.

In 1916 Dome Mines, Ltd., did about \$16,000 worth of development work on the property, including 211' of drifting on the 600' level and 6,661' on surface. From existing limited development it appears that profitable orebodies

must be sought at a depth of 1,400' or more. Diamond drilling being done, 1917.

DOME LAKE MINING & MILLING CO., LTD. ONTARIO

New Liskeard, Ont., and South Porcupine, Ont. **Officers:** Geo. Taylor, pres.; A. A. McKelvie, v. p.; with Thos. McCamus, S. S. Ritchie, F. L. Bapst, S. J. Dark and Chas. L. Sherrill, directors; F. L. Hutchinson, sec.-treas.; Ralph Regnell, mgr.

Inc. Aug. 26, 1912. **Cap.**, \$2,500,000; shares \$1 par, reduced to 500,000 shares, Feb., 1913; increased to \$1,000,000 in Feb., 1914, and to \$2,000,000 in 1915. All issued. Hudson Bay Mines Ltd. took up its full allotment of 1,000,000 shares. Trusts & Guarantee Co., Ltd., Toronto, transfer office. Annual meeting 2nd Monday in Feb. Listed in Toronto and on New York curb.

Statement for year ending Jan. 1, 1917, shows receipts from ore shipments \$18,922; expenditures, \$111,451 which includes \$79,688 for development work.

Reported 1917, that company plans increasing its capitalization to \$3,000,000.

Property: 3 claims, patented, 120 acres, in Tisdale Twp., Porcupine. Gold ore occurs in shoots as replacement deposits. Veins have strike of N. 10° E. and dip of 70°. Recent work is said to prove that the mineralized zone traverses the company's property instead of dipping into property on the north. Country rock is basalt.

In Feb., 1917, the vice-president reports that an over-estimate of values and tonnage in the mine was made by the former manager. The new manager is resampling the mine as the records are not considered accurate or reliable.

The principal work for 1916 was the development of the No. 1 vein on the 300' and 400' levels proving oreshoots of fair milling grade west of the main crosscut and showing that the vein is faulted, with movement along the dike as well. The manager finds that in view of the encouraging results in a winze below the 400' level and the large acreage of unprospected ground, that a further expenditure for prospecting and development is warranted.

Development: by 460' shaft with over 14,000' of workings. In 1916, 5,750' of work was done. Reported stoping No. 3 vein on 400' level Sept. 1917. Reserves at end of Aug., 1917, were reported as 9,089 tons, assaying \$9.23 per ton.

Equipment: includes Vulcan hoist, compressor and 200-ton mill. A 100-ton cyanide plant has been installed.

Production: during 1916, 7,700 tons of ore, of which 6,540 tons were milled, yielding a bullion return of \$18,267. The milling cost was \$14,345.

The property has not been as successful as hoped for, but the management believes that continued active development will prove the mine to be valuable.

DOME MINES, LTD. ONTARIO

Executive and financial departments: 43 Exchange Place, New York City. **Head office:** 36 Toronto St., Toronto, Ontario, Canada. **Mine address:** H. P. De Pencier, supt., South Porcupine, Ont.

Officers: J. R. De Lamar, pres.-treas.; W. S. Edwards, 1st v. p.; C. D. Kaeding, 2nd v. p.-gen. mgr.; H. P. De Pencier, 3rd v. p.; Alex. Fasken, sec.; A. H. Curtis, asst. treas.-sec., preceding, except H. P. De Pencier and C. D. Kaeding, with Andrew V. Stout, A. H. Curtis, G. C. Miller and J. S. Wilson, directors.

Inc. March 23, 1910, in Ont. **Cap.**, authorized \$5,000,000; outstanding \$4,000,000; shares \$10 par. Guaranty Trust Co., New York, and Trusts & Guarantee Co., Ltd., Toronto, transfer agents. Bankers Trust Co., New York, and Toronto Genl. Trusts Corp'n, Toronto, registrars. Annual meeting, 2nd Tuesday in June. On June 23, 1915, the New York Stock Exchange listed \$3,500,000 of the capital stock with authority to add \$500,000 on official notice of issuance and payment in full.

Dividends: present rate, 10% payable quarterly. On Sept. 1, 1915, initial

quarterly dividend of 50c. per share was paid; continued until reduced in June, 1917 to 25c quarterly. Dividend passed in Sept. Total dividends to date, \$1,400,000.

Comparative General Balance Sheet: years ending March 31:

	Assets					Total
	Bldg. Equip., Construction, etc	Inven- tories	Current	Ins. Unexpired	Int. Accrued	
1917.....	\$4,457,192	\$301,121	\$677,357	.....	.....	\$5,191,375
1916.....	4,050,798	172,518	806,794	\$102,348(a)	.....	5,132,458
1915.....	3,724,070	102,921	377,623	1,642	\$1,854	4,208,110
1914.....	3,753,878	97,025	232,039	1,796	1,143	4,085,884

Liabilities

	Cap. Stock	Accts. Pay.	Taxes Accrued	Accident- Fund	Surplus	Total
	1917.....	\$4,000,000	\$47,792	\$22,665	\$697,051	$5,191,375
1916.....	4,000,000	93,050(b)	14,636	.....	.....	5,132,458
1915.....	3,500,000	42,212	800	.....	665,098	4,208,110
1914.....	3,500,000	92,580	2,308	\$4,476	486,520	4,085,884

(a) Includes undistributed development expenditures, \$98,506. (b) Includes pay-rolls, \$37,670.

Operations for 1916-17 include \$2,171,785 from bullion sales with operating expenses of \$1,241,862. Total output to April 1, 1917, 1,302,832 tons, yielding \$7,781,669.

Profit and Loss Statement: years ending March 31:

	Gross Earnings	Net Earnings	Int., Disc. and Exch.	Balance	Dev. Deprec. and Improv.	Surplus
	1917.....	\$2,194,311	\$929,922	\$22,526	\$952,449	\$221,369	$731,079
1916.....	1,778,959	889,365	23,015	912,380	370,518	541,861
1915.....	1,055,497	481,620	6,878	488,498	309,920	178,578
1914.....	1,204,597	750,633	2,695	753,328	295,631	457,696

Property: 6 claims, 240 acres, in Tisdale Twp., Ont. The geology is fully described in report of Ont. Bureau of Mines, 1915. Ore is white quartz carrying free gold and auriferous pyrite, occurring in a stockwerk of veins and stringers netting schists of pre-Cambrian age. The orebody is large, being over 100' across in places and has been proven by diamond drill work for 500' or more. The original outcrop, a dome-shaped hillock about 30' high, showed so much free gold at one place that it was called the Golden Stairway.

Company has an option on 5 adjoining claims belonging to the Dome Extension Mining Co., effective until October, 1917. Basis of exchange is 50 shares of Dome Extension for one of Dome Mines. About \$16,000 was spent in development work on these claims in 1916. Diamond drilling in progress, 1917.

Ore occurs in large irregular masses, entirely without walls and extremely uneven in values. It is found on or near the contact of an igneous rock (porphyry) and sedimentaries and is capped by slate. Development has proven the existence of quite as good ore at 700' and in diamond drill holes at 1,150' vertically below the surface, as that mined on the surface and in the upper levels.

Development: there are 2 working shafts, one 850' deep, with 8 levels. Underground work has been distributed over a zone 1,500' long and 400' wide. For year ending March 31, 1917, new development work totaled 7,051' and diamond drilling footage totaled 11,423'.

Ore reserves: estimated April 1, 1917, as 2,250,000 tons, average grade \$5.32 in gold per ton, or a total value of \$11,979,000 compared with the estimate of the previous year of 2,600,000 tons of \$6.20 ore.

Equipment: includes a crusher on the 5th level, automatic loading hoppers, 5-ton cars and 4-ton skips. Shrinkage stoping system is used.

Company owns a very complete mill and cyanide plant of 1,500 tons daily capacity, enlarged to present size in 1916. Over \$400,000 was spent in new equipment and improvements, 1916, stamps being replaced by ball mills.

Water is obtained from Porcupine Lake by means of 2 electrically-driven 4-stage turbine pumps. Electric power is obtained from Wawaitin Falls, 13 miles from the property. Three-phase current is supplied over the Company's transmission line at a pressure of 12,000 volts, stepped down to 550 volts by three 600-k. w. Westinghouse transformers.

Production and costs since milling started, March 23, 1912, for fiscal year ending March 31st:

Year	Tons Milled	Value Per Ton	Rec. %	Costs per Ton			Total
				Mining	Reduct.	Gen.	
1917.....	459,530	\$4.73	92.98	\$1.44	\$1.05	\$0.30	\$2.70
1916.....	347,640	5.50	92.88	1.22	1.01	.32	2.56(b)
1915.....	249,550	4.68	90.6	1.38	1.12	.46	2.97(b)
1914.....	145,305	8.77	94.51	1.86	1.69	.64	4.19
1913.....	101,812	10.72	95.63	1.31(a)	2.35	1.29	4.95

(a) Does not include development. (b) Reduction due to larger units of operation, improved methods, and greater efficiency.

Cost of producing an ounce of gold has risen from \$10.30 in 1915-16 to \$11.82 in 1916-17 and to \$14.18 in March and April, 1917. The bullion produced in 1917 was \$2,171,784.

Operations for 1916-17, were curtailed by labor shortage in mine development work, but an orebody 119½' wide, averaging \$17.15 per ton, was cut by a diamond drill hole and a crosscut extended out to it on the 700' level. This will, it is hoped, increase the grade of ore mined which averaged below \$5 a ton compared with \$8 at the Hollinger, \$6 at the Schumacher, \$10 at the Porcupine Crown and Porcupine V. N. T. properties.

In April, 1917, operations were further curtailed, the mill treating but 28,900 tons yielding \$132,000, compared with 36,500 normally, or \$175,000 and 39,600 tons in Jan., producing \$181,000. The 1,500-ton mill treated only 963 tons daily in April, owing to lack of labor, but was run full capacity in Sept.

The Dome is a long-lived mine with liberal orebodies which will be profitably mined for many years to come. It can continue its current dividend of \$1 a year for a decade unless forced to shut down temporarily for lack of labor in 1917.

Owing to increased cost of supplies and labor shortage, the company, early in Dec., 1917, decided to suspend milling during the winter. The new shaft, 800' deep, will be sunk deeper, and diamond-drilling continued.

HARGRAVE SILVER MINES, LTD.

Has holdings in the Porcupine district. See same title in Cobalt section.

HOLLINGER CONSOLIDATED GOLD MINES, LTD. ONTARIO

Offices: 85 Bay St., Toronto, and Timmins, Ont.

Officers: Noah A. Timmins, pres.; John McMartin, v. p.; D. A. Dunlap, sec.-treas.; P. A. Robbins, managing director; above with L. H. Timmins and J. B. Holden, directors.

Inc. 1916, in Ontario. Cap., \$25,000,000; shares \$5 par; 4,920,000 issued, Jan. 1, 1917.

Toronto Genl. Trusts Corp. and Montreal Trust Co., transfer agents. Guardian Trust Co. and Montreal Safe Deposit Co., registrars.

Dividends: initial dividend of 1% paid July, 1916; 1% quarterly paid to March, 1917, when rate was decreased to 1% every 8 weeks; June, 1917, dividends suspended. Company is a consolidation of the Hollinger Gold Mines, Ltd., Acme Gold Mines, Ltd., Millerton Gold Mines, Ltd., and Claim 13,147 of the Canadian Mng. & Finance Co., Ltd.

Stock was issued as follows: 200,000 shares in treasury; 2,400,000 to Hollinger shareholders; 2,100,000 to Acme shareholders; 100,000 to Canadian M. & F. Co. shareholders.

Shareholders in Acme, Millerton and Canadian M. & F. companies were to receive full dividends from Jan. 1, 1916, on Hollinger Consolidated stock issued to them; amounting to \$720,000 in June, 1916. Owing to increased labor costs and scarcity of labor, operations resulted in a deficit and company sold 120,000 shares to shareholders at \$6.50, proceeds being used to pay the \$720,000 indebtedness.

Income and expense account for 1916: gold-silver production, \$5,073,401; misc., \$212,461; total, \$5,285,862.

Operating expenses, \$2,134,539; dividends, \$3,126,000; taxes, \$144,063; depreciation, \$150,000; total, \$5,554,601. Deficit for year, \$269,591.

Property: 11 claims, 440 acres, patented in Tisdale Twp., Porcupine. The chief rock of the entire area consists of basalt in the S. E. portion and the common greenstone of the Keewatin series in the N. W., while between these two areas, approximately 2,000' apart, lies an area of basalt schist and an area of greenstone schist, which have been intruded by a quartz-feldspar porphyry. The porphyry has not, except near its marginal contacts with the older rocks, proved of value as a source of gold, yet it is believed that its occurrence has had some definite influence upon the mineralization and concentration of gold values in the older rocks. It is within the area between the basalt and the greenstone that the gold bearing veins are found; 54 veins had been found on the Hollinger property up to 1915, and 12 had been reached by underground workings. Orebodies consist of quartz veins and country rock containing gold and pyrite. Veins are not fissures with well defined walls; the fissuring has been very irregular; a vein consisting largely of quartz in one place may consist of quartz veinlets and intervening schist a short distance away. In No. 1 shaft the veins are practically vertical.

Ore reserves estimated Dec. 31:

	Tons	Value	Estimated Gross Value
1916*	3,938,540	\$8.68	\$34,185,535
1915(a)	1,846,000	9.65	17,824,800
915.	1,600,800	10.02	16,031,600
914.	1,162,960	11.49	13,358,420
913.	845,300	13.71	11,604,800
912.	664,540	17.48	11,271,400
911.	462,000	22.14	10,230,000

*For consolidated properties.

(a) Reserves refigured for consolidation purposes.

Development: by shafts to depth of 1,250' on the old Hollinger claim; No. shaft on the Millerton was deepened and a 4' vein encountered carrying \$15 old ore. The Acme being developed by shafts Nos. 9 and 11. Claim 13,147 as idle, 1916.

Development during 1917 has been very extensive. Approximately one mile of underground work is being done per month, and development work is being pushed forward at one hundred different faces. Every level from the

surface to 1,250' is being opened up and about 40 machines are engaged on the work, with the result that it is expected the ore reserves at the end of the current year will show a considerable increase. Heretofore reports on ore reserves at this mine did not include anything below the 900' level, and the decision to resume developments at the 1,250' depth is of interest.

Total work done, 1916, was 20,280'. Average number of men employed in 1916 was 1,056, against 735 in 1915 and 546 in 1914.

Mill: 100-stamps and cyanide plant, with daily capacity of 3,000 tons. The ore is easily treated; practice is to crush by stamp and to regrind in tube mills, preparatory to cyanide treatment.

Power: obtained from the central power plant built by the C. M. & F. Co.

Recent production and costs (costs are per ton of ore milled):

	Tons Milled	Average Value	Milling Costs	Mining Costs	Assay Tailing	Values Recovered
1916.....	601,854	\$8.84	\$2.188	\$0.969	\$0.40	\$5,073,401
1915(a).....	334,750	10.11	2.18	9.99	.40	3,169,813
1914.....	208,936	13.676	2.70	1.220	.56	2,719,354

(a) In addition there was milled 106,486 tons Acme ore at a cost of \$1.09 per ton.

Operating costs are greatly affected by the war; the price of explosives in Feb., 1916, was sufficient to add 15c per ton to the mining costs; milling costs per ton were increased 7c, due to advanced price of zinc dust. It is expected that greater economies in operations will partly offset the increased cost.

Company has been working against great odds owing to lack of skilled labor and increased cost of supplies. A comparison of costs shows but a slight increase, but this is due to the economies made possible by the consolidation of the different properties. Under normal conditions management expects to be able to reduce working costs from 40c to 50c per ton.

JUPITER MINES, LTD.

ONTARIO

Succeeded, 1915, by the McIntyre-Jupiter Mines, Ltd., which see.

KENEBEC SILVER MINES, LTD.

ONTARIO

Address: W. H. Jeffrey, mgr., Temiskaming district, via Cobalt, Ont.

Development: on the Veteran claim, 2 veins have yielded some high-grade silver ore. Ore occurs in Keewatin formation.

Equipment: includes boilers, hoist, and 5-drill compressor.

KIRKLAND LAKE EXPLORATION, LTD.

ONTARIO

Office: Pinners Hall, Austin Friars, London, Eng.

Officers: C. H. Villiers, pres.; H. J. Hollingsworth, and R. D. La Bere, directors. E. C. Wheeler, sec.

Inc. Jan., 1914, in England to acquire mining properties in Ontario. Canada. **Cap.,** £150,000; shares £1 par; 26,000 issued. On June 30, 1914, assets included stocks and bonds at cost, £10,320; interest in the Kirkland Lake district, £1,650. Organization expenses, £5,498; exploration, etc. £12,001; cash, £116.

Property: in Swastika district, near Porcupine, Ontario, Can., and an interest in claims adjacent to the Tough Oakes mine. Is a holding company. inactive during the war.

KIRKLAND LAKE GOLD MINING CO., LTD.

ONTARIO

Address: Kirkland Lake, Ont., or c/o Beaver Consolidated, Cobalt, Ont. **Cap.,** \$2,000,000; shares \$1 par; 1,830,526 issued.

Property: under option to the Beaver Consolidated Mines, Ltd., of Cobalt, since Oct., 1915. In Dec., 1917, the Temiskaming Mining Co. It acquired 871,525 shares of Kirkland Lake at 40c from the Beaver Consolidated.

Development: shaft sunk 700', with levels every 100'. On No. 1 level the vein was opened for 166'; on No. 2 it was faulted; on No. three, 5', 10' and 12' of ore was cut, assaying from \$7 to \$12.80 per ton; on No. 4 there is 220' of ore; on No. 5 some rich ore was opened; while No. 6 was satisfactory. In 2 years, work totaled 4,608'.

Ore reserves: estimated at \$1,000,000, including 8,000 tons of \$10 ore on dumps. A new shaft will be sunk at a better location and a 150-ton mill is to be constructed. All money is provided by the Beaver Consolidated and Temiskaming Mining companies.

Equipment: includes steam plant, electric motors, double-drum hoist, 4, 10 and 12-drill compressors, shops, residences, assay office, and 150-ton mill to be ready by June, 1918.

This property appears to have a future, and is in good hands.

KIRKLAND LAKE PROPRIETARY, LTD. ONTARIO

Secretary and office: J. J. Sneddon, Finsbury Pavement House, London, E. C., Eng.

Directors: H. G. Latilla, A. Burt, C. A. Foster, J. D. G. Simpson and G. F. Wyatt.

Inc. Nov. 27, 1913. **Cap.**, £200,000; shares £1 par; 75,000 issued and fully paid. First annual meeting was held Aug. 3, 1915.

Company's assets consist of shares in the following companies: Tough-Oakes Mines, Ltd., Burnside Gold Mines, Ltd., Sylvanite Gold Mines, Ltd., Teck-Hughes Gold Mines, Ltd. and Sudbury Syndicate, Ltd.

Balance sheet Feb. 28, 1916, shows general expenses, £13,882; cash, £63; debtors, £19,824; loans and interest, £59,448; shares and interests in properties at cost, £82,101; creditors, £11,221; loans and interests, £89,950.

KITCHIGAMI GOLD DEV. CO. ONTARIO

Officers: John Daniell, pres., Calumet, Mich.; John MacRae, v. p.; Chas. Chynoweth, sec.; Jas. T. Fisher, treas.

Inc. 1915, in Ariz. **Cap.**, \$300,000; shares \$2 par; 100,000 shares subscribed at 25c.

Property: 160 acres, Gordon McGuire claims, on Goldfish lake, Morisette township, Ont., Kirkland district, adjoining the Goldfish Lake Gold Mine Co. Ground acquired on advice of Chas. W. Botsford, E. M.

Some diamond-drilling was done in 1916, without important results.

LA BELLE KIRKLAND MINES, LTD. ONTARIO

Property: the Gibson group of claims at Goldfish Lake, Kirkland Lake district, Cobalt, Ont., shows molybdenite and gold ore in Keewatin formation. Developed to depth of 350' by shafts and crosscuts, showing several 2' stringers of high-grade ore. Encountered fault on this level, April, 1916. Diamond drilling totaling 5,000' was done 1916 and is said to indicate one to 700' depth. On the 100' level a promising vein is under development.

Equipment: includes compressor and hoist good for depth of 1,000'.

Suspended operations, July, 1917, pending financing.

LAKE SHORE MINES, LTD. ONTARIO

Haileybury, Ont. Harry Oakes, pres.; J. W. Morrison, sec.-mgr.

Inc. Feb. 25, 1914, in Ontario. **Cap.**, \$2,000,000.

Property: the Lake Shore gold mine, on Kirkland Lake, adjoins the Teck-Hughes on the east.

Development: by 300' shaft with crosscut at 200' level. One vein has been developed to bottom level and 2 others, under the lake, have been cut by drift. In July, 1917, a strike of ore was reported at a point 150' in the drift. Values are gold.

Equipment: includes 7-drill compressor. About 30 men employed.

LA MINE D'OR HURONIA, LTD.

ONTARIO

Three Rivers, Quebec.

Officers: Chas. Lafond, pres.; P. V. Ayotte, v. p.; A. Lebrun, sec.-treas.; E. H. York, gen. mgr.

Property: 4 claims, 177 acres, in McVittie Twp. and in Gauthier Twp. Swastika district, Ont., Can., 18 miles from Dane.

Development: by 3 shafts, 102', 75' and 45' deep, a 300' tunnel and 125' of drifting on the 50' level.

Equipment: includes mill and hydro-electric plant. Power is transmitted to the mine from the Goldfields mine at Larder Lake. Total gold production to date amounts to \$7,064. About 40 men employed.

MCINTYRE EXTENSION MINES, LTD.

ONTARIO

Property and assets of this company purchased by McIntyre Porcupine Mines, Ltd. (which see), by payment to minority shareholders of 294,000 shares in exchange for 955,501 shares of McIntyre Extension Mines, Ltd. See Vol. XII for description of property, and history of company.

MCINTYRE-JUPITER MINES, LTD.

ONTARIO

Property and assets of company purchased by the McIntyre Porcupine Mines, Ltd. (which see), by payment to minority shareholders of 316,298 shares of McIntyre Porcupine Mines, Ltd., in exchange for 943,893 shares of McIntyre-Jupiter Mines, Ltd. See Vol. XII for description of property and of organization.

MCINTYRE-PORCUPINE MINES, LTD.

ONTARIO

Offices: Royal Bank Bldg., Toronto, and Schumacher, Ontario.

Officers: J. P. Bickell, pres.; H. M. Pellatt, v. p.; with W. J. Sheppard, J. B. Tudhope, H. D. Symmes, E. F. B. Johnston and G. E. Drummond, directors. M. P. Van der Voort, sec.-treas.; L. J. Pashler, asst. sec.; R. J. Ennis, gen. mgr.; J. E. McAllister, mine supt.; A. Dorfman, mill supt.

Inc. March 16, 1911, in Ontario. **Cap.**, \$3,000,000; shares \$1 par; outstanding, \$2,986,985. Capital increased to \$4,000,000, shares \$1 par, in 1917, when company purchased properties and assets of McIntyre Extension Mines, Ltd., and McIntyre Jupiter Mines, Ltd. Payment amounted to 610,298 shares for both mines. McIntyre-Porcupine shares issued total 3,610,283. The capital of the three amalgamated companies was \$7,500,000, \$7,398,878 issued.

Toronto General Trusts Corp. and Security Transfer & Registrar Co., New York, transfer agents and registrars. Annual meeting, first Monday in February. Traded in on New York Curb and Standard Exchange, Toronto.

Funded debt: first mortgage 7% 5-year gold bonds, due Aug. 15, 1918; interest February 15 and August 15, at office of the trustee, Toronto General Trusts Corp. Coupon, \$500, registrable as to principal. Authorized \$250,000; redeemed, \$158,000; unissued, \$41,500, purchased \$39,500; outstanding, \$11,000. One-fifth of issue may be redeemed at par and interest at end of first year, and the whole or any part of the balance of outstanding bonds at 105 and interest at end of second year.

Dividends: initial dividend of 5% paid Feb. 15, 1917; also 5% May 31, 1917, total \$361,028.

Comparative General Balance Sheet: year ending March 31st—

Assets:

	Plant and Equip.	Capital Devel.	Investments	Disc. on Sec. Sold	Current	Total
1917(b).....	\$4,432,250	.....	\$100,000	.....	\$319,530	\$4,851,780
1916.....	2,921,991	209,508	175,036	\$211,992	151,963	3,670,490
1915(a).....	2,799,035	209,508	.....	214,492	104,670	3,327,705

(a) 15 months, ending March 31. (b) 15 months, ended June 30, 1917.

Liabilities:

	Capital Stock	Bonds	Current	Reserves	Profit and Loss	Total
1917.....	\$3,610,283	\$11,000	\$87,597	\$400,996	\$741,903	\$4,851,780
1916.....	2,999,985	31,000	111,989	144,466	383,050	3,670,490
1915.....	2,986,985	54,500	114,704	4,989	166,527	3,327,705

Comparative Operating Account: year ending March 31—

	Receipts	Disbursements			Profit and Loss Account
		Mine	Mill	Miscel.	
1917(b).....	\$1,693,040	\$526,200	\$159,005	\$285,185(c)	\$725,790
1916.....	775,821	265,622	102,389	80,286	327,524
1915(a).....	749,234	319,203	101,354	95,923	232,752

(a) 15 months, ending March 31. (b) 15 months ended June 30, 1917. (c) Includes depreciation, \$114,764.

Property: located on the south, west and north sides of Pearl Lake. Tisdale Twp., comprises 347 acres, of which 113 acres are under Pearl Lake and Gillies Lake. The area added by acquiring the Extension and Jupiter mines was 127 and 79 acres, respectively. The immediate object of amalgamation was to secure the right of operating through the Extension main shaft for deeper exploration of the McIntyre property on N. side of Pearl Lake. Recent work revealed large orebodies at 1,000' depth in both mines.

An option is held on the Plenaurnum property of 120 acres, adjoining the Jupiter section.

Geology: the north and south sections of the property show areas of altered volcanic schist, basalt and associated lavas; between them there is a broad band of schistose quartz porphyry. Veins are classified in the following systems: veins in the basalt and gray schist and veins in the contact between the quartz porphyry and gray schist on the south side of Pearl Lake; No. 5 vein and veins in the contact zone paralleling the north contact between the quartz porphyry and the basalt on the north side of Pearl Lake. veins in the quartz porphyry.

Exploration has shown that the best deposits of gold occur in the altered volcanic schist, at or near the contact with the quartz porphyry; development in the quartz porphyry away from the contact has not shown much gold. Orebodies are lenticular in form and very irregular; the ore shoots consist of quartz more or less interbanded with mineralized schist. The location of orebodies has been rendered difficult by the presence of compression faults which have displaced portions of the ore as much as 130'.

Eighty per cent. of ore milled is heavily mineralized schist.

Development: by shafts to 1,000' depth, amounting to 44,651' to end of June, 1917; also 19,920' of diamond drilling. A report issued in Sept. 1917, states that exploration continues to be most satisfactory. On 1,000' level the main vein has been opened for 1,150', of which 900' is high-grade milling ore. At depth of 1,387' the drill has cut this vein, where it is 19' wide, assaying \$25.30 per ton. Veins in the McIntyre-Jupiter property are from 24 to 50" wide, with rich stringers running out into the walls along the joint planes.

Ore reserves: due to form and occurrence of orebodies, it is impracticable to attempt to block out ore in the usual manner.

Date	Tons	Average Value	Total Value
June 30, 1917.....	443,617	\$11.14	\$4,943,034
Mar. 31, 1916.....	201,920	11.12	2,247,128
1915.....	109,693	7.79	854,436

Reserves were considerably enlarged by acquiring the Extension and Jupiter mines, and subsequent development.

Equipment: property is well equipped with hoisting and milling facilities, the latter including a 525-ton cyanide plant. The ores yield 95% of their gold content to the simple treatment of grinding in cyanide solution and giving them a short period of agitation. Treatment was described by A. Dorfman in Aug., 1917, Bulletin of Canadian Mining Institute.

Production:

	Tons	Value	Rec.	Costs per Ton			Profit
	Milled	per Ton	%	Mine	Mill	Tot. Optg.	per Ton
1917(c).....	195,307	\$10.00	95.4	\$2.99	\$0.89	\$4.78	\$5.22
1916(a).....	105,758	7.71	95.6	2.51	.96	4.28	3.09
1915(b).....	85,654	8.87	94.4	3.72	1.18	6.02	2.5
1913.....	31,979	7.85	89.8	.....	.....	.....	.....
1912.....	14,500	7.00	75.0	.....	.....	.....	.....

(a) Year ending March 3. (b) 15 months, ending March 31. (c) 15 months ended June 30, 1917.

Mine development during the past 3 years has shown steady improvement. The lower levels so far as opened up have proven to be as productive as the upper levels, while lateral development on the upper levels has cut new orebodies. The results of the underground work, together with the addition of adjoining properties, assures a productive life to the company, and the making of another large producer for Porcupine.

MILLER INDEPENDENCE MINES, LTD.

ONTARIO

Address: Boston Creek, Northern Ontario.

Inc. Nov. 17, 1915, in Ont. Cap., \$500,000.

Property: in the Boston Creek district.

Ore: consists of white quartz, with some pyrite, galena and telluride, in fine grained pillow lava and hornblende. On the hanging wall of the vein is a feldspar-porphry dike. Gold occurs with the minerals. A Nissen stamp mill and oil flotation plant were erected in 1916.

NEWRAY MINES, LTD.

ONTARIO

Office: 55 Yonge St., Toronto, Ont., Canada.

Officers: C. Millar, pres.; H. W. Drayton, v. p.; C. P. Charlebois, mgr.

Inc. in Ont. Cap., \$1,500,000; shares \$1 par; 1,200,000 issued. Imperial Trust Co., Toronto, transfer agent.

Is a reorganization of the Rea Consolidated Gold Mines, Ltd.; shares exchangeable at the rate of 1½ shares in the new company for every share of Rea Consolidated stock.

Statement for 1916 shows cash in banks \$13,312, less current liabilities. -\$7,904. Receipts in 1916 totaled \$31,757, of which \$31,050 was from sale of "donated" stock. Expenses were \$20,530, of which \$6,588 was spent in drilling and prospecting, and \$3,091 on plant.

Property: North ½ of lots 6 and 7, Concession III, about 320 acres, comprises the Rea mine, at Porcupine, Ont., 1½ miles from Schumacher, the nearest railroad station. Mine was operated in 1914 under lease by the Porcupine-Aurum Mng. Co. The veins are well-defined quartz fissures, strike N. E. and dip N. W.; ore-shoots occur as lenses in and along shear zones.

Development: 2-compartment vertical shaft, sunk 420' on vein, with levels at 200, 300 and 400'. On the 200' level 390' of drifting was done. The oreshoot is cut and displaced by a fault at depth of 240'; below the fault the vein is not of the same character nor does it show ore. The orebody above the fault was stoped out for about 300' in length, 4½' wide, and 200' in

depth and is said to have produced 19,500 tons of ore, averaging \$11 per ton.

In Nov., 1916, the diamond drill was down 900', and is said to have cut 12' of quartz showing free gold at 630' vertical. A crosscut on the 400' level, 985' from the shaft, opened 5' of ore in Aug., 1917.

Equipment: includes 10-stamp mill, which is to be considerably enlarged, Sullivan hoist, 6-drill compressor, pumps and boiler.

Production: mill treated 11,607 tons of ore yielding \$125,000 in bullion in 1915. It resumed treatment in May, 1917, but recent returns are not available.

Property reported on by C. H. Poirier, June, 1916.

An immense quantity of literature has been published about this mine, mostly in the interest of speculators. Evidently, the management is trying hard to make it a large producer.

In Nov. 1917, property was taken under control by the Crown Reserve company of Cobalt.

NORTH DOME MINING CO.

ONTARIO

Owned by Temiskaming Mining Co., Ltd., which see.

NORTH THOMPSON (ASSOCIATED) GOLD MINES, LTD.

ONTARIO

Merged, 1917, into Porcupine V. N. T. Gold Mines, Ltd., which see.

ORR GOLD MINES, LTD.

ONTARIO

Address: Kirkland Lake, Ont., Can.

Inc. 1917. Cap., \$3,000,000.

Has taken over the Orr group.

PEARL LAKE GOLD MINES

ONTARIO

Bankrupt. Property acquired, 1915, by McIntyre Extension Mines, Ltd., a subsidiary of the McIntyre-Porcupine Mines, Ltd.

PENNIAC GOLD REEF MINES CO.

ONTARIO

See Star Lake Gold Mines, Limited.

PORCUPINE CROWN GOLD MINING CO.

ONTARIO

Offices: Dominion Exp. Bldg., St. James St., Montreal, Que.; 59 Victoria St., Toronto, and Timmins, Ont.

Officers: J. W. Carson, pres.; W. I. Gear, 1st v. p.; J. G. Ross, 2nd v. p.; above with C. A. Smart, J. W. Ross, A. G. Gardner, R. W. Redford, F. S. Meighen, Ziba Gallagher, James Cooper, directors. James Cooper, sec.-treas.; John Reid, asst. sec.-treas.; Samuel W. Cohen, Cobalt, Ont., gen. mgr.; M. W. Summerhayes, mgr.

Inc. in Oct., 1913. Cap., \$2,000,000; shares \$1 par. Crown Trust Co., Montreal, registrar and transfer agent. Traded on New York Curb.

Balance sheet of Dec. 31, 1916, showed net profit for the year \$270,430, making total with balance brought forward of \$542,445; dividends, 12%, absorbed \$240,000, other accounts \$25,360, leaving surplus of \$277,085.

Statement for half year ending June, 1917, shows income from bullion sales, \$245,031; expenses, \$120,352, leaving profit of \$124,180.

Dividends: 3% quarterly has been paid since 1914. Total to Aug., 1917, \$840,000. In August directors decided to suspend dividends on account of shortage of labor due to the war which prevented keeping development ahead of production.

Property: one patented claim, 40 acres, at Porcupine, Ont., shows quartz ore with free gold and sulphides in veins in schist. Orebody is 5' wide and 1,100' long. Vein strikes N. and has dip of 70° S.

Development: by 900' vertical shaft. New work in 1916 totaled 1,753' with 4,156' of diamond drilling. Ore mined by shrinkage stoping.

Ore reserves: management reports 97,000 tons of ore blocked out, valued at \$1,050,000.

Equipment: includes 150-ton cyanide mill. Costs per ton for 1916 were: mining, \$2.17; hoisting and tramping, 43c; mill operations, \$1.10; power, heat and maintenance, 90c; general mine expense, 53c; administration, depreciation, insurance and taxes, 34c; total, \$5.47.

Production:

	Tons Treated	Value per Ton	Extrac- tion	Net Value Bullion
1916.....	51,273	\$12.11	97.14%	\$571,652
1915.....	41,326(a)	14.46	97.70%	613,565
1914.....	40,857	17.18	97.26%	689,151

(a) In addition there was treated 5,093 tons from impounded tailing of the first amalgamation mill, assaying \$3.15 per ton, extraction 85.77%.

Some high-grade ore was opened up on the 800' and 900' levels, 1916, but the prospects of finding new veins are not favorable since the quartz porphyry throughout the Western portion of the property has been proven non-productive. Milling operations being carried on, October, 1917, at a rate sufficient only to pay expenses.

PORCUPINE EXCELSIOR MINING CO., LTD. ONTARIO
Porcupine, Ont., Canada.

Officers: P. Cameron, pres.; Wm. Duncan, sec.; G. L. Wheeler, asst. sec.

Property: claims, Nos. 13890, 13891 and 900 P. in Shaw Twp., Nipissing district, Ont., formerly owned by the Tommy Burns Mining Co.

PORCUPINE MINES SYNDICATE ONTARIO

Care Mark Harris, Mutual Life Bldg., Buffalo, N. Y. Is a new scheme of the above named promoter and his associates, who are too well known in the United States.

Will acquire the Cross Veteran location, 160 acres, in Tisdale Twp., Porcupine district. Not regarded favorably.

PORCUPINE PREMIER GOLD MINING CO., LTD. ONTARIO

Office: G. W. Fields, treas.-gen. mgr., 53 State St., Boston, Mass. B. M. Walton, supt.

Inc. in Mass. Cap., \$1,000,000; shares \$1 par. Traded on Boston Curb.

Property: 40 acres in Whitney Twp., 110 acres in Deloro Twp., Porcupine district, Ont., Can. Also said to own Standard group of about 110 acres, south of Dome Lake property. Is reported, 1916, to have bought the Virtue mine near Baker, Oregon.

Development: on the Porcupine property consists of two shafts, one 200' deep, with drifts and crosscuts. Mines are in the prospect stage and are outside of the proven belt, but are regarded as worthy of prospecting. Company's promoter is also treasurer and general manager.

PORCUPINE VIPOND MINES, LTD. ONTARIO

Merged, 1916, into Porcupine V. N. T. Gold Mines, Ltd., which see.

PORCUPINE V. N. T. GOLD MINES, LTD. ONTARIO

Office: 50 East 42nd St., New York.

Mine office: Schumacher, Ontario, Canada.

Officers: Henry H. Ward, pres.; H. A. Poillon, v. p.; Chas. C. Dickson, v. p.-treas.; H. F. Karst, sec.; C. H. Poirier, mgr., with L. A. Sorenson, and J. A. Carey, directors. H. W. Heine, supt

Is a merger of the Porcupine Vipond and North Thompson Mine companies. Inc. 1917.

Property: about 160 acres, adjoining the Hollinger on the west, in the Porcupine mining district, Ontario, Canada. Claims show several veins, one cut on 600' level reported to average 20' in width and to carry \$15 gold ore.

Ore: gold quartz, occurs in fissure veins, said to be 3'-10' wide, which

run N. E.-S. W. and are vertical. Pay ore occurs in a shoot 900' long. Formation is an amygdaloidal basalt.

Development: by 600' shaft.

Ore reserves: in the Vipond, April 1, 1916, estimated at 68,145 tons in place, valued at \$8 per ton, and 22,850 tons already broken, but not pulled, averaging \$6.25 per ton, a total of 91,000 tons, valued at \$688,600.

Equipment: includes hoist, 2 compressors, hydro-electric and steam power, and 140-ton mill, which employs the continuous decantation process and is equipped with Buchanan crusher, 6' Hardinge ball mill, classifiers, Dorr agitators and Dorr thickeners. New 400-ton mill to be erected.

Production: treating 100 tons daily, Aug., 1917.

PRESTON EAST DOME MINES, LTD.

ONTARIO

Office: 7 Melinda St., Toronto, Ont., Canada.

Officers: Lt. Col. D. M. Robertson, pres.; Gordon Taylor, sec.-treas., with C. L. Sherrill, R. T. Shillington and D. L. White, Jr., directors.

Inc. 1911, in Ont. **Cap.**, \$3,000,000; shares \$1 par; 2,500,000 shares outstanding. Stock listed on New York Curb. Toronto General Trusts Corp'n, Toronto, transfer agents.

Property: 3 claims, patented, in Tisdale Twp., Porcupine, Ont., adjoining the Dome Mines, Ltd.

Ore: which occurs in narrow veins in quartz-porphry, carries coarse gold, associated with pyrite and zinc-blende. Company is idle, pending outcome of further development on the Dome Mines property. Secretary reports a small cash balance on hand.

R. A. P. SYNDICATE

ONTARIO

Succeeded, 1916, by the Boston Creek Gold Mines, Ltd., which see.

RAPP MINING DEVELOPMENT & PROSPECTING CO. ONTARIO

Address: Boston Creek, via Krugersdorf on the Ont. Northern Ry.

Property: the original "find" at Boston Creek shows a gold-bearing quartz vein on which shaft has been sunk.

Equipment: includes hoist, compressor, etc.

REEVES-DOBIE MINES, LTD.

Reported incorporated June, 1917, to develop the Reeves-Dobie group at Gowganda. **Cap.**, \$2,000,000.

SCHUMACHER GOLD MINES, LTD.

ONTARIO

Head office: 85 Bay St., Toronto, Ont. **Mine office:** Schumacher, Porcupine district, Ont.

Officers: F. W. Schumacher, pres.; F. L. Culver, v. p.; with J. Y. Murdoch, H. E. Tremain and O. G. Manby, directors; F. A. Hammond, sec.; E. S. Davis, treas.; S. A. Wookey, mgr.

Inc. July 16, 1914, in Ontario. **Cap.**, \$2,000,000; shares \$1 par; 1,750,000 issued, plus 100,000 sold July, 1917.

Balance sheet for year ended June 30, 1916, shows assets totaling \$1,857,532, including property \$1,393,970; plant and equipment, \$127,526; development \$121,237; current assets, \$49,799; and discount on shares \$165,000. Liabilities included current \$37,300; and surplus \$69,935.

Revenue from bullion, etc., was \$163,992, of which \$31,933 was profit.

Property: the Schumacher mine, adjoining the McIntyre on the W. for $\frac{1}{8}$ mile and the Acme of the Hollinger Consolidated for $\frac{3}{8}$ mile, Porcupine, Ont.

Development: surface showings are numerous and extensive. No. 1 vein is 1,150' long and from 50 to 60' wide. It is considered that the ore zone is 1,000' wide, running E. and W. Openings to date total 8,880' to 600' depth. Two orebodies cut on the 600' level by diamond-drill have not been mined yet.

Reserves: were estimated at 64,900 tons, worth \$6.11 per ton. The main

shaft was to be sunk to 1,000' in Sept., 1917, and No. 4 shaft, 1,400' E. of main shaft, to 400'.

Equipment: hoist, 25-drill compressor, boilers, shops, 150-ton plant containing Hardinge and tube mills, and 300-ton continuous decantation cyanide plant.

Production: Oct. 1, 1915, to June 30, 1916, 30,120 tons of ore yielding \$161,949.

Early in July, 1917, property was closed for a period of 51 days to overhaul mine and plant. In September work was in full swing again.

Property apparently has a good future, judging by nearby mines.

SYLVANITE GOLD MINES, LTD. ONTARIO

Subsidiary of Kirkland Lake Proprietary. Chas. A. O'Connell, mgr., Kirkland Lake, Ont.

Inc. June, 1913, in Ont. **Cap.**, \$2,000,000.

Owns the Wright and Robbins claims adjoining the Tough-Oakes gold mine, Kirkland Lake. Work to date has been chiefly surface exploration.

Letters returned in 1917.

TECK-HUGHES GOLD MINES, LTD. ONTARIO

Office: Bankers Trust Bldg., 14 Wall St., New York. **Mine office:** Kirkland Lake, Ont.

Officers: C. L. Denison, pres.; R. W. Pomeroy, v. p.; A. D. Crooks, sec.; H. C. Clarke, treas.; also directors. L. W. Ledyard, supt.

Inc. in Ontario. **Cap.**, \$2,000,000. **Bonds:** \$250,000.

Statement for year ended Aug. 31, 1916, showed an expenditure of \$52,455, and \$156,485 total to that date. Current assets were \$96,987, and current liabilities \$4,484.

Property: 4 miles from Swastika, in Kirkland Lake district, Ont.

Development: by 600' shaft. At 400' the vein is said to be up to 30' wide. Exploration is reported as being entirely satisfactory.

Equipment: hoist, 10-drill compressor, and plant, including ball and tube mills, cyanidation by counter current decantation, and Oliver filter. Electric power is supplied by the Northern Ontario Light & Power Co. of Cobalt, whose transmission line is 65 miles long.

Production: commenced March, 1917, and up to July the total was 5,121 tons ore, yielding \$37,853. The ore varied from \$4.84 to \$9.66 per ton, and the mill is treating 40 tons daily.

Is one of the promising mines of the Kirkland Lake district.

TEMISCAMING & HUDSON BAY MINING CO., LTD. ONTARIO

Address: New Liskeard, Ont., Can.

Officers: Geo. Taylor, pres.; A. A. McKelvie, v. p.; with T. McCamus, John Dunkin, F. L. Bapst, W. H. Kinch, Chas. L. Sherrill, directors; F. L. Hutchinson, sec.-treas.; D. A. Mutch, mgr.

Inc. July 29, 1903, in Ontario. **Cap.**, \$25,000; shares \$1 par; outstanding \$7,761. Annual meeting, last Tuesday in October. Company is a holding corporation, whose operating company is the Hudson Bay Mines, Ltd., which in turn controls Dome Lake Mining & Milling Co., Ltd.

Balance sheet for year ending Aug. 31, 1916, shows: assets \$2,956,599, which includes, stock of Hudson Bay Mines, Ltd., 580,000 shares, \$2,900,000; cash, \$2,113; Hudson Bay Mines, Ltd., account receivable, \$49,673; Gowanda claims, \$4,500; furniture, \$313. Liabilities include: outstanding capital stock, \$7,761; balance, loss and gain account, \$2,948,838.

For year ended Aug. 31, 1917, assets totaled \$2,853,180, including 556,000 Hudson Bay Mines shares, \$2,780,000; accounts receivable, \$66,096; cash, \$2,302. Liabilities include capital \$7,761, and balance at credit of loss and gain account, \$2,845,419.

Dividends: during 1915-'16 one 300% dividend was paid, bringing total dividends paid since incorporation in 1903 to 25,000%, or \$1,940,250. Operations are described under titles of the subsidiary companies.

TISDALE GOLD MINING CO., LTD.

ONTARIO

Inc. Oct., 1910, in Ont. **Cap.**, \$500,000 shares \$5 par. See Dobie Mines, Ltd.

TOMMY BURNS GOLD MINING CO.

ONTARIO

Address: H. B. Hatch, Porcupine, Ont.; and Phil. Moore, Brookfield, Nova Scotia.

Officers: W. E. Beattie, pres.; L. M. Myers, v. p.; with V. Marone and J. Fairbrother, directors. A. W. Young, sec.-treas.

Inc. in Del. **Cap.**, \$3,600,000; shares \$1 par; Registrar & Transfer Co., 32 Nassau St., New York, registrar and transfer office.

Owns all but 5 shares of stock of the Tommy Burns Gold Mines, Ltd. Balance sheet of Jan. 31, 1916, shows no other assets besides this stock and \$5,000 cash. Balance sheet of the same date for the Tommy Burns Gold Mines, Ltd., gives this stock a value of \$99,995 and shows \$4,000 cash and total development expense of \$5,645.

See Tommy Burns Gold Mines, Ltd.

Canadian Mining Manual considers this a too much advertised company. Its promoters deserve credit for gall and nerve, but nothing more.

TOUGH-OAKES GOLD MINES LTD.

ONTARIO

(Subsidiary of Kirkland Lake Proprietary, Ltd.) **Office:** 119 Finsbury Pavement, London, E. C., Eng. **Mine office:** Kirkland Lake, Ont.

Officers: G. R. Bonnard, chairman; R. Simpson, E. H. R. Trenow, directors. C. O. Connell, mine mgr.; H. J. Almond, sec.

Inc. in England, Jan., 1914. **Cap.**, £500,000; shares £1; 230,007 outstanding. Organized to acquire 426,388 fully paid shares of company of same name registered in Canada, with a capital of \$3,000,000 (£600,000), in \$5 shares, together with an option to January 31, 1915, on a further 85,555 shares at 15s each and 85,555 at 20s. To September 30, 1915, £44,997 cash and £30,000 in fully paid shares had been paid on account of shares of which 66,781 had been delivered, and in the annual report, December 31, 1916, it was stated that legal proceedings were still in progress regarding delivery of further shares in the Canadian company. According to latest reports, litigation has not been terminated, but 280,555 more shares are in Court in England.

Cash on hand, Sept. 30, 1916, was \$5,860.

During 1915, two dividends of 2½% each were paid by the Canadian company and during 1916 four dividends of 2½% each.

For details of property see Tough-Oakes Mining Co., Ltd.

TOUGH-OAKES MINING CO., LTD.

ONTARIO

Office: Kirkland Lake, Ont.

Officers: C. A. Foster, pres.; Chas. O'Connell, mgr.

Inc. 1913, in Ontario. **Cap.**, \$3,000,000.

Earnings in 1916 were \$707,114, of which \$260,668 was profit. Dividends absorbed \$260,750, and with other deductions, there was a loss of \$104,667.

Dividends: to July, 1917, total \$391,125.

Property: 185 acres in the Kirkland Lake district, Ont., being the principal gold producer in that region.

Development: by shafts to 500' depth. Reserves are estimated as worth \$1,000,000.

Ore: is 85% hard feldspar-porphry, the remainder quartz with some conglomerate and graywacke.

Equipment: complete, with 120-ton mill using ball and tube mills and

counter current decantation cyanidation. Cost of treatment is \$2.43 per ton. Twenty machines are employed underground.

Production: in 1916 was 33,171 oz. gold and 13,051 oz. silver, from 39,863 tons of ore and tailing. In June, 1917, output was \$2,000 daily.

Company employs 200 men, is the only dividend payer in the district, and has a good future under present management.

UNITED KIRKLAND GOLD MINES, LTD.

ONTARIO

Address: Kirkland, Ont.

Officers: R. T. Shillington, pres.; W. G. Ellis, v. p.; H. A. Day, sec.-treas., with Levi Dodge and Ed. Kert, directors.

Inc. in Ontario. Cap., \$2,000,000; shares \$1 par; 1,000,000 issued.

Property: 135 acres near the Teck-Hughes mine, Kirkland Lake district, Ont. Geologic conditions are said to be similar to adjacent producers.

Development: by surface prospecting; No. 1 shaft being sunk in September, 1917.

Company may have fair prospects, but has received considerable advertising by brokers.

WEST DOME CONSOLIDATED MINES

ONTARIO

Office: Traders Bank Bldg., Toronto.

Officers: Sir Henry M. Pellatt, pres.; Hugh Blair, v. p.; C. H. Manaton, sec.-treas., with J. A. Murry, A. M. Hay, and G. A. Stimson, directors.

Inc. 1915, in Ontario to take over property and assets of the West Dome Mines Co. Cap., 3,000,000 shares; \$1 par; 2,000,000 shares offered in exchange for 3,000,000 shares in the old company, leaving 1,000,000 in the treasury to provide funds for development. Annual meeting in April. Listed on New York Curb and in Toronto.

Property: 176 acres adjoining the Dome mine on the W. in Tisdale Twp., Porcupine, Ont. Idle from 1912 to 1915 after fire destroyed surface equipment worth \$75,000.

Development: by 70° incline shaft, 365' deep, sunk on a quartz vein that averages 5' in width and in some places 8'. Eight veins have been found by diamond drilling, which cost \$30,000, to a depth of 1,800'. Work is being concentrated at 300' depth. Reserves in Sept., 1917, were estimated as worth \$2,000,000, the ore valued at \$6.17 to \$8 per ton.

Equipment: includes 12-drill compressor, electric motors and transformers, 4 boilers, drills, etc. A mill is now contemplated.

The Dome has a large probable tonnage and is expected to make a big mine.

WRIGHT-HARGRAVES MINING CO.

ONTARIO

Address: Kirkland Lake, Ont.

Development: by 2 main shafts, 300' deep. At 100' depth there is said to be 12' of \$30 gold ore. In October, 1917, the vein, where cut, at 300' depth, showed indications of making ore.

Ore: high-grade silver, containing arsenic and smaltite. Assays on shipments average from 500 to 6,000 oz. silver per ton. Deposits occur at contact of the Keewatin formation with a diabase sill. Pay ore is found in shoots.

Development: by vertical shaft. Greatest depth is 1,600' and total extent of workings over 4 miles. Reserves total 15,734 tons. In the first half of 1917, new development aggregated 2,750' including 117' of shaft sinking. Drilling at the North Dome amounted to 1,700', finding ore at depth. Work is suspended at this mine for a while owing to scarcity of labor.

Diamond drilling has proved that another contact occurs below the diabase sill at a depth of about 2,000'. In April, 1917, the main shaft

reached 1,600' depth, and was connected with the Beaver adjoining, where over 1,000 oz. ore had been opened at the lower contact. In July, prospecting for ore under the diabase sill was still underway.

Equipment: includes a compressor for 20 drills, a Nordberg hoist with 6' drums and a capacity of 2,500', and 150-ton, 40-stamp mill, equipped with concentrating machinery. Concentrates averaged 953 oz. silver per ton in 1916. Plant treated 32,897 tons.

Total cost of production, 1916, was 26.4c per oz. silver.

Mill tailings amounting to 150,000 tons, averaging 4 oz. silver per ton, are held in reserve, and will probably be treated by flotation.

The Temiskaming was in poor physical and financial condition early in 1914. Since then a profit of \$943,044 has been made by present management.

About July, 1917, H. B. Wills, a broker and M. Morgenstern, a shareholder, are alleged to have accused the management of distorting reports to shareholders. As a result the mine was examined by Balmer Neilly of the Penn-Canadian mines. He estimated 11,572 tons of positive ore broken, about 4,000 tons less than official reserves. Shareholders were not satisfied and Douglas Mutch of the Hudson Bay mine was employed to examine the mine. He estimated 10,816 tons of all classes of ore, containing 393,800 oz. silver. Little new ore is being developed. Exploration at 1,600', or lower contact, does not warrant further expenditure. This report generally vindicates the management.

This controversy is unfortunate, for while the Temiskaming is not a large mine, it seems to be carefully handled, is highly profitable, and though it has no great future, it may pay dividends for some time to come.

THUNDER MINING CO., LTD.

ONTARIO

Address: Dominion Reduction Co., 42 Broadway, New York. Julius Cohen, mgr.; H. H. Lavery, supt.

Inc. Oct. 7, 1916, in Ontario. **Cap.**, \$2,000,000; shares \$1 par; 1,610,000 issued.

Property: the St. Anthony Gold Mining Co.'s ground at Sturgeon Lake, Ont., held jointly by the Dominion Reduction Co. (66%), Kerr Lake Mining Co. (22%) and Wettlaufer-Lorrain (12%).

Considerable development has been done by the above owners.

TRETHEWEY SILVER-COBALT MINE, LTD.

ONTARIO

Office: 1601 Royal Bank Bldg., Toronto. **Mine office:** Cobalt, Ont.

Officers: S. R. Wickett, pres.; J. B. Tudhope, v. p., with Gordon Taylor, J. B. Bickell, W. J. Sheppard and T. E. Leather, directors; L. J. Pashler, sec.-treas.

Inc. 1906, in Ontario. **Cap.**, \$2,000,000; shares \$1 par; non-assessable; outstanding, \$1,000,000. No bond issues. Annual meeting, February. Toronto General Trust Corporation, transfer office. C. E. Robin, registrar. Listed on New York Curb.

No financial statement for 1915 is available, operations having been suspended for most of the year, owing to the low price of silver. For the seven months ended Dec. 31, 1916, gross earnings were \$156,746 and operating expenses were \$92,083.

Dividends: total, 113% of outstanding capital stock. Last dividend of 5%, paid Dec., 1916.

Condensed balance sheet: Dec. 31, 1916 shows assets, \$1,117,358, with liabilities as follows: cap. stock, \$1,000,000; accounts payable, \$13,223; credit of rev., \$104,135.

Revenue in 1916 was \$156,747, of which \$155,771 was from silver; profit was \$64,664.

Property: one patented claim, 40 acres, Coleman township, Cobalt district; also owns control in Rochester Mines, Ltd., of Cobalt. Ore deposits yield silver and cobalt and occur between conglomerate and diabase. Pay ore occurs in shoots. Average of all ore milled in 1916 gave 16.3 oz. silver.

Development: by vertical shaft, greatest depth about 230' and total linear extent of workings, 24,970'. Mining costs, \$3.34 per ton.

Equipment: compressors, hoists and other necessary mining machinery besides a 30-stamp concentrating mill with a capacity of 100 tons daily.

Total output to date, about 6,000,000 oz. silver.

Company spent \$35,956 during 1916, in prospecting other properties. Operates under lease the Rochester Mine at Cobalt, the Rochester to get 20% of the net profits.

A 100-ton flotation plant being erected in Sept., 1917, to treat slime dumps which contain 65,000 tons of 4.7 oz. material.

Production: in 1916, the mill treated 18,541 tons of 16.3 oz. ore at a cost of 1.59 per ton.

The Northern Custom Concentrators, Ltd., offered to buy the Trethewey property in 1916; the latter's directors recommended the sale, but shareholders voted it down. As the Beaver, adjoining the Rochester, has rich ore at 1,600', the latter has additional speculative value. Trethewey should be very profitable while present high silver prices continue.

UNIVERSITY MINES, LTD.

ONTARIO

Is a subsidiary of the La Rose Consolidated Mines Co., which see.

WETTLAUFER-LORRAIN SILVER MINES, LTD.

ONTARIO

Office: 61 Broadway, N. Y. **Mine office:** South Lorrain, Ont.

Officers: H. Lockhart, Jr., pres.; D. M. Steindler, v. p.; E. H. Westlake, sec.-treas.; the foregoing, and T. L. Herrmann, J.-H. Susmann, W. J. Magavern, W. H. Clipham, J. L. Mitchell and Herman Cook, directors. H. A. Kee, mgr.

Inc. Nov., 1908, in Ontario. **Cap.**, \$1,500,000; \$1 par; non-assessable; outstanding, 1,416,590 shares. Annual meeting, fourth Monday in January. Bankers' Trust Co., New York, and Trust & Guarantee Co., Ltd., Toronto, transfer offices; Security Transfer & Registrar Co., New York, registrar. Listed on New York Curb.

Operations ceased in 1913, owing to exhaustion of ore, and efforts to find other bodies in the property practically abandoned. Treasury contained \$129,153, which will be used for prospecting and purchase of other property. Examination of other properties planned for 1917.

During 1916 the company's properties were operated under a lease to the Comfort Mining & Leasing Co., Ltd., and royalties amounting to approximately \$8,250 were earned. The lessee assumed all expenses, and performed some development, but no important discoveries were made. The lease expired on Feb. 17, 1917, the lessee not having availed itself of the privilege to renew. In September, the Pittsburg Lorrain company took over the mine, and is to treat the low-grade dumps.

With respect to the option which was held by this company jointly with the Kerr Lake Mining Co., Ltd., on the properties of the St. Anthony Gold Mining Co., Ltd., at Sturgeon Lake, Ontario, considerable exploration was done in conjunction with the Kerr Lake company, this company bearing one-third of the expense. The Wettlaufer decided to participate in the venture only to the extent of a one-ninth interest, and a new corporation was formed under the name of the Thunder Mining Co., Ltd., in which corporation the title to the property is now vested. Shares in this new company representing its interest have been received by the Wettlaufer.

MINING COMPANIES OF THE SUDBURY DISTRICT

BRITISH-AMERICAN NICKEL CORP., LTD.

ONTARIO

Office: 507 Royal Bank Bldg., Toronto, Ont. Mine office: Nickelton, via Sudbury, Ont.

Officers: J. H. Dunn, pres.; W. A. Carlyle, v. p.; W. H. Coade, sec-treas.; E. P. Mathewson, gen. mgr.; F. J. Brulé, chief engr.; E. Hibbert, supt. of mines; F. B. Prescott, supt. of const.; T. N. Hay, purch. agt.

Inc. Aug., 1913, Canada. Cap., \$20,000,000 common stock, all issued; \$6,000,000 first mortgage bonds, 6%, all issued; \$10,000,000, 6% debenture stock authorized, of which \$3,500,000 has been issued; \$14,000,000 stock and \$3,000,000 bonds held by British Government, out of \$29,500,000 issued.

Property: In the Sudbury nickel district, Ontario, the Corporation owns 17,590 acres, of which 12,590 acres are within a mineral bearing zone, the balance being non-mineral and required for smelter townsites, etc. Included in the above are the following mines: Murray, Whistle, Wild Cat, Jackson, Nickel Lake group, W. D. 16, Elsie, Gertrude, Victor, Lady Violet and Falconbridge. Lands contain 21 known orebodies, 7 of which have been developed. The company has spent \$850,000 on diamond drilling from 1907 to 1913.

The Whistle mine has been developed and is ready for production, but the Murray mine, having shown a much larger orebody has been selected as the property on which the first work is to be concentrated. In all, the company has developed by diamond drilling over 13,000,000 tons of ore, 9,000,000 of which is in the Murray mine, which is about 4 miles N. W. of the town of Sudbury.

The surface works contemplated at the Murray mine and now in course of construction will consist of electric hoist, rock crushing and sorting house with a capacity of 3,500 tons of ore per day, and electrically driven air compressors and the usual shops and change house. The corporation is now diamond drilling at the Murray mine to determine the extent of the orebody, with a view to larger operations than at first contemplated and the sinking of another shaft. At the Murray mine a 2,000' three-compartment shaft was sunk 700', but the mine was closed down in August, 1914. Work was resumed on this property under new management, August, 1916, and is now being pushed.

The plans made for the smelter in 1913 have been considerably improved and enlarged. The present design provides for the construction of 4 blast furnaces with hearths 50x300", 7 Pierce-Smith converters, 13x30', to be erected in a modern plant with full equipment of cranes, flues, stacks, bins, shops, power house and tramping system, all machinery to be operated by electricity. An electrolytic refinery, using the Hybinette process for the separation of copper and nickel and the precious metals from the matte, will be constructed adjacent to the smelter and will have a capacity of about 10,000 tons nickel per annum. The site chosen for the smelter and refinery is about one mile west of the Murray mine shaft. Preliminary work at the site is now underway.

It is the intention of the management to have all employees reside in the town of Sudbury, and cars or suburban trains will be provided for their transportation. The mines are connected with the Canadian Pacific, the Canadian Northern Ontario and the Algoma Eastern railroads.

CANADIAN COPPER CO.

ONTARIO

Subsidiary of International Nickel Co.

General office: 43 Exchange Place, New York. Mines and smelter office: Copper Cliff, Ontario. Mines in the Sudbury district.

Officers: A. D. Miles, pres.; F. S. Jordan, 1st v. p.; Andrew Squire, 2nd v. p.; J. L. Ashley, sec.-treas.; A. D. Miles, W. A. Bostwick, F. S. Jordan, Andrew Squire and F. S. Whitcomb, directors; G. E. Sylvester, asst. to the pres.; J. L. Agnew, gen. supt.; J. C. Nicholls, mine supt.; Wm. Kent, smelter supt.; T. W. Rawlins, metallurgist; Frank Ludlam, gen. pur. agt.; E. Horton Jones, chief engr.

Inc. Jan. 6, 1886, in Ohio. Cap., \$2,500,000; shares \$100 par. Licensed in Canada, by special act of Parliament. Controlled through entire stock ownership by International Nickel Co. The Canadian Copper Co. is the world's largest producer of copper nickel ores and copper nickel matte. Ore was discovered 1884, mining commenced 1886, and smelters were started in 1888.

Property: about 18,000 acres, mostly on the south range of the Sudbury nickel belt. The ore consists of a mixture of chalcopyrite, pyrrhotite and pentlandite in a norite gangue. The ore may be massive sulphides, as in the Creighton mine, or disseminated sulphides scattered through the gangue, as in Crean Hill mine. For geology, see Eng. & Min. Jour., Vol. 101, No. 19.

Total ore production is now being obtained from Creighton and Crean Hill mines, distant from Copper Cliff by rail, respectively 8 and 19 miles.

The Creighton mine is developed by 3 incline shafts, the maximum vertical depth of hoisting at present being 1,000'. Open pit mining was the principal system until 1912, since which time underground stoping has been almost exclusively carried out, the mine being fully developed to the 12th and partly developed to the 16th level.

The new No. 3 shaft, which was put into commission in July, 1917, has 5 compartments, incline 55°. All ore is now hoisted through this shaft. No. 2 shaft is used for handling men and supplies only. No. 1 is being dismantled. Trimming is done by electric locomotives, with 4-ton cars, on the main levels.

Primary crushing of ore is carried out underground at one main-level station. The crusher is the jaw type, 42"x30" and is set at 6". Shafts are equipped with electrically-driven hoists operating in balance, mechanical appliances being in use for quick loading of skips. The handling of men in the mine is provided for by separate hoists.

The opening of the new No. 3 shaft also marked the completion of an elaborate new surface equipment, including combined headframe and rock-house, hoist house, change house, and office building, warehouse, work shops, oil-storage, etc. All these buildings are of concrete, steel and brick, fireproof construction.

In the new rock-house, which has a capacity of 500 tons per hour, secondary crushing is carried out, with screening and hand sorting on picking belts, in successive stages. Concrete bins of 3,000 tons capacity are situated under the picking belts. There is an extensive system of yard tracks and sidings, with a hump for gravity switching of cars.

The main ore hoist is electric, and is operated on the Ilgner system, with capacity for hoisting 9-ton skips at 2,500' per minute; present skips hold 7 tons. The mine is served with 4 compressors, 3 of 5,000 cu. ft. capacity, and one of 2,500 cu. ft., giving total capacity for about 175 drills. Production of ore from this mine is 3,500 tons per day, with 1,200 to 1,400 employees.

Crean Hill mine, about 2 miles east of Victoria mine, is opened by a 4-compartment shaft, 780' deep, the first 300' at an angle of 57° and the remainder at an angle of 71°. The daily production is about 450 tons of sorted ore with stoping in progress as present down to the 5th level.

Surface equipment consists of rock house for crushing and sorting ore, power house containing 3 compressors, suitable for operating 65 drills, workshops, warehouses and necessary housing facilities for employees.

No. 2 mine, situated at Copper Cliff, is developed to the 11th level, at a depth of 860', and produces about 200 tons of sorted ore per day. Surface equipment at No. 2 mine is similar to that at Crean Hill.

A quartz quarry about 15 miles south of Copper Cliff produces the necessary silica used for fluxing. This quarry is operated during the summer months, when the output is so arranged as to provide the necessary storage of crushed quartz for the winter's requirements.

All the mines are operated by electric power, which is transformed to 2,200 and 550 voltage. A subsidiary corporation of The International Nickel Co., known as the Huronian Co., has a hydro-electric installation at High Falls on the Spanish River, about 30 miles from Copper Cliff, utilizing an effective head of 85', which yields about 10,000 k.v.a. The current is transmitted at 35,000 volts.

Ore from the Crean Hill mine is sent to the smelter; ore from the Creighton mine goes mostly to the roast yard about 13 miles from Copper Cliff, and in part to the smelter. The yard is about 7,500' long and is served by four tracks. It contains space for 122 roast beds. Fuel is wood. The ore is re-loaded from the beds by steam shovel and taken to the smelter in 50-ton drop-bottom steel cars, from which it is dumped into bins 30'x600'x23' deep.

The blast furnace building contains 7 furnaces, 5 of which are 4' 2"x17' one 4' 2"x21' 3", and one 4' 2"x25' 6". Four of the furnaces are now 18' deep, a 3' 6" jacket having been inserted between the upper and lower tiers to lower the settlers sufficiently to receive molten converter slag. No. 8 furnace is under construction.

The jackets, except the top row, are of cast iron with a grid of cooling pipes cast in. The lower jackets are 8' 6" in height and carry 2 tuyeres 6" in diam.; there are 8 jackets on each side, thus making 16 tuyeres at 12¾ centers on each side of a 17' furnace. The center line of tuyeres is 3' 10" above the sole plate. The upper jackets of steel plate are 6' in height. The furnace building is served by two 50-ton and one 25-ton cranes.

The charge is a mixture of raw and roasted ores, which as a rule, is self-fluxing, but which can be adjusted as required, by the admixture of quartz or limestone. About 11.5% coke is used on the charge. The slag carries about 32.5% silica and is sent to the dump in standard gauge slag pots of 225 cu. ft. capacity. Matte from the blast furnace is taken to the converter building, which is parallel to the blast furnace building, and 60' away. This matte averages 24% CuNi.

The reverberatory department contains a fine grinding plant, 4 Wedge roasters and 2 reverberatories, one working. This department is served by a high level track 70' above the main yard, and has steel storage bins of 126,000 cu. ft. capacity for ore and fuel. The ore is ground in ball mills and roasted in Wedge furnaces. These are 22' 6" diameter, have 7 roasting hearths and 1 drying hearth, producing calcines containing 8% sulphur. The reverberatory charge consists of a mixture of calcines, green ore fines

and flue dust. Ore is fed along the side and end walls of the reverberatory from a continuous trough shaped bin, served by a charge car, and drops into the furnace through feed pipes in such a manner that the side walls are continually protected by a blanket of fresh charge. The furnace smelts about 500 tons charge in 24 hours. It burns pulverized coal, which is crushed so that about 75% will pass 200 mesh and is blown in by fan blast; about 100 tons a day is consumed, and has proved entirely satisfactory. The slag is skimmed from the front of the furnace into 225 cu. ft. iron pots. Matte is tapped from the front near the slag skimming door. It averages 23% CuNi.

The matte from both departments goes to the converter building, which is served by two 50-ton cranes of 55' 8" span with 20-ton auxiliary hoist. Matte is charged into 5 basic converters of the horizontal type 37'x10' diam., using about 8,500 cu. ft. free air per min. A mixture of quartz and mine rock which carries a little ore is used for flux.

The operation is conducted exactly as in the conversion of copper matte, but is stopped as soon as the iron is eliminated. Final product contains 24% copper, 55% nickel, and 0.5% iron. Slag contains 28% silica, and 4% copper-nickel, most of which is recovered by passage through blast furnace settlers. Matte is cast into iron molds, broken up, and sent to the refinery of The International Nickel Co., at Bayonne, N. J. On completion of The International company's Canadian refinery, now under construction at Port Colborne, Ontario, on Lake Erie, matte will be sent there for treatment.

Production: of the Canadian Copper Co., in 1916 was approximately 63,600 tons of finished matte. Company employs directly about 3,500 men.

CANADIAN MINING CORPORATION, LTD. ONTARIO

Liquidator: V. Layman, Balfour House, Finsbury Pavement, London, E. C. England.

Company is in process of voluntary liquidation, shareholders to receive for each £1 share, a fully paid \$5 share of the Mining Corporation of Canada, which see.

Dividends: 2½% Nov. 25, 1914; 2½% March 31, 1915; 2½%, interim, Oct. 14, 1915.

DOMINION NICKEL-COPPER CO., LTD. ONTARIO

Property taken over by British-American Nickel Corporation, which see.

INTERNATIONAL NICKEL CO. ONTARIO

General office: Constable Hook, Bayonne, N. J. **Executive office:** 43 Exchange Place, New York.

Officers: E. C. Converse, chairman of the board; E. F. Wood, 1st v.p.; J. R. De Lamar, 2nd v.p.; J. L. Ashley, sec.-treas.; foregoing, with W. N. Cromwell, A. Jaretski, W. E. Corey, Wm. T. Graham, W. A. Bostwick, W. H. Brownson, Charles Hayden, Thomas Morrison, and S. Prosser, directors.

Inc. Sept., 1912, succeeding International Nickel Co. and Colonial Nickel Co., the former absorbing the Canadian Copper Co., which owns the great nickel-copper mines and smelters of Sudbury, Canada.

Cap., \$8,912,600, 6% non-cumulative preferred stock, \$100 par, and \$41,834,600 common stock, \$25 par. The authorized share capital is \$12,000,000 and \$50,000,000, respectively.

Stock is listed on the New York Stock Exchange. Bankers Trust Co., New York, transfer agent. New York Trust Co., New York registrar.

Comparative Statements of Income Account and Balance Sheets years ending March 31:

Year	Total Income	General Expenses	Taxes	Depreciation	Mineral Exhaustion
1917.....	\$16,979,608	\$801,498	\$628,873	\$936,000	\$1,039,941
1916.....	14,340,966	870,860(a)	.....	1,721,828(b)	.....
1915.....	7,230,760	449,319	68,055	730,000	385,315
1914.....	6,566,787	376,665	61,147	641,915	687,395
1913.....	6,929,107	477,862	64,445	553,449	498,472
1912.....	5,088,966	217,778	4,775	497,520	139,782

(a) Includes taxes; (b) includes mineral exhaustion.

Year	Balance for Dividends	Preferred Dividends	Common Dividends	Balance To P. & L.
1917.....	\$13,557,970	\$534,756 (6%)	\$10,040,304 (24%)	\$2,982,910
1916.....	11,748,279	534,756 (6%)	9,431,803	1,781,720
1915.....	5,598,071	534,756 (6%)	4,753,937 (12½%)	309,778
1914.....	4,792,665	534,756 (6%)	3,803,150 (10%)	454,759
1913.....	5,020,305	534,755 (6%)	3,491,049 (18½%)	994,501
1912.....	3,581,960	534,729 (6%)	2,143,412 (13%)	903,709

Assets: Mar. 31, 1917, were \$63,135,281, which included properties. \$45,169,973, as compared with \$59,433,736 and \$43,709,221 respectively, Mar 31, 1916.

Balance sheet for six months ended Sept. 30:

	1917	1916	1915
Total income.....	\$7,776,276	\$7,912,773	\$6,770,708
Adm. & gen'l exp.....	297,233	563,896	452,126
Res. for U. S. taxes.....	1,741,140	.....	.....
Net.....	5,737,903	7,348,877	6,318,582
Dep. & min'l exhaus.....	986,128	1,004,630	751,163
Surplus.....	4,751,774	6,344,247	5,567,419
Preferred divs.....	267,378	267,378	267,378
Balance.....	*4,484,396	6,076,869	5,300,041
Common divs.....	2,510,076	2,510,076	1,901,555
Surplus.....	1,974,320	3,566,793	3,398,466

* Equal to \$2.68 per share on \$41,834,600 common stock (par value \$25), against \$3.64 for six months to Sept. 30, 1916.

The net quick assets, or excess of current assets over current liabilities, amounted to \$12,063,584 on Dec. 31, 1917, as compared with \$8,531,147 on Mar. 31, 1916.

Dividend Earnings: regular dividends of 6% have been paid upon preferred stock since 1906, and varying rates have been paid on common since 1909. Stockholders received 10½% in 1913, 10% in 1914, 10% stock and 17½% cash in 1915; in 1916, 8%, in 1917, 24% paid June 1. Present rate is 24% per annum, payable quarterly, M. J. S. and D. 1. Since the expansion in 1912, the International Nickel Co.'s earnings have averaged about 12% yearly for its common shares. Actual percentages are 11.7% for year ending Mar. 31, 1913; 11.2% in 1914; 13.32% in 1915; 32.2% in 1916 and 37.1% in 1917. The large increase in earnings does not seem to be entirely due to war conditions.

The copper-nickel properties consist of mines with an estimated developed reserve of 20,000,000 tons, smelting plants at Copper Cliff, Canada, handling 3,500 tons daily, separating and refining plants at Constable Hook and Camden, N. J. Company also absorbed the Orford Co., Anglo-American Iron Co., Vermillion Mining Co., American Nickel Works, Nickel Corporation of Great Britain, and the Société Minière Calédonienne.

Production: company is said to control the world's production of nickel, which is 60,000,000 to 70,000,000 lbs. per year, selling at present at 50c. to 55c. per lb. It also produces about 35,000,000 lbs. copper annually, and 1916-17 profits from this source are larger than normal, though its price has remained practically stationary.

With reference to this, it may be said that shareholders began to chafe under the price-level (35c. per lb.) of its nickel, and asked directors to raise the selling price, they having adopted the policy of not increasing the price to customers. In March, 1917, the directors acquiesced, and made the price 40c.

War requirements for nickel have been less of a factor than generally supposed, the big expansion having taken place in developing new uses for the metal. Company has adopted policy of increasing earnings through development of new uses for the product. When the war is over International Nickel ought to retain most, if not all of its present large earning power. The number of shareholders increased from 7,145 in 1915-16 to 9,252 in 1916-17.

Company's mines are described under Canadian Copper Co.

At Port Colborne, Ontario, near the Lake Erie entrance of the Welland Canal, the International Nickel Co. is erecting a refinery which will cost \$5,000,000. To Mar. 31, 1917, the sum of \$1,046,740 had been spent on it. Completion is set for the end of 1917. The initial capacity is to be 15,000,000 lbs. of nickel.

One of the reasons for building a new plant in Canada, instead of enlarging the existing refinery at Bayonne, N. J., was on account of the agitation started in Canada soon after the war commenced. It was stated that nickel, produced from Canadian mines refined in the United States, was finding its way to Germany, also that enemy shareholders were interested in International Nickel. These accusations were apparently groundless, but a great deal of politics was made of the debate in Canada. (A Nickel Commission was appointed by the Canadian Government, the report being handed in early in 1917. It discussed the refining of nickel in Canada, ore reserves of the Sudbury area—70,000,000 tons of proved ore—New Caledonian deposits, and those of Norway, etc. The cost of producing nickel from New Caledonian ore was 19c. per lb., before the war.) Eventually, after considering the whole question, International Nickel acquired the new site in August, 1916, and rushed completion of the new refinery. International has a strong rival in the nickel field, namely, the British-America Nickel Corporation, Ltd., (which see) also erecting a refinery in Ontario.

Company is subject to war taxes in both countries, but is expected to earn dividend requirements despite this.

MOND NICKEL CO., LTD.

ONTARIO

Secretary's address and sales office: D. O. Evans, 39 Victoria St., London, S. W., England. **Mine office:** Conniston, Ontario. **Works office:** Clydach, Glamorganshire, Wales.

Directors: R. L. Mond, chairman; Bernhard Mohr, gen. mgr.; E. J. Griffith, Saxton W. A. Noble, Sir Robert Hadfield, Emile S. Mond, Dr. Carl Langer, Robt. Mathias and Sir Edmund Walker. C. V. Corless,

Canadian mgr.; Oliver Hall, mines supt.; A. Sharp, supt. Garson mine.

Inc. Sept. 20, 1900, in Great Britain. Cap., £600,000, increased July, 1908, to £850,000; in £500,000 cumulative 7% preferred shares, £5 par; £300,000 ordinary shares, £1 par, and £50,000 deferred shares, £1 par; total issued capital, £750,000. Reorganized July 22, 1914, with authorized capital of £2,400,000, in shares of £1; 500,000 being in 7% cumulative preferred shares; 1,000,000 in 7% non-cumulative preferred shares, and 900,000 ordinary shares. All except £520,000 of the non-cumulative shares has been subscribed and called up; £375,000 5% first mortgage debenture stock and £500,000 6% redeemable debenture stock has been issued. For fiscal year, 1916, profits were £322,589.

Dividends: 7% has been paid regularly on preferred shares; dividends on ordinary shares: 6% in 1905; 10% in 1906; 12½% in 1907; 15% in 1908, 1909 and 1910; 16¼% in 1911 and 1912; 21¼% in 1913; 35% in 1914; 20% in 1915 and 1916, on new capital. Dividends on deferred shares were 18% in 1906; 33% in 1907; 48% in 1908, 1909 and 1910; 55% in 1911 and 1912; 85% in 1913. Reserve fund, £150,000. Cash balance, April, 1916, £22,321. Net profits, £111,320 in 1909; £114,107 in 1910; £140,803 in 1911; £146,650 in 1912; £191,047 in 1913; £248,088 in 1914; £285,282 in 1915, and £306,460 in 1916.

Property: about 14,000 acres in the Sudbury district and mining rights on about 12,000 acres near to and including Bruce Mines. Mines in the Sudbury district include Levack, Garson, Victoria, Worthington, Frood Extension, Kirkwood and North Star. Only the first four named worked at present. Mines in the Bruce Mines area consist of several openings grouped under the general name of Bruce Mines. The former group produces copper-nickel ore and the latter quartz-copper ore, used as flux in the converters. For geology of the Sudbury nickel-copper deposits, see Eng. & Min. Jour., Vol. 101, No. 19, and Vol. 102, No. 2.

The Levack mine, purchased in 1913, is being opened up by a 5-compartment shaft 400' deep.

Garson mine has a 3-compartment 800' shaft. Present deepest level is at 600'. Extraction to date has been almost exclusively from the upper 400', where a large tonnage still remains to be extracted.

Victoria mine is one of the deepest mines in Canada. The bottom level is over 2,300' vertically from the shaft collar, and the 3-compartment shaft, the sinking of which is nearly continuous, is now over 2,400' deep.

Worthington mine, now about 500' deep, produces a mixture of very high-grade ore and rock, which is subjected to close sorting. The orebody is a brecciated basic dike and not typical of the Sudbury deposits. For geology see Economic Geology, Vol. X, No. 6. The Worthington is developed by a 3-compartment shaft.

The purchasing and opening of the Levack mine, 1913, caused the closing down of several properties, including Frood Extension mine, which had been opened up to a depth of 1,000' by a 4-compartment shaft.

The copper-nickel ratio of the ore from these mines differs quite widely, but the production from the various mines is usually so arranged as to give close to an evenly balanced copper-nickel matte.

The old smelter, near the mines, has been abandoned, and a new 1,500-ton smelter, erected 1912., at Conniston, Ont., was blown in May 15, 1913.

Equipment: includes 2 Allis-Chalmers water-jacketed copper blast furnaces, 50"x240", and 2 Pierce-Smith basic converters with shells 10' in diam. and 25' 10" long. Ores are smelted and bessemerized to a copper-nickel matte averaging about 82% copper and nickel, which is shipped to the company's refinery at Clydach, in Swansea Valley, South Wales, where

the metals are separated and the nickel is refined by the Mond Process.

The copper-nickel matte from the smelter is dead-roasted and treated with dilute sulphuric acid, which permits the extraction of about 65% of the copper and 2% of the nickel. The residue, after drying, assays 45 to 60% nickel, and is treated in charges of 500 kgs. with water-gas, in a reduction tower, at a temperature of about 300° C. This tower has shelves and the ore is moved from shelf to shelf by automatic rakes, the lower shelves being cooled. After treatment in the reduction tower the charge is transferred to a volatilizing tower and treated with carbon monoxide at a temperature of about 100° C. The residue therefrom is returned to the reducing tower and the charge goes forward and back between the 2 towers for 10 to 15 days, and when 60% of the nickel has been volatilized, as nickel carbonyl, the residue of the charge is returned to the roasting furnace. The nickel carbonyl is treated in a decomposing apparatus, wherein the metal is recovered in granules, assaying 99.4 to 99.8% nickel, and the copper is turned out as bluestone.

All the Canadian plants are up-to-date and operated electrically by power from 3 hydro-electric plants, 2 of which are the property of the Lorne Power Co., a subsidiary of the Mond Nickel Co. The growth of the company's operations within the past 5 years has been phenomenal.

The mine output for 1911 was 163,352 tons, 117,658 tons in 1912 and 408,638 tons in 1915.

Production is not reported by the company, but unofficial estimates two years ago placed the annual output at about 4,000,000 lbs. fine copper and 5,000,000 lbs. nickel, with a possible maximum production of 10,000,000 lbs. copper and 15,000,000 lbs. nickel.

QUÉBEC

ALBERT COPPER CO.

QUEBEC

Office: 25 Broad St., New York. **Mine office:** Capelton, Sherbrooke Co., Que. Was organized to take over the mining interests of the Nichols Copper Co. in Quebec and is controlled by that company.

The Albert mine, 640 acres at Capelton, carries lenses of chalcopyrite and pyrite, assaying up to 5% copper and 38% sulphur. Development is by 6 shafts, 4 under 500' depth each, with one of 800' and one of 2,000', the mine having upwards of 5 miles of workings.

The works at the Albert mine include a 150-ton concentrator, a smelter and an acid plant. The chemical works, completed, 1907, at a cost of about \$1,000,000, with capacity of 150 tons of commercial sulphuric acid daily, are among the most complete in existence manufacturing sulphuric, nitric and hydrochloric acids and glauber salts. The cinder remaining from the burning of cupriferos pyrite for sulphuric acid is smelted in a small blast furnace producing 1 to 2 tons daily of matte assaying up to 40% copper, with small silver contents, shipped to the Laurel Hill works for refining, and copper production is estimated at 350,000 lbs. yearly.

ASCOT MINING CO.

QUEBEC

A close corporation owning an old copper mine near the Eustis mine. See Vol. XII. In Ascot township, Sherbrooke Co., Que.

CANADIAN WOOD MOLYBDENITE CO.

QUEBEC

Address: Harvey Fitzsimmons, mgr., 14 Metcalf St., Ottawa. H. E. Wood, Denver, Colo., part-owner.

Property: near Quyon, Pontiac Co., Que.

Development: open cuts opened molybdenite in reddish gneissoid granite. The ore is principally finely disseminated in flakes of 1/2" or less. and is hand sorted.

Equipment: includes 60 and 150-ton mills, using crushers, dryers, ball mills and Wood flotation machines. Ore containing as low as 1% MoS₂ gives 75 to 80% recovery.

Production: from March, 1916 to March, 1917, over 5,500 tons of 2% ore had been mined. At present over 250 tons of 2½% ore is being treated weekly.

EAST CANADA SMELTING CO., LTD.

QUEBEC

See Weedon Mining Co., Ltd.

EUSTIS MINING CO.

QUEBEC

Office: Eustis, Sherbrooke Co., Quebec, Can.

Officers: W. E. C. Eustis, 131 State St., Boston, Mass., pres., sec.-treas.: F. M. Passow, supt.

Inc. 1878, in Quebec, and operated as a close corporation.

Property: near Sherbrooke, carries 4 parallel interbedded lenses of cupriferous pyrite, in talcose schist crossed by diorite dikes, the cupriferous belt being traceable for 2 miles. The orebody is worked through an inclined shaft to a depth of about 3,450' on the incline, with an average dip of 45°. Lenses are 3 to 60' in width, averaging about 2.5% copper, up to 60 cts. per ton in combined gold and silver values, and 40% sulphur, but with considerable variations, ore occasionally carrying up to 50% sulphur. Footwall vein, or lens 4 to 20' thick, 50 to 100' long. Main vein 20 to 100' thick, 100 to 120' long. Shaft vein, 3 to 15' thick, 50 to 100' long. No. 1 vein 2 to 25' thick, 20 to 120' long. Footwall and shaft lenses richest in copper, averaging 4 to 8% while others carry 2½% copper with 42 to 48% sulphur. Property is primarily a producer of pyrite, for the sulphuric acid trade.

Development: the mine, opened 1870, and producing for 30 years, has a 7x7' crosscut tunnel, 1,000' long and a 3,000' shaft, sunk at 20 to 45' with double skip tracks. The mine is dry, most of the water coming from surface and the upper stopes, but the limited quantity of mine water is very acid, and contains copper in solution, which is precipitated as cement copper on scrap iron as it leaves the tunnel, through which it is conducted by a launder. Mine is served by the Boston & Maine railway. About 150 men are employed in the mine and mill.

There is a 400-k.w. hydro-electric power plant on the Coaticook river, 2 miles from the mine. The main plant has 2 alternators mounted on the same shaft and run in parallel, driven by turbine water wheels. There is one 375-k.w. generator direct-connected to the water wheels running at 450 r.p.m. The power is generated at 2,200 volts. The electric efficiency is 90 to 93% and efficiency of water wheels is 60 to 80%, according to load.

Equipment: includes a 150-h.p. Westinghouse electric hoist, good for 3,500' depth, and two 8-drill, 2-stage, Rand air compressors, 1 run by steam and 1 by electricity.

The 300-ton mill, three-fourths mile from the mine, is connected therewith by an electric tram, equipped with three 3-ton cars. The mill has a 150-h.p. electric equipment. Ore is dumped onto grizzlies, coarse ore falling to the sorting floors and conveyor belts, where hand-picked and cobbed. Ore sufficiently rich for shipping is reduced to 2½" size, and concentrated ore is reduced to ½" size, by crushers and ball mills, going thence to an 8-compartment classifier with spigots discharging to Wilfley tables. Middlings from coarsest tables are returned to ball mills and from finer tables, to the re-crushing department.

Both the power plant and mill were burned down in 1916, but have been rebuilt.

Selected ore and concentrates are shipped to various acid works, at:

there burned for sulphur, the cupriferos cinder remaining then being shipped to the Norfolk smelter, where treated for copper. Production is about 30,000 tons of cupriferos pyrite yearly.

NORTON, A. O.**QUEBEC**

Office: Coaticook, Quebec. A. O. Norton, owner and mgr.; W. Jenkin, mine supt.

Property: 600 acres, freehold, except 150 acres, title covering only mining rights, includes the Suffield, King, Silver Star, and Marrington mines, in Ascot township, 7 miles from Sherbrooke, with railroads within 2 miles on either side.

The mines show 3 lenses, of 3 to 20' width, 1 proven to depth of 400', estimated by owner to average 4 to 5% copper, from a trace to 10% zinc, 5 to 25 oz. silver, and \$1.50 gold per ton. The King mine has a 165' incline shaft with about 500' of workings. The Suffield mine has a 350' shaft with about 1,200' of workings, showing ore with an average of about 4%, and combined gold and silver values of \$2 to \$12 per ton, with about 25% sulphur. The Marrington mine, 100 acres, 1½ miles from Suffield, and about 1 mile from Capelton, is opened by a 260' shaft with about 400' of drifts, developing a lens about 75' wide at surface; said to carry at depth 5 to 7' of good ore. Little development work has been done since Aug., 1914, and no shipments have been made from the property.

Equipment: includes a steam plant, 100-h.p. boiler, a 50-h.p. double cylinder steam hoist and a straight-line air compressor. Property considered promising.

WEEDON MINING CO., LTD.**QUEBEC**

Office: 263 St. James St., Montreal. **Shipping office:** 11 Broadway, New York. L. D. Adams, gen. mgr.

In 1915 acquired the property of the East Canada Smelting Co., at Weedon from the Precious Metals Corporation of New York. Controls the Zinc Co., Ltd., which operates a lead and zinc mine at Notre Dame des Anges, Portneuf Co., Quebec; also the Canadian Zinc Products Co., Ltd., which operates a zinc oxide plant at Notre Dame des Anges.

Property: 375 acres in Wolff county, Province of Quebec. Has produced 260,000 tons of cupriferos pyrite ore, mined for sulphur as well as copper in the last 6 years. Average assay is 3.3% copper, 40.8% sulphur, trace of lead, 0.77% zinc, 0.5 oz. silver, and 20c. gold per ton. Market price is about \$9 per ton.

Geology: ore occurs in two lenses in schist. Main orebody is 570' long and from 15 to 45' wide, with dip of 45° N. E., and course N. 37° E.

Development: by two shafts 700 and 900' deep, and 9 levels driven to the limits of the ore.

Reserves: on January 1, 1917, were about 200,000 tons.

Equipment: 2 air hoists (60-h.p.), one 150-h.p. electric hoist, 2 compressors, (one electrically driven, 1,600 cu. ft. capacity), and all necessary buildings, shops, etc.

The zinc mine is developed by one 300' shaft. It is equipped with a 150-ton concentrating mill using tables, flotation unit, and magnetic separation. Produces zinc concentrates containing 42% zinc and lead concentrates averaging 60% lead, 65 oz. silver, and \$13 gold per ton.

Transportation: at copper mine 3½ miles of aerial tram to railroad, costing 7c. per ton.

At zinc mine there is 4 miles of teaming. Mining costs at copper mine in 1916, including development and all overhead charges were \$2 per ton. Compete cost at zinc mine for concentrates, f.o.b. cars, was \$6 per ton of crude ore.

Production of copper in 1916, 5,640,000 lbs.

SASKATCHEWAN

BEAVER LAKE GOLD MNG. CO.**SASKATCHEWAN**

Prince Albert, Saskatchewan, Canada. Frank Kisbey, sec.

Property: in April, 1914, the company acquired 32 claims of the Prince Albert Expl'n Co., located on the north shore of Beaver Lake, 118 miles from Le Pas, the nearest R. R. point, is on the Can. Northern Ry., out of Winnipeg.

Development: has been done on the Prince Albert claim where, at the contact of the Huronian schist and Laurentine diorite, a 48" quartz outcrop can be traced for a considerable distance. A 70' incline shaft, sunk on the vein, is said to show a 4 to 5' vein averaging \$16 in gold and 2 oz. silver per ton. Company was planning development work at last accounts.

YUKON TERRITORY

ATLAS MINING CO.**YUKON**

Presumably dead as in Feb., 1916, company holdings were taken over by the Yukon Copper Co., Ltd., a Canadian company, which see.

CANADIAN KLONDYKE MINING CO., LTD.**YUKON**

Is a subsidiary of the Consolidated Goldfields of South Africa, Ltd.

Address: Dawson, Yukon Territory.

Officers: Jos. W. Boyle, pres.-mgr.; J. W. Boyle, Jr., v.p.- acting mgr., with J. J. Boyle, F. A. Tilton and Jas. McDougall, directors. John Kennally, Jr., sec.; L. H. Titus, gen. supt.; Allan McIntosh, dredge supt.

Inc. March 5, 1913, in Canada. **Cap.**, \$8,000,000; shares \$5 par; \$6,000,000 issued. Bonds authorized, \$1,798,000; all outstanding. Annual meeting 1st Tuesday after 2nd Monday in May.

Property: 151 placer claims and Hydraulic Lease No. 18, about 26,000 acres, in the Klondyke Valley, with total production to date of \$11,000,000 and estimated reserves of 115,000,000 cu. yds.

Company operates 4 bucket dredges with aggregate capacity of 40,000 cu. yds. per day. During 1916, the dredges handled 18,302,610 cu. yds.

Equipment: includes 10,000-h.p. hydro-electric power plant and six steam shovels.

Management plans installing oxy-acetylene plant, electric furnace and additional shop equipment.

On Nov. 22, 1917, the Granville Mining Co. (which see), the bond-holding company, applied at Dawson for a receiver for the Canadian Klondyke Mining and Canadian Klondyke Power companies.

GRAFTER COPPER MINING CO.**YUKON**

Geo. Armstrong, E. A. Dixon, J. P. Whitney, Robert Law, and W. C. Pedlaw, owners.

Property: 1 claim, crown-granted, 50 acres, elevation 3,822', 1 mile N. of the Arctic Chief, near White Horse, Yukon, Can., has a 7-mile wagon road to the terminus of the White Pass & Yukon R. R.

Mine lies in an area of alternating bands of limestone and diorite, with aplitic cross dikes. **Ore:** consists of magnetite containing bornite and chalcopyrite, with a garnet-augite gangue. Ore is estimated to carry 8% copper and \$3 gold per ton. Mine opened 1900, but idle until 1907. Has a shaft of about 90' depth, with 150' of workings, including some stopes nearly to the surface.

Equipment: includes steam power. Estimated 200 tons of high-grade copper ore on dumps. Operations resumed and mine unwatered in 1915. Has shipped over 15,000 tons of 6% copper ore to Tacoma smelter since then.

GRANVILLE MINING CO., LTD.**YUKON**

Head office: 8 Old Jewry, London, E. C., England. **American office:** 233 Broadway, New York.

Officers: F. A. Govett (chairman), M. H. Orr-Ewing, A. C. Beatty, H. L. Sapte, W. Trask, Lord Brabourne, A. N. C. Treadgold, H. C. Hoover, J. S. Wetzlow, directors; J. Bradshaw, sec.

Inc. Aug. 11, 1911, in England. **Cap.**, £1,500,000; shares £1 par; 1,410,000 shares outstanding.

Acquired in 1911 from A. N. C. Treadgold, placer gold properties in the Yukon, for £206,000 cash, £100,000 debentures, and 1,200,000 shares. Certain of the properties were sold to the Canadian Klondyke Mining Co. (which see), which guarantees the Granville company a minimum income of \$240,000 per annum up to Feb. 28, 1928, on stock and shares held by the Granville.

Assets consist of \$1,646,000 6% convertible debentures and \$2,175,000 shares (out of \$8,000,000) in the Canadian Klondyke (bonds are convertible at par; if converted, Granville holds 49% of the Canadian Klondyke); \$1,200,000 6% debentures (out of \$1,500,000) in Canadian Klondyke Power Co., Ltd. (a large electric power producer in the Yukon); and 1,015,000 shares in the North-West Corporation, Ltd.

Apparently the Granville company was behind in meeting its obligations, as in April, 1917, a receiver was appointed by the British Court, on the motion of the Gold Fields American Development Co. (which see), a holding company that acquired the American interests of the Consolidated Gold Fields of South Africa, Ltd. Granville raised funds from the Gold Fields American for exploitation. The receivership was asked to protect secured creditors from possible actions by unsecured local creditors of the Canadian Klondyke Mining and Power companies, and to prevent forfeiture of the North West company's claims. Under the trust deed the trustees should have had deposited with them bonds and securities of the Canadian companies, but Granville had failed to do this and interest payment was in default. The general aspect is complex and some reorganization must be arranged.

On Nov. 22, 1917, the Granville Mining Co., the bondholders, applied to the court at Dawson for a receiver for the Canadian Klondyke Mining and Canadian Klondyke Power Companies, alleging failure to issue bonds for a loan of \$1,350,000, or to pay interest thereon, etc. The Granville company will not stop Canadian Klondyke's operations, but wants an adjustment and steady payments of obligations.

YUKON COPPER CO., LTD.**YUKON**

Address: White Horse, Y. T.

Officers: Dr. Alfred Thompson, pres.; W. D. Greenough, v. p., White Horse, Y. T.; Jas. Smilley, sec.-treas., Ottawa, Can.

Inc. Nov., 1915, in Canada. **Cap.**, \$200,000; shares \$100 par; all issued. **Company** took over holdings of the Atlas Mining Co.

Property: 10 claims, 720 acres, in the valley of Porter creek, 4 to 7 miles west of White Horse, include the Pueblo group of 420 acres, and the Carlisle group of 300 acres.

The Pueblo concession, located 1899, was sold to the White Horse Copper Co. That company immediately bonded it to the British American Corp'n, who relinquished bond in 1901, and property reverted to locator, H. E. Porter. In 1908, the Yukon Pueblo Mines Co. of Spokane, bought the concession, transferring it in 1911 to the Atlas Mining Co., controlled by Greenough Bros. of Spokane.

Geology: the Pueblo orebody is an irregular shaped mass 400' long

and 200' wide, running N. W.-S. E. and raking north. It is enclosed in crystalline limestone, near a granite contact, and apparently the limestone replaced by the orebody was cut by granite dikes, traces of which remain. There also is a porphyry dike of 3 to 4' width, crossing the orebody, decomposed and showing copper stains. Ore is essentially cupriferous hematite, varying in texture from compact to coarse, with some alteration, and with irregular silicification. The copper sulphides in the hematite have been largely altered into carbonates, oxides and silicates, only a little chalcocopyrite having been found to depth of 100'. Principal ore mineral is malachite, disseminated in hematite, with considerable chrysocolla, and some cuprite occurring in veinlets and small masses. Ore ranges from 1 to 10% in copper, and 700 tons of roughly sorted ore sent to the Crofton smelter, carried 5% copper, 1.25 to 2 oz. silver and some gold per ton.

Development: by a 400' shaft and 28 prospect diamond drill-holes, totaling 3,796'. Employed 100 men at last accounts.

The Carlisle mine, 2 miles from the Pueblo, has a vein 15' wide, with a high-grade paystreak up to 4' in width of bornite and chalcocopyrite. Developed by shafts of 50' and 137'.

Equipment: includes steam power, a 10-drill air compressor and necessary mine buildings. Mine has a spur line to the White Pass & Yukon railway, built 1910.

Production: 1914, shipped to the Tacoma smelter, was 250 tons of ore per day from the Pueblo mine. Property considered promising. Nothing recent available.

YUKON GOLD CO.

See same title under United States section.

NEWFOUNDLAND

ANGLO-NEWFOUNDLAND DEV. CO.

NEWFOUNDLAND

Address: Grand Falls, Newfoundland. Mining properties transferred to Terra Nova Properties, Ltd., which see.

BUCHAN'S MINE

NEWFOUNDLAND

P. O.: Millerton, N. F. Wm. Scott, supt.

Property is owned by the Terra Nova Properties, Ltd., and described under that name. This company is a subsidiary of the Anglo-Newfoundland Development Co., which has a timber and mineral concession over about a million acres in the center of the island, near Grand Falls and has built largest pulp paper plant in the world, and mining is merely a side issue.

Idle.

GREAT NORTHERN COPPER CO.

NEWFOUNDLAND

Idle. **Office:** 11 Broadway, New York City. **Mine office:** Twillingate, Newfoundland.

Officers: H. R. Warnock, pres.; H. G. Terry, v. p.; A. E. Randall, sec.; Obadiah Hodder, treas. and gen. mgr.; preceding officers, W. L. George and W. J. Devison, directors.

Inc. 1905. Cap., \$100,000; shares \$1 par. Company was combined with Notre Dame Copper Co. and Hodder Supply Co. of Pittsburg, in 1912. Reorganized Jan., 1917, and inc. in South Dakota with cap. of \$5,000,000; shares \$1 par; 3,010,135 issued.

Lands: 526 acres, freehold, on Twillingate, North Island, on the eastern coast of Newfoundland, in the vicinity of the Tilt Cove mine. Company claims a vein 163' wide, uncovered for one-half mile and tested to depth of 200', carrying chalcocopyrite, averaging 2.9% copper. **Management**

estimates ore reserves of 9,000,000 tons with 500,000 tons blocked out.

Ores: of this district, as developed elsewhere, average about 4% copper, 50% sulphur and \$1.50 gold per ton, and are somewhat bunched, with sphalerite frequently found in connection with the chalcopyrite. Mine is worked opencast.

Equipment: includes steam power and a hoist, with a tram line and 2,000-ton ore bins on the sea. Has 1,500-ton coarse crushing plant and is installing 150-ton concentrator, 1917.

HYDRO-ELECTRIC SMELTING CO. NEWFOUNDLAND

Developing an old copper property on Little Bay, Newfoundland, operated by a British company, 1878-1890. Driving adit, about 500' in June, 1917.

REID-NEWFOUNDLAND CO. NEWFOUNDLAND

St. Johns, N. F. Owns a copper property at New Bay, N. F., now idle. Property was under development in 1907, but has never been a producer. Company owns the railroad and steamship lines of Newfoundland.

TERRA NOVA PROPERTIES, LTD. NEWFOUNDLAND

Secretary and office: E. A. Sursham, Fleetway House, Farrington St., London, Eng. **Mine address:** Millertown, Newfoundland. Mayson M. Beeton, chairman; William Scott, supt., at Grand Falls, Newfoundland. Is a subsidiary of the Anglo-Newfoundland Development Co.

Company owns rights over about 2,500 sq. miles, held by 99-year lease, in the central part of Newfoundland, surrounding Long lake. The principal property is Buchan's River mine, about 5 miles W. of the lake on the N. shore. Ore occurs in sericitic schists formed of volcanic grits, the vein having strike of N. 51° E. and dipping about 30°.

Development: consists of a 370' shaft with several levels, having long drifts on the vein. The one orebody thus far found varies from 5 to 10' in thickness, is 350' long, horizontally, and 370' in downward extension. The ore is a complex sulphide carrying 2.36% copper, 8.14% lead, 20.38% zinc, 6.70 oz. silver and \$2.72 gold per ton.

Examined and reported on by W. H. Weed.

YORK HARBOUR MINE NEWFOUNDLAND

Idle. **Former address:** York Harbour, Birchy Cove, Bay of Islands, N. F. The mine, 4,000' from the bay, at elevation of 1,000', carries cuprififerous pyrite. The ore is compact and close-grained with 2% to 4.5% copper and 38 to 41% sulphur, the sulphur being valuable for the manufacture of acid.

Development: by 360' main shaft sunk at an angle of 72° to the S. E., practically the same as the dip of the ore lenses. Levels are opened at 60' intervals, with drifts driven S. W., along the strike of the orebodies.

Equipment: included a 250 h. p. steam plant, with a 50 h. p. Flory hoist and an 8-drill Norwalk high-altitude air compressor. Company supposedly bankrupt and property has been closed down for years.

MEXICO

MEXICO

Owing to unsettled political condition of the country and the various massacres of mining men in the revolutionary states of the nation, the mining industry has been greatly depressed for four years past, and many formerly prosperous companies have stopped work, while others have maintained merely nominal operations.

In 1916 the Carranza government peremptorily ordered all mining companies to resume work under penalty of confiscation of property. This action, combined with the doubling of taxes, the imposition of export taxes and the prohibition of gold exports, even in base bullion, and demanding the return of 25% of all silver exported, have so crippled the mining industry as to make one wonder whether it is worth while owning even a proven mine across our southern border line. To add to these taxes and onerous impositions, the new Mexican constitution contains a clause making partners, or profit sharers, of each mine employee and a provision for 3 months' wages to be paid a discharged employee, while the merits of the case are being considered by an enquiry commission. All this has made the mine manager's job a worrying one.

The active mining companies of this country are grouped by states. Owing to the great difficulty of getting letters to or from our correspondents in Mexico, the descriptions are in some cases old and many companies have no doubt been omitted.

AMERICAN SMELTING & REFINING CO.

See same title under United States mines.

EXPLORATION CO. OF ENGLAND & MEXICO, LTD. MEXICO

In liquidation, 1917.

EXPLORATION CO., LTD. MEXICO

H. F. Wreford, sec., 24 Lombard St., E. C., London; P. L. Foster, 61 Broadway, New York.

Directors: R. T. Bayliss, chairman and managing director; J. H. M. Shaw, managing director; J. R. Maguire, J. E. D. Ryder, G. D. Smith and O. E. Warburg.

Registered March 21, 1904, to acquire the assets and undertakings of a company of same name, registered June, 1896, except certain assets and liabilities which had been acquired by the Exploration Assets Co., Ltd. The company carries on a general financial business and holds interests in the South African Real Estate Trust, Ltd., Tomboy, El Oro, Santa Rosa, Buena Tierra, Greene-Cananea Copper, Chile Copper, Natomas Cons. and other concerns, and has floated the Mexico Mines of El Oro, Ltd.

Cap., £750,000; shares £1 par; reduced Nov., 1916, to £375,000; shares 10s par. For every 5 old shares, holders received 3 fully paid shares and £2 of the Assets Company's debenture stock.

Dividends declared by former company: 1896, 2s; 1897, 2s 6d; 1898, 2s 6d; 1899, 3s; 1902, 1s. Dividends paid by present company: 1905, 1s; 1906, 1s; 1907, nil; 1908, 1s; 1909, 1s 6d; 1910, 1s; 1911, 1s; 1912, 1s 6d; nil in 1913, 1914 and 1915; 1s in 1916.

For year ending Dec. 31, 1916, there was a net profit of £3,251, making with balance forward, £97,457; cash, £16,498; sundry debtors, £7,366; investments, £617,863.

INTERNATIONAL COOPERATIVE HOLDING CO. MEXICO

Letters returned from Las Cruces, New Mexico. Branch office: 203-4 Mills Bldg., El Paso, Texas.

Officers: J. I. McCullough, pres.; L. M. Stiles, v. p.; F. W. Campbell, sec.-treas; above with J. C. White and Albert Runkel, directors.

Cap., \$250,000; shares, \$10 par.

Purpose of company is to acquire control of, or options on mining properties in Mexico, to be held until business is re-established in that country, then sell them or organize subsidiary companies to operate them.

Company's prospectus states that mines should be cheaply acquired, and it is only a matter of time until dividends are paid.

In view of recent happenings in Mexico this concern will find that properties cannot be held, but must be worked.

STATE OF AGUASCALIENTES**ASIENTOS MINING CO.****MEXICO**

Mine office: Asientos, Ocampo, Aguascalientes, Mex. Chas. Adler, v. p.; Abram Rapp, gen. mgr.

Inc. 1898, in Delaware. Cap., \$1,000,000; shares \$10 par; non-assessable; fully issued.

Lands: 190 acres, including the Nopensada and Alta Palmira mines, which are antiguas, and the Veta Grande and Refugio mines. The Nopensada, said to have been a considerable producer in early days, carries mainly slightly argentiferous copper ore, of about \$40 per ton average value. The Alta Palmira mine, having a 450' shaft, produces auriferous and argentiferous copper ore. The Refugio mine shows ore carrying up to 10% copper and 1,100 grams silver per metric ton, with small gold values. Idle owing to revolutionary disturbances.

Equipment: includes a 150 h. p. steam plant and hoist.

FORTUNA, S. A.; COMPANIA MINERA LA.**MEXICO**

Aguascalientes, Mex. Mine office: Tepezalá, Ocampo, Aguascalientes, Mex.

Officers: Geo. B. Wardman, pres.-gen. mgr.; O. F. Westlund, v. p.; De Witt Crevelling, sec.-treas. Alberto Pez, supt.

Inc. 1902. Cap., 200,000 pesos; shares 100 pesos par.

Property: 20 hectares, including La Fortuna and adjoining mines.

Development: by 2 tunnels and a 100-meter blind shaft, mines having a vertical depth of 200 meters and greatest horizontal length of 600 meters of workings, showing mainly oxidized argentiferous copper ores of good average tenor in both metals. Has animal power and employs 200 men normally. Idle owing to revolution.

STATE OF BAJA CALIFORNIA**BOLEO; COMPAGNIE DU****MEXICO**

U. S. office: 303 Market St., San Francisco, Cal.

Secretary and office: M. Georges Odier, 56 Rue de Province, Paris, France. Mine at Santa Rosalia, Sur, Baja California, Mex. Albert Mirabaud, pres.; Charles La Forgue, managing director; William d'Eichtal, Maurice Ephrussi, Marquis de Montaigu, Henri Puerari, Ernest Tambour, Charles de Wendel and Alex. Tombelaine, directors. Ernest Michot, director-general; R. Plonin, mgr. M. Michel Berger and André d'Eichtal, auditors.

Inc. May 16, 1885, in France. **Cap.**, \$12,000,000; shares \$100 par. There are also 46,000 founders' shares. Is controlled jointly by the French house of Rothschild and the Banque Mirabaud, and owns a considerable share interest in the Compagnie d'Inguaran. Is exempt, until Dec. 17, 1925, from all federal and local taxes, except stamp taxes; is exempt, until 1935, from export and import duties on fuel consumed; is exempt, until 1942, from custom duties and local duties.

Balance sheet of Dec. 31, 1915, published May, 1916, shows: assets, \$37,119,557, which includes: works, \$1,000,000; ore and copper matte, \$6,198,029; supplies on hand and en route, \$5,792,483; live stock, \$488,267; cash on hand and in banks, \$7,233,532; notes receivable, \$5,799,642; acct's receivable, \$10,214,122. Liabilities include: stock outstanding, \$12,000,000; reserve fund, \$8,517,189; acct's payable, \$8,335,418. Operating profit for 1915 was \$7,941,489, as compared with \$4,587,442 in 1914.

By a fixed rule 5% of the profit goes into the reserve fund, 8% to the ordinary shares and 2% of the remainder to the directors. Of the balance then left, 77% goes to the ordinary shares and 23% is divided among 46,000 "founders" shares. The result is that ordinary stockholders get 73½% of the profit, founder shareholders 19½% and directors 2%.

Dividends: \$62.5 in 1901; \$62.5 in 1902; \$104.16 in 1903; \$135.41 in 1904; \$200 in 1905; \$312.5 in 1906; \$200 in 1907; \$25 in 1911; \$36 in 1912, with \$34.1 for founders' shares; \$35 in 1913, with \$21 for founders' shares; \$22 in 1914, with \$10.90 for founders' shares; \$40 in 1915, with \$24 for founders' shares.

Property: 11 groups of copper claims, 20,000 hectares, granted by the Mexican government, also 598,600 hectares of grazing lands south of the mines. Principal groups are the Soledad, Providencia and Purgatorio. Lands include 5 known copper deposits of importance, the copper-bearing formation covering 3,000 hectares, with possibilities of further extensions.

Geology: the ore occurs in a formation of Tertiary conglomerate, sandstones and tuffs, the cupriferous tuffs overlying conglomerates of eruptive rock pebbles, and being surmounted by argillaceous tuffs, all traversed by fissures. The ores comprise a remarkably varied series of oxidized copper minerals in which the metal occurs in combination with silver, lead, cobalt, manganese and other metals. The prevailing oxide is melaconite, more or less mixed with manganese and iron oxides; and the prevailing sulphides below water level are covellite and copper glance. The following rare minerals are peculiar to this deposit: boleite, an oxychloride of lead, copper and silver; cumengeite, oxychloride of lead and copper; fosgeneite, a chlorocarbonate of lead; spherocobaltite, a carbonate of cobalt. Practically every known oxidized ore of copper occurs here, as well as those of lead, manganese and iron. Gypsum is abundant and native sulphur occurs. All minerals occur in an unctuous, decomposed tuff, locally called soap-clay. There are 3 cupriferous beds, the upper averaging about 3' in thickness, the middle 2 to 3', and the bottom 2 to 10'. The middle bed carries oxide and carbonate ores in oolitic concretions, known locally as boleos; hence the name of the mine. The lowest bed, partly below the water line, carries sulphide ores, as well as oxides and carbonates. This bed, No. 3, has been the chief source of ore supply of the property. It has averaged 1 meter in thickness, but varies from a few inches up to 16' in different parts of the property. The ore is disseminated through the tuffs in thin, irregular veins, with clay gouge, and has a marked concentration toward the bottom of each bed, where the ore forms compact layers of 6 to 12"

Development: the main workings are 15 to 200 meters above sea level, the mine being opened by numerous tunnels, and by 7 shafts of the following depths: Sombrero, 98 meters; Carmen, 53 m.; Purgatorio, 55 m.: Cen-

tral, 156 m.; Amelia, 48 m.; Santa Rita, 86 m.; San Juan, 86 m. The mine is extensively developed.

Owing to the peculiar nature of the mine, all drilling is done by hand, the ore is hand-sorted, and about half is machine-briquetted at a cost of only about \$0.8 per ton, the argillaceous gangue serving as a natural binder.

Equipment: the mine has complete steam and electric plants, generating upwards of 2,500-h. p. from steam engines, of which 2,000-h. p. is transformed by two 500-k. w. 3-phase current generators and two 250-k. w. 3-phase generators. The electric plant, at Santa Rosalia, furnishes power for hoisting, traction engines and a lighting system having 50 arc lights and a number of incandescent lamps. The company is courageous in installing new machinery. The climate is tropical, and the country extremely arid. Potable water is brought from a reservoir on the Yaqui plateau, through a 16,074-meter pipe line, having pumps at Santa Agueda and Santa Rita. The mines and works are connected by a 30-kilometer private railway, equipped with 9 locomotives and 250 cars.

The smelter, rebuilt 1901 and 1906, has 12 water-jacket blast furnaces, of 200 to 250 tons capacity each, 6 with 12 and 6 with 15 tuyeres each. There are 6 large Root blowers, driven by three 175-h. p. compound engines. Sea water for jackets is supplied by a duplex pump of 2,400 cubic meters hourly capacity, operated by a 250-h. p. engine. Electric locomotives on the slag line dump molten slags into moulds in rough holes in the ground, and, after cooling, the masses of slag are dumped over the end of the breakwater, serving a useful purpose in its extension. Fuel for smelting was German coke and English coal, and patented coal briquettes are used for general fuel. The first fusion product is a matte of 60 to 65% copper tenor, blown up to black copper of 93 to 94% average tenor, production being about two-thirds matte and one-third black copper. Matte and bars are shipped to England and France for refining, the management believing this preferable to adding a converter plant.

The works at Santa Rosalia include a 2-story power building, of steel, concrete and brick, and extensive machine shops, capable of handling all classes of mining work, the company occupying a singularly isolated position.

The harbor of Santa Rosalia has breakwaters of 650' and 2,500', with a 340-meter jetty and 2 new wharves, the dock having an area of 15 hectares, with breakwaters composed of large blocks of slag. The harbor works include a dredge and three 200-ton lighters used therewith. The port handled only 47,879 tons of freight in 1915, as compared with 148,536 tons in 1914. The company owns two steamers, plying between Santa Rosalia and the eastern coast of Mexico. These boats were seized by the Revolutionists in 1914, but later were returned to the company. Copper is shipped to Europe on the steamers of the *Compagnie Chargeurs Reunis*.

The towns of Santa Rosalia has a population of 9,500, of whom 200 are Europeans, dependent solely upon the mines and works, and is controlled absolutely by the company. The town is well laid out, and has 4 general stores, warehouses, saw mill, church, 4 school houses, theater, amphitheater and market. The company gives free medical and surgical attendance, medicines and an excellent hospital service to employes.

The labor question has given considerable difficulty, owing to the scant population of Lower California, necessitating the importation of workmen. Wages average about 2 pesos daily for miners.

In 1915 the company employed 3,360 men. Almost all hand labor is Mexican with some Yaqui Indians. Europeans are only employed as foremen and for special work.

Production: 29,120,000 lbs. in 1910; 27,686,400 lbs. in 1911, and 28,336,000 lbs. in 1912. The production of ore mined for 1911 was 355,100 tons of 3.47% ore; 364,850 tons of 3.51% ore in 1912; 371,300 tons in 1913; 324,000 tons in 1914; 316,800 tons in 1915. The smelter handled 356,700 tons of ore in 1911; 360,000 tons of ore, yielding 12,650 tons of copper in 1912; 374,350 tons, yielding 3.47% or 13,000 tons copper in 1913; 324,000 tons, yielding 3.53% or 11,480 tons of copper in 1914; 317,000 tons, yielding 3.62%, or 11,500 tons of copper in 1915.

Railway transported 607,088 tons, in 1914, as against 675,743 tons in 1913. Reserves of ore amount to 6 years' supply.

The company's policy of secretiveness, concerning mine operations together with its refusal to permit inspection by visiting engineers and geologists, has made it impossible to give detailed information concerning a unique ore deposit and its exploitation. The property is one of exceptional merit and has been ably managed for many years. Company has been able to continue operations despite revolutionary disturbances in Mexico.

Producing at rate of 1,600,000 lbs. of 3% copper ore monthly, 1917.

ESMERALDA COPPER MINING & SMELTING CO. MEXICO

Idle. Mine near Santa Catarina del Norte, Baja California, Mex., known as La Esmeralda, is opened by shaft, with considerable development.

ESPERANZA MINING CO. MEXICO

Sec. and office: E. W. Nicholson, 801 Land Title Bldg., Philadelphia, Pa. **Operating office:** P. O. Box CCC, San Diego, Cal. Mine near Ensenada, Baja California, Mex. Geo. P. Brown, gen. mgr.

Property: 83 hectares, and 40 acres miscellaneous lands, on Cedros island, on the Pacific coast, shows diorite, cut by veins having 3 lenticular ore shoots carrying carbonate and sulphide ores, estimated by company to average 40' width, 300' depth and 1,100' length, and to contain an average of 2.5% copper, 3% zinc, 2 oz. silver and \$3.50 gold per ton.

Development: about 8,500' of workings, showing 150,000 tons of low-grade ore, with about 100,000 tons blocked out for stoping. Has produced about \$450,000 from shipments to the Denver, Pueblo, San Francisco and Tacoma smelters.

In 1915, unsettled conditions in Mexico necessitated closing down the property.

GULF COPPER CO. MEXICO

Head office: Phoenix, Ariz. Mine at Angeles Bay, Gulf of California, Mex.

Cap. \$1,000,000; shares \$1 par. J. H. Baker, pres. and gen. mgr.; G. E. Anthony, mgr. engr.; J. H. Loudon, directors.

Property: 40 hectares, about 100 acres, at north end of Angeles bay, 140 miles N. W. from Guaymas and about 90 miles S. W. from Port Lobos. **Claims** show siliceous schists cut by porphyry dikes and a vein running N. W., dipping at 45° and varying from 5 to 42' in width.

Ore: black oxide and sulphide of copper said to average 4.7% with trace of gold and silver.

Development: by tunnels with 1,363' workings, including winze sunk on vein 175'. Has shipped 300 tons, 25% picked ore, and has several thousand tons of low-grade ore on dump. Property considered promising if properly financed and handled. Presumably idle.

SAN JUAN REDUCTION CO. MEXICO

San Antonio, Baja Calif. Paul Knapp, gen. mgr.; J. C. Puttner, mine mgr.; David Lawrence, mill supt. Operates a mine yielding gold-bearing arsenopyrite ore, 5 miles E. of Triunfo.

The reduction plant has dry rolls, Hardinge mills, roasting furnaces and cyanide tanks.

WEST MEXICO MINES CO.**MEXICO**

Office: Wm. G. Krape Inv. Co., Gas & Electric Bldg., Denver, Colo.
Mine office: San Antonio, Baja California.

Officers: W. G. Krape, pres.-mgr.; D. H. Lawrence, v. p.-supt.; H. C. Van Norman, sec.; T. Williams, treas.

Inc. Jan., 1912, in Arizona. Cap., \$3,000,000; shares \$1 par; non-assessable; outstanding 1,985,000 shares. Annual meeting 1st Wednesday in January.

Property: 3 claims, about 30 acres, in the San Antonio district, 38 miles S. of La Paz, Lower California, Mex. Veins are both fissure and contact, containing gold and silver. Pay ore occurs in shoots and streaks, the main orebody varying from 3' to 14' wide. Sulphides appear at 275' depth.

Development: by inclined shaft, greatest depth being 340' and extent of lateral workings 5,000'. Company claims to have 15,000 tons in reserve with a gross value of \$400,000.

Equipment: includes a 3-stamp concentrating mill.

Production: total production said to be \$20,000 from 6 shipments of ore assaying \$192 to \$326 per ton.

In 1914 the Wm. G. Krape Inv. Co. was selling this stock at "12½¢ per share, fully paid and forever nonassessable" on the installment plan, a recommendation that is a warning to all but the most foolish.

STATE OF CHIHUAHUA**ALMOLOYA MINING CO.****MEXICO**

Office: 46 Cedar St., New York. **Mine office:** Baca, Chihuahua, Mex.

Officers: Nils O. Bagge, pres.; W. H. Schlofield, v. p.; C. I. Morey, sec-treas.; preceding officers and W. M. Jermyn, directors; Victor C. Joslyn, mine mgr.

Inc. 1903, in Arizona. Cap., \$2,000,000; shares \$1 par, in \$800,000 participating noncumulative 10% preferred stock, and \$1,200,000 common stock, all outstanding. New York Trust Co., registrar. Holds title to lands through Minas de Almoloya, S. A., a Mexican corporation.

Property: 177 hectares, including the San Enrique group adjoining the Cigarrero mine, and 4 other groups, about 4 miles from Baca, in the Allende district, with rail transportation over a standard-gauge line to the Cigarrero mine.

The Sierra de Almoloya is an isolated mountain range, about 9 miles long and 2 wide, carrying limestone beds of the Comanche series of the Lower Cretaceous, extensively fractured by several systems of faulting, with shear zones of 50 to 90 metres width, principal zones being the northeast system, of Eocene age, of which the most prominent is the San Pedro fault zone, and the N. 40° W. system of Miocene age, which are the sources of large and rich ore chambers, the most important orebodies occurring at the intersection of these faults. Lands adjoin the Cigarrero mine on the northeast, and carry the extension of the San Pedro fault, proven by diamond-drilling to occur between the 800' and 900' levels.

Development: several shafts, deepest 700', and 4 tunnels, longest 1,600'. Present development is confined to the San Enrique and Exploradora groups, having 1,186' of shafts and winzes, with 2 main and several shorter tunnels, and a total of 4,400' of workings.

Equipment: includes gasoline and air power, with one 15-h. p. and two 60-h. p. hoists. Property will use commercial electric current as soon as available.

Ore so far found has been in pockets, in leached shear zones, carrying

low copper values, which are expected to increase at depth, with about 30% lead, 700 grams silver and 8 to 80 grams gold.

Development: work has been almost entirely along the San Pedro fault which shows ore in depth. Revolutionists practically stopped all work in 1913, holding the superintendent for ransom in April and stopping mail and telegraphic service. Work will be resumed when conditions are again stable.

ALVARADO MINING & MILLING CO.

MEXICO

Offices: Richard Fay Parker, sec. and asst. treas.; 60 State St., Boston, Mass.; W. J. Freeman, asst. treas., Mills Bldg., El Paso, Texas. **Mines and reduction plant:** Parral, Chihuahua, Mexico; T. G. Hawkins, Jr., asst. mgr.

Officers: A. J. McQuatters, pres. and gen. mgr.; Gordon Dexter, v. p. and Ch. of Board; J. Dudley Clark, treas.; R. F. Parker, sec. and asst. treas.; with S. R. Kaufman, F. W. Clifford, N. M. Kaufman, Junius Beebe, Herbert Dumaresq, Dr. Leonard Wheeler, and Frederick Parker, directors. Wm. J. Freeman, asst. treas.; T. G. Hawkins, Jr., asst. gen. mgr.; D. V. Fennessy, cons. engr.

Inc. 1910, in Maine. Cap., \$6,000,000; shares \$5 par. Bonds. \$935,500, 1st mtge., 6% convertible, matured Jan. 1, 1916, extended to Jan. 1, 1926. Old Colony Trust Co., Boston, Mass., transfer agent; State Street Trust Co., Boston, Mass., registrar.

No recent report made up as all records were destroyed by Mexican soldiers in 1916.

Comparative General Balance Sheet.

Assets:	Power Cons. & Stock					
	Property	Plant	Devel.	Discs.	Current	Total
1915.....	\$5,355,935	\$100,000	\$1,099,388	\$20,000	\$536,310	\$7,111,634
1914.....	5,355,935	100,000	910,616	30,073	371,495	6,768,120

Liabilities—	Cap. Bonds Res. for Misc. P. & L.					
	Stock	Notes(a)	Bond Conv.	(b)	Current	Surplus Total
1915.....	\$4,305,025	\$996,700	\$665,333	\$124,730	\$355,191	\$664,655 \$7,111,634
1914.....	4,305,025	1,007,100	665,333	129,000	289,354	371,603 6,768,120

(a) Bonds, \$935,500; (b) includes power plant No. 2, \$92,000.

Comparative Operating Statement.

	Gross Earnings	Oper. Costs	Oper. Profits	De- ductions	P. & L. Surplus
1915.....	\$1,296,631	\$871,156	\$425,475	\$132,423	\$293,052
1914.....	871,156	650,629	412,567	243,046	169,521

Property: at Parral, Chih., includes the Presena, Las Cruces, and Palmilla groups of mines, the latter including the famous Palmilla mine of Pedro Alvarado. These are old mines which were worked in former days by Mexicans.

Ore: silver, gold. New work in 1915 totaled 13,409'; said to have increased ore reserves by 250,000 tons. Total reserves not reported.

Company operates a 400-ton cyanide plant; a 50-ton flotation mill was recently built. Employs, when working, over 1,000 men. Electric power obtained from the Mexican Northern Power Co.

Production:

	Ore to Mill	Gms. Per Ton		Contents	
	Metric Tons	Silver	Gold	Silver-oz.	Gold-oz.
1915.....	128,612	530.2	1.19	2,192,444	4,932
1914.....	82,728	548.1	1.06	.....	.....
1913.....	118,383	570.1	0.79	.....	.....

In 1914 company lost 131 days of operating time; in 1915 operations covered 93.2% of the total time; loss was due mainly to shortage of fuel which had to be transported chiefly from El Paso on special trains operated by the company.

1916: due to political disorders in Mexico company's properties were operated only 42% of the year. Tonnage milled for the year, 53,119 metric tons, containing 886,559 oz. silver and 723 oz. gold.

The Villista forces occupied Parral on November 5th, 1916; seized the cyanide mill and mines, which they operated for 15 days, producing 45 bars of gold and silver bullion; 96 additional bars were stolen and the property robbed to the extent of \$300,000. Many of the office and operating records were destroyed, therefore the company was unable to make its annual statement.

Owing to the very large increase in ore reserves, the capacity of the cyanide mill will be increased from 400 to 600 tons per day and the necessary machinery purchased. Present ore reserves, 500,000 tons. Company will resume operations Oct., 1917.

ARADOS COPPER CO.**MEXICO**

Address: 25 Broad St., New York. Clarence W. Hoyt, pres., 79 Milk St., Lowell.

Property: about 2,000 acres were taken over 1910 from Chihuahua Copper Co., Quo Vadis Copper Co., and include a number of adjoining claims privately owned.

The Chihuahua group has several shallow shafts, and 9 tunnels with about 1,500' of workings, estimated by management to show several thousand tons of ore.

The Quo Vadis and other groups show numerous contact veins between limestone and porphyry, ranging from 2 to 40' in width, development work said to have yielded enough ore shipped to pay for machinery in use on these properties, ore averaging better than 5% copper.

Idle several years owing to political disturbances, but president writes that property will be vigorously and systematically developed as soon as conditions in Mexico warrant. Company is controlled by strong interests who are successful copper producers, and stock is privately held by a few people.

Equipment: includes a 25-h. p. hoist, good for 500', and small Gardner air compressor and necessary mine buildings.

AURORA Y ANEXAS; CIA. MINERA LA, S. A.**MEXICO**

The Cia. Minera Aurora y Anexas, owned by the late Ernesto Madariaga and brother, has worked for several years past, the Aurora mine, with 16¹/₂ hectares in the Cuchillo district, near Coyame, Chihuahua and the Justicia copper mine, 4 miles east of Marquez station on the Kansas City, Mexico & Orient railroad. These properties were purchased from Don Francisco Diaz in 1908.

Owing to the revolution it is impossible to get recent information.

BATOPILAS MNG. CO.**MEXICO**

Address: 50 Broad St., New York City. **Mine office:** Batopilas, Chihuahua, Mex.

Officers: F. D. Merchant, pres.; Sam'l Elliott, N. F. Palmer, v. ps., preceding officers, Jas. Marwick, Geo. W. Field, Alton B. Parker, Gates W. McGarrah, Louis H. Scott, Walter M. Brodie, Geo. Rowland, E. L. Stevens, all of New York. F. A. Drury, Worcester, Mass.; Robt. M. Currier, Boston, directors; E. W. A. Jorgensen, sec. and asst. treas.; L. H. Scott, treas.; John R. Harbottle, gen. mgr.

Cap., \$9,000,000; shares \$20 par; outstanding \$8,931,980; nonassessable. **Bonds:** authorized \$1,000,000, 1st mtge. 6's, dated Dec. 1, 1887, for 15 years, outstanding \$367,900. Bonds were extended to Dec. 1, 1917, with provision that 10% of amount outstanding at that time, \$45,900, should be retired each year, beginning in 1908. Shares are listed on the New York and Boston Stock Exchanges. Annual meeting 3rd Tuesday in April. Union Trust Co., New York, and State St. Trust Co., Boston, transfer offices. Farmer's Loan & Trust Co., New York and Old Colony Trust Co., Boston, registrars.

A concession from the Mexican government was granted April 12, 1886, to A. R. Shepherd for 20 years, covering 61 sq. miles of the richest mineral district in and around Batopilas, together with water rights of the Batopilas River. This concession was assigned to the Batopilas Mng. Co., which was organized Oct. 13, 1887, in New York, as a consolidation of 6 companies, Cons. Batopilas Silver Mng. Co., New Giral Silver Mng. Co., Descubridora Cons. Silver Mng. Co., Camuchin Cons. Silver Mng. Co., Valenzuela Cons. Silver Mng. Co., Animas Silver Mng. Co.; other mining properties were also purchased. The concession expired in 1906, and was renewed for 10 years, expiring May 31, 1916. It gave the company full mining rights over the area mentioned, the company being required to purchase outright at least 100 hectares, 240 acres, per year.

Balance sheet as of Dec. 31, 1914, shows assets, \$12,794,479, of which amount \$12,485,435 represents mines, real estate, buildings, equipment, etc., and \$207,322 current assets; current liabilities \$37,258, accrued liabilities \$24,950. Total surplus Dec. 31, 1914, \$3,365,771. Oct. 15, 1915, the company had cash in New York banks, \$87,247.

Property: located around the town of Batopilas, in the Andres del Rio mining district, in the extreme southwestern part of the State of Chihuahua, Mexico. When 1913 began the company had titles in the silver zone for 865 hectares, and in the auriferous zone, 20 miles up the river, for 64 hectares. On account of the revolution it has been impossible, during the last 3 years, to comply with the provisions of the contract and time allowances have been granted. In addition the company owns 130,000 acres of ranch and timber lands.

Ore: native silver occurring with calcite in veins, which are mainly in diabase. Some of the veins have contained very rich ore. The San Miguel property contains many veins, some of which have been worked for more than 100 years. The main veins are the San Antonio, Cancio, Cinco de Mayo, Diablo, Carmen, and Veta Grande now worked out. During 6 months in 1913 the average assay for low grade ore from the San Miguel mine, which produces $\frac{3}{4}$ of the silver output, was 9.27 oz. per ton, while the ore from the Porfirio Diaz Tunnel group averaged 6.55 oz. per ton. High-grade ore produced during 8 mos., 609 tons, averaged 411 oz. per ton.

Development: over 10 miles of adit levels and 77 miles of workings. The principal mines are the Porfirio Diaz Tunnel on the Todos Santos Group, the San Miguel mine, El Escritorio, and El Camuchin. Work at El Escritorio and El Camuchin was unsatisfactory in 1913 and they were closed down.

Equipment: the Hacienda San Antonio contains 100-stamp mill with a

daily capacity of 40 tons, electric light plant and air compressor, all run by Pelton wheels capable of furnishing 550-h. p. The San Miguel Hacienda contains a 25-stamp mill for high-grade ores, cyanide plant, amalgamating pans, refining plant, a roasting and lixiviation plant for concentrates, with a daily capacity of 8 tons, machine shop, foundry, office buildings, dormitories, boarding house, etc.

Power obtained from the Batopilas River by means of a dam 764' long and an aqueduct 9,900' long. The water after being used in the San Antonio plant, is siphoned under the river and runs to the San Miguel Hacienda, where 32-h. p. is developed by turbines.

Production and profits have been as follows:

Year	Tons Ore Treated	Oz. Silver	Operating Profits
1915.....	.....	156,862	.....
1914.....	6,630	188,087	\$ 10,556
1913.....	20,887	374,174	60,068
1912.....	34,032	564,398	80,046
1911.....	33,073	516,688	17,409(a)
1910.....	43,612	730,697	106,258(a)

(a) Deficit.

During the last 3 years the Mexican revolution has interfered with the operation of the company, the mines were worked only about 8 mos. of each year with a consequent reduction of output. The future of the property depends upon new development and the acquisition of a new mine.

At a special meeting called in Aug., 1916, company's charter was amended, authorizing the management to conduct mining operations in the United States.

BUENA TIERRA MINING CO., LTD.

MEXICO

T. D. Pillans, sec., 11 Cornhill, London, E. C. Eng.

Directors: R. T. Bayliss, chairman; Lord Arthur Butler, W. McDermott, J. H. M. Shaw; R. M. Raymond, cons. engr.; A. C. Brinker, genl. mgr.

Cap., 330,000 shares, £1 par; all issued and fully paid. Reg. Feb. 2, 1912, in England, to acquire from the Exploration Co. of England and Mexico, Ltd., the Buena Tierra mine, 89 acres, in the Santa Eulalia district, Chihuahua, Mex., 15 miles S. E. of Chihuahua. Purchase price was £300,000, payable £178,201 cash, £121,799 in fully-paid shares. Property reported on by R. T. Bayliss and R. M. Raymond. Dividends paid, 2 shillings per share.

Ore: principally lead and zinc carbonates assaying 10 oz. silver, 50% lead and 25-50% zinc. There is also a low-grade mixed sulphide. Ore-bodies occur in limestone lying almost flat, but instead of following the fissures, spread out into flat beds near them, their average width is 30', average thickness, 40'. The Chorro orebody has a depth of over 1,000'. Developed orebodies are most numerous at 450' depth, but most of the mines have ore down to a depth of 1,300'. Ore reserves estimated each in 1915 at 300,000 tons.

Development: by shafts; Buena Tierra shaft is 1,400' deep. Raises are put up from the levels at intervals of 75-200' and the ore is mined in small bunches, little powder being required and practically no timber.

The Mexican revolution has interfered with production during the past few years and property has not been operated steadily. Lead ore is shipped to the A. S. & R. Co.'s smelter at Chihuahua or El Paso and the zinc ore to the United States.

Development costs are high, due to difficulty of finding orebodies. If a daily tonnage of 300 tons can be maintained, conditions are good for low costs.

In Sept., 1916, Pres. Carranza of Mexico issued a decree enforcing the working of all mining properties under penalty of confiscation, with certain exceptions. Exemption for the Buena Tierra Co. has been applied for.

BUENA VISTA GOLD MINING CO. MEXICO

Owned by El Rayo Mines Co., which see.

CHIHUAHUA-ESPERANZA GOLD MINING CO. MEXICO

Subsidiary of the Mines Co. of America, which see.

CHIHUAHUA MINING CO. MEXICO

See Howe Sound Co.

Offices: 734 Fifth Ave., New York City, and Chihuahua, Mex.

Officers: G. B. Schley, pres.; E. B. Schley, v. p.; W. J. Walworth, sec.-treas.; C. G. Raynor, asst. sec.-treas.; W. J. Quigly, mgr., Chihuahua.

Inc. Jan. 8, 1890, in New York. **Cap.**, \$600,000; shares \$1 par; outstanding, 587,806 shares, nearly all of which is owned by El Potosi Mining Co., control of which company was obtained by Howe Sound Co. in Jan., 1916. Stock transferred at company's New York office. Annual meeting, second Monday in January. Stock is closely held.

Property: in the Santa Eulalia district, Chihuahua, Mex.

Ore: lead, silver and zinc.

Development: by vertical shafts to a depth of 1,800'. Operations have been hampered by the revolution, though shipments of zinc ore were made in 1915 and 1916.

CUSI MINING CO. MEXICO

Office: 1025 Peoples Gas Bldg., Chicago, Ill. L. P. Ryan, supt., 711 Mills Bldg., El Paso, Texas (temporary address).

Officers: Potter Palmer, Jr., pres.-treas.; Honore Palmer, v. p.; A. M. Murphy, sec.; all of 721 Peoples Gas Bldg., Chicago. H. L. Hollis, mg. director.

Property: the Promontorio mine and other claims, at Cusihuiriacic, Chihuahua, Mexico, showing veins of silver-lead ore.

Equipment: includes a 250-ton mill, partly completed, June, 1917, and one flotation unit installed to treat silver-lead ore.

DESCUBRIDORA MINING & DEVELOPMENT CO. MEXICO

Owned by El Rayo Mines Co. See Mines Co. of America.

DOLORES MINES CO. MEXICO

Subsidiary of the Mines Co. of America, which see.

EL POTOSI MINING CO. MEXICO

Control obtained in Jan., 1916, by Howe Sound Co., which purchased 53,800 shares out of a total outstanding capitalization of 60,000 shares.

Property. in Santa Eulalia district, Chihuahua, adjoins property of Chihuahua Mining Co., nearly all of whose stock is owned by El Potosi. Is one of the oldest producers of silver-lead ore in the district, said to have paid dividends for many years, and to have large ore reserves. Idle at present due to disturbed conditions in Mexico.

EL RAYO MINES CO. MEXICO

Subsidiary of the Mines Co. of America, which see.

IGNACIO RODRIGUEZ RAMOS, S. A.; COMPANIA MINERA MEXICO

Property "confiscated" by Gen. Villa, 1915, and operated by Sr. F. R.

Quijano, Chihuahua City, Chih., Mexico. Shipments 1915 to Granby Mining & Smelting Co., St. Louis, held up by Villistas, and smelter agent unjustly jailed. No direct information received.

Property: 129 hectares, covering the mineral zone of the Sierra Almoloja. The geological conditions greatly resemble the Santa Eulalia camp. Ore occurs in limestone, in lenses, one having a width of 70' and length of 140', ore said to average 5% copper, 25% lead, 6% zinc, 15 oz silver and \$8 gold per ton. Values are mainly in silver-lead ores, though chalcopyrite occurs as a by-product.

The mine is extensively developed to a depth of 300 meters, by an 800' shaft and 2 main tunnels, with much rich ore in sight.

Equipment: includes steam and electric power, with steam hoist and air compressor. A 3-stamp experimental mill is connected with the mine by a 4,000' incline tram.

INTERNATIONAL GOLD & COPPER MINING CO. MEXICO

Idle. **Mine office:** Guaynopa, Chihuahua, Mex. J. C. Peterson, pres. Company took over lands formerly held by International Cons. Smelting & Mining Co., known as the Utah mine, in Guaynopa canyon. Claimed by former owners to have a 90' vein, with an 8 to 12" pay streak carrying high-grade chalcopyrite, assaying 5 to 8% copper, with good silver values. Mine has several short tunnels. Idle on account of revolution, but regarded unfavorably for other reasons. No recent returns secured.

LAS VIGAS MINING CO. MEXICO

Dead. Property controlled by A. McKenzie, 66 Broadway, New York. Mine at San Sostenes, Coyame, Iturbide, Chihuahua, Mex., consists of 74 hectares, said to show upturned Cretaceous sandstones and shales with interbedded copper lodes, occurring as impregnations and replacements in sandstone. Four veins last under development are reported to average 7 to 12' width, and to give average returns of 7.5% copper and 3 oz. silver per ton, mainly from disseminated bornite and chalcopyrite, with occasional oxidized ores and native copper.

Development: by shafts of 61', 98', 125' and 212', with various levels; also 3 short tunnels. Workings estimated to develop 160,000 tons of ore.

Equipment: includes steam power, a hoist, an air compressor, and a 100-ton concentrator. Buildings include an office, store and 19 dwellings. Ore was hauled, 43 miles, to Las Trancas stations, by a Buffalo-Pitts traction engine. Reported under option to English parties, 1916.

LLUVIA DEL ORO MINING CO. MEXICO

Is a close corporation, owned and controlled by B. F. Yoakum, John Scullin of St. Louis, Mo., and the estate of Jas. Campbell. Fred G. Farish, mgr.

Property: in the Andres del Rio Mtns., Chihuahua, Mex., consists of the Lluvia del Oro gold mine, a mill, cyanide plant and hydro-electric plant.

MINES COMPANY OF AMERICA MEXICO

Office: 115 Broadway, New York City.

Officers: John Lambert, pres., Chicago; W. E. Reis, v. p.; W. H. Aldridge, 2nd v. p.; A. T. Black, 3rd v. p.; H. S. Black, treas.; J. D. Tooker, sec. and asst. treas.; preceding, with W. L. Ellwood, W. B. Thompson and W. H. Smith, directors; Chas. Biesel, gen. mgr., El Paso, Texas.

Inc. Dec., 1902, in Me., as a holding company. Owns entire capital stock of the Creston Colorado Co., 99% of capital stock of Dolores Mines Co., 99½% of capital stock of the El Rayo Mines Co., and 33¼% of the La Dura Mill and Mining Co., of which company the Dolores Mines Co.

owns 33½% and the El Rayo Mines Co. 33½%. Also owns the **Chihuahua-Esperanza Gold Mining Co.** and the **Consuelo Mining, Milling & Power Co.** Cap., \$9,000,000; outstanding, Dec. 31, 1916, \$8,648,013; shares \$10 par. Authorized capital stock increased 1910 from \$2,000,000, and par value shares from \$1. Of the new stock \$4,000,000 was set apart to acquire the \$2,000,000 stock of the Dolores Mines Co., and \$2,499,100 was appropriated to acquire the \$714,040 stock of the El Rayo Mines Co. U. S. Mortgage & Trust Co., New York, transfer agent. Guaranty Trust Co., New York, registrar. Annual meeting, first Wednesday after first Saturday in November, at Augusta, Me.; books close 10 days in advance. Stock listed on New York Curb.

Dividends: total paid to Dec. 31, 1916, amounted to \$4,958,600, including a dividend in 1906 in stock of the Dolores Mines Co. No dividends were paid in April, July or Oct., 1912, owing to revolutionary conditions in Mexico; in January, 1912, 1½% was paid. Dividends resumed in January, 1913, with payments of 1¼%, which rate was also paid in April and July, 1913; no payments since.

Comparative Cons. General Balance Sheet, Dec. 31

Assets:	Prop. Investments	Plant & Equip.	Claims Against Mex. Govt.	Current Assets	Total
1916.....	\$8,577,309	\$1,051,632	\$393,544	\$641,302	\$10,744,466
1915.....	7,911,712	1,050,660	392,859	732,089	10,087,322
1914.....	7,951,718	1,041,639	382,920	960,848	10,337,126

Liabilities:	Cap. Stock	Sub. Co.'s Stock Out.	Suspense Account	Cur. & Wk'g Accts. Pay.	Surplus & Res.	Total
1916.....	\$8,648,013	\$622,864	\$273,414	\$225,020	\$ 975,154	\$10,744,466
1915.....	8,376,583	23,604	302,202	56,358	1,328,573	10,087,322
1914.....	8,376,583	23,624	291,314	90,743	1,554,861	10,337,126

Operating receipts for 1916 were \$100,892; operating expenditures, \$248,619, leaving an operating loss of \$147,727, compared with profit of \$71,037 in 1915. Adding general expense and taxes, the loss in 1916 was \$173,419.

Ore reserves: on Jan. 1, 1917, estimated total ore of the company's properties had a gross value of \$5,824,670, an increase of \$402,801, based on gold at \$20 and silver 75c per oz.

Companies controlled by Mines Company of America:

Chihuahua-Esperanza Gold Mining Co., Mexico

Owned by Mines Company of America.

Property: adjoining that of the Dolores Mines Co., Chihuahua, on the west, consists of 3 claims, 304 acres. Company also owns 10,000 acres of timberland 5 miles north of Dolores.

Geology: formation is similar to that of the Dolores. Veins occur as rhyolite fissures in dikes; 3 vein-systems exist. Development amounts to 502'. Ore reserves said to total 2,500 tons worth \$15 per ton. La Esperanza mine has great possibilities.

Consuelo Mining, Milling & Power Co., Mexico

Control, owned by Mines Company of America.

Property: adjoins that of the Dolores Mines Co., west of Madera, in Chihuahua, on the south and east, and consists of 77 pertenencias, 190

acres, and a half interest in 9 pertenencias, 22 acres, also a water right on the Tutuca River. The formation is similar to that of Dolores. No systematic development has been done; the value of the ground is prospective.

Creston Colorado Co., Mexico

Controlled through entire stock ownership by Mines Company of America. **Mine office:** Torres, Sonora, Mex.

Officers: John Lambert, pres.; W. E. Reis, v. p.; A. T. Black, 2nd v. p.; H. S. Black, sec.-treas.; J. D. Tooker, asst. treas.; John Lambert, W. E. Reis, J. H. Hoyt, H. A. Kelly, G. von den Steinem, directors.

Inc. February, 1902, in Ohio. **Cap.**, authorized and outstanding, \$100,000; par \$100. Annual meeting, 1st Saturday in November.

Property: 27 claims, 828 acres, commonly known as "Minas Prietas (Black Mines), in Sonora, at La Colorada, a station on the narrow-gauge Mexico Union Ry., 12 miles east of Torres, on the Southern Pacific R. R. of Mexico, and 200 miles south of Nogales, Ariz. The mines have been worked for 100 years and have produced regularly during the last 33 years. Gross production estimated at over \$112,000,000.

The property is divided into 4 different mines: the Creston, Colorada, Amarillas-Grand Central and Verde. The claims contain a number of producing veins, and cover the latter for 8,000' along their strike. Company also owns surface rights to 7,000 acres land, including the mining claims. It also owns a water right on the Matape River.

Ore: veins have a general E.-W. strike, dip N. 55° to 90°, and vary in width from 3' to 40'. Larger orebodies occur principally in diorite, metamorphic rocks and quartz porphyry. The Creston ore, or east end ore, is a highly fractured quartz. The Colorada is a harder quartz. Sulphides of silver, iron, lead and zinc occur from the surface down. Streaks of high-grade sulphide shipping ore are occasionally found. The Verde ore is a hard quartz, at times very refractory. The Amarillas-Grand Central ore is a highly oxidized quartz, containing free gold in places. Average values in ores, as milled, are said to be 60% gold and 40% silver.

Development: in 1916 totaled 2,075'; compared with 2,578' in 1915. Work was divided as follows: Creston mine, 1,473'; Colorada mine, 220'; Amarillas-Grand Central mine, 376'.

Ore reserves: estimated Jan. 1, 1917, as 190,350 tons, average assay \$4.93 per ton, or a gross value of \$937,591, as compared with 200,300 tons average assay \$4.89 per ton, the previous year; gold figured at \$20 per ton, silver at 75c per oz. The Amarillas-Grand Central mine has one dump containing 280,000 tons which will be retreated.

Equipment: at the Creston mine includes steam hoisting and compressor plant, foundry, etc., a large Gates crusher receives the ore from the mine; at the Colorada cyanide plant, which receives Creston ore over a 3,200' aerial tramway, and the Colorada ore over an 800' incline tramway; at the Amarillas-Grand Central mine includes steam operated hoisting and compressor plants, electrically-driven crushing plant; also a 5-ton cyanide plant, which receives ore from the Creston, Amarillas-Grand Central and Colorada over aerial tramways. A pumping plant, 18 miles from the mines, on the Matape River, supplies water for all purposes through a pipe.

Mill and cyanide plants: in 1916 extensive shut-downs were in order due to revolutionary disturbances. The Amarillas-Grand Central unit operated 48 days and treated 14,550 tons of ore. Extraction amounted to 73.8%, 20.5% by concentration and 53.3% by cyanidation.

Production:

Year	Creston Mine, Tons	Colorado Mine, Tons	Am.-G. C. Mine, Tons	Old Tail- ing, Tons	Total Tons	Value per Ton
1916.....	12,400	2,150	.....	.....	14,550	\$5.65
1915.....	98,662	18,854	10,365	3,469	131,350	4.80
1914.....	94,655	18,090	10,887	3,243	126,875	4.67

The Colorado mine has ore below 400' justifying further work. Creston-Colorado was closed at last accounts.

Dolores Mines Co., Mexico

Controlled through ownership of 99% of capital stock by Mines Company of America. Same directorate.

Inc. Nov., 1903, in Mex. Cap., authorized and issued, \$2,000,000; full paid and non-assessable; par \$5. No bonded debt. U. S. Mortgage & Trust Co., New York, transfer agent. Guaranty Trust Co., New York, registrar. Annual meeting, first Tuesday in December. Listed on New York Curb.

Entire capital stock of this company was formerly owned by an English company called Dolores, Ltd.; dissolved Feb. 25, 1908, by exchange of stock, share for share, of Dolores Mines, Ltd. The company owns 33 1/3% of the La Dura Mill & Mining Co.

Property: 17 contiguous claims, 250 acres, in Chihuahua, west of Madera, a station on the Mexico Northwestern Ry., about 250 miles S. W. of El Paso, Texas, and 200 miles N. W. of the city of Chihuahua. Mines are reached over a 45-mile trail, requiring 5 to 7 days' time for pack trains. Company also owns 3 detached mineral claims, 126 acres, near Dolores, and all surface rights to 12,500 acres, also a water right on the Tutuaca river. The main group, as shown by developments to date, contains 4 main vein systems, known as the Alma, San Francisco, West San Francisco, Washington and Arco Iris dikes, covered for 8,000' on the strike of the Alma vein system, 4,000' on the San Francisco vein system, 3,800' on the West San Francisco, 1,000' on the Washington, and 2,600' on the Arco Iris vein system.

Geology: vein systems consist of rhyolite dikes in andesite; the veins are fissures in these rhyolite dikes, strike north and dip 55° to 90°. Ore-bodies occur at or near intersections of side fractures and within the boundaries of the dike. The Dolores ore is a very hard quartz, containing about 2% sulphides of iron, silver and occasionally lead and traces of zinc. Values in ore are approximately 40% gold and 60% silver.

Development: in 1916 totaled 1,795' as compared with 2,833' in 1915; all done by hand and above the 500' level. The 600' and 700' levels are under water.

Ore reserves: were estimated Jan. 1, 1917, as follows:

	Tons	Value per Ton	Gross Value
Ore in place.....	135,628	\$13.80	\$1,873,335
Broken Ore.....	13,595	14.10	191,668
Total.....	149,223	\$13.83	\$2,065,003

Compared with 125,663 tons of \$14 ore with gross value of \$1,768,693 on Jan. 1, 1916. Values are based on \$20 per oz. for gold and 50c per oz. for silver.

Equipment: includes steam-operated crushing, concentrating and cya-

niding plants, also compressor and hoisting plants, machine shops, etc. A steam-driven Reidler pump, $2\frac{1}{2}$ miles east of the mine on the Tutuaca river, supplies all necessary water. Electrical equipment to supplant steam power is in place. A 30-mile transmission line connects Dolores with Madera; line is designed to carry 3-phase, 60-cycle current of 33,000 volts. Power will be furnished by a generating plant built near Madera, to consist of three 320 k. w. generators, driven by 3 Diesel type oil engines of the "Snow" make. It is the intention to double the capacity of the milling plant, which now has 25 stamps and four 5' Bryan mills.

In the re-modeled mill a 15x24" Blake crusher will replace 3 small machines; belt conveyors will be installed and steel ball mills will replace stamps and Bryan mills. The complicated flow-sheet will be simplified.

The milling plant was not operated in 1916 on account of the revolution. When operating, extraction is about 87%, 18% by concentration and 69% by cyanidation. Bullion is marketed in Maurer, N. J. Concentrates are shipped to the El Paso smelter.

Company employs about 365 men under normal conditions, only 17 being Americans. The small amount of development work done in 1916 gave good results.

The orebody found in unprospected ground in 1915 opened well on the 400' and 500' levels. The shoot is now 265' long, with indications of greater length. Management expects to reduce power costs by over 300% when the plant is running by electricity and to double the milling capacity. The future of Dolores looks promising.

El Rayo Mines Co., Mexico

Controlled through ownership of 99½% of capital stock by Mines Co. of America. Same directorate. Mine office: Santa Barbara, Chihuahua, Mex.

Inc. Feb. 13, 1906, in Maine. Cap., \$1,000,000; outstanding \$714,040; shares \$2 par. No bonded debt. Annual meeting, second Tuesday in February. Listed on New York Curb. Company is the American holding company for the El Rayo Mining & Development Co., S. A., a Mexican corporation. Owns the Descubridora Mining & Development Co. and Bueno Vista Gold Mining Co., also 33E..D%OTAA....6 UIG,nRy. cmfwyp Co.

Property: 21 claims, 766 acres, in the State of Chihuahua, S. W. of Santa Barbara, the terminal of a branch line of the Mexican Central Railway. Mines can be reached from Santa Barbara over an 8-mile trail. Company also has a 14-year lease on about 12 square miles of timberland, adjoining the mining property. El Rayo is at an elevation of 7,200' above sea level. The mining claims cover the N. S. strike of the producing veins for over 2 miles.

Ore: gold, silver in fissures in rhyolite. Veins dip from 50° to 90° and the filling varies from a friable and oxidized quartz at the north end to a harder sulphide-bearing quartz at the center and south end of the property. The north end contains about 4% sulphides, chiefly iron, with traces of lead and zinc. Copper sulphides are found occasionally. Values in the ore as produced during 1915 are, approximately, 74% gold and 26% silver. The orebodies consist of a number of irregularly shaped lenses, greatly varying in width and values. They occur principally at the intersection of side fracture with main fracture.

Development: total underground workings amount to 78,268'. In 1916, 282' was done during the limited time of operations, divided as follows:

Adela mine, 276', El Rayo mine 6'. The Adela mine covers 4,700' of the vein system at the north end. The El Rayo mine covers 2,300' of the vein system and adjoins the Adela on the south. The Descubridora mine covers 5,000' of the vein system on the extreme south end of the property. A 6' vein has been opened by winze 126' below 1,300' level of the Descubridora mine. The waste filling system of stoping is used.

Ore reserves: were estimated Jan. 1, 1917, as follows:

	Tons	Value per Ton	Gross Value
Ore in place.....	65,210	\$11.58	\$755,283
Broken Ore.....	13,328	10.77	143,542
Total.....	78,538	\$11.44	\$898,825

Compared with 75,038 tons of \$10.48 ore with gross value of \$786,825 on Jan. 1, 1916. Values are based on \$20 per oz. for gold and 50c per oz. for silver.

Equipment: includes a 1,950 cu. ft. steam operated compressor plant. A 2-mile aerial tramway furnishes the necessary fuel, lumber and mining timbers.

Mill: includes 160-ton crushing, concentrating and cyaniding plants. From the storage bin at the portal of the 1,100' level of the Adela mine the ore is trammed 1,300' in 6-ton cars to the mill storage bin. Course of ore through plant is as follows: from bin through 9"x15" Blake crusher, set at 1" discharge; undersize by conveyor belt to bin, by Challenge feeder over conveyor belt to one set of 16"x36" Traylor rolls, discharge to 2 sets of 14"x30" Traylor rolls; to classifier; overflow to tables, oversize in closed circuit returned to 7"x14' tube mill; discharge to classifier, overflow to tables, oversize in closed circuit returned to tube mill. Pulp treated by cyanide solution. Resulting bullion and also the concentrates are marketed in the U. S.

Power: electrification of entire plant is under way. Electricity will be furnished, under contract, by the Cia. Agricola y de Fuerza Electrica del Rio Conches, S. A., from their plant at La Boquilladam, about 70 miles from El Rayo.

Extraction has been as follows:

Year	Conct. & Flotation	Cyanidation	Total
1916—No output.			
1915.....	20.7%	63.3%	84%
1914.....	(a) 14.0%	68.0%	80%
1913.....	(a) 12.0%	77.0%	89%

(a) By concentration alone.

Flotation by the Callow system was proven a success. During the last month's operations recoveries were 42.7% by cyanidation and flotation and 47.6% by cyanidation.

Due to revolutionary conditions the property was closed down Sept. 9, 1915, to be reopened when practicable. Work has been carried on under most adverse conditions, but at a profit. When operating under normal conditions the company employs 15 Americans and about 385 Mexicans.

La Dura Mill & Mining Co.

Office: 111 Broadway, New York City. **Mine office:** La Dura, Sonora, Mex. **Cap.,** outstanding, \$1,000,000. The Mines Co. of America, Do-

lores Mines Co. and El Rayo Mines Co., each own one-third of the capital stock.

Property: 4 individual mines—Gloria-Fortuna and La Dura, on the east bank of the Yaqui river, Sonora; California and Prieta, 1½ miles N. E. of the former. The mines are near La Dura station on the Cananea, Yaqui River & Pacific Ry., which leaves the main line of the Southern Pacific of Mexico at Corral station, 325 miles south of Nogales, Ariz. Mines are connected with railroad by aerial tram.

Ore: silver, copper, lead, in 5 main veins; the California, Prieta, Gloria-Fortuna, West Florida and La Dura veins. The Prieta and Gloria veins, from 6" to 4' wide, occur in andesite, strike N. W.-S. E. and dip 30° S. W. Ore is a white quartz containing sulphides of silver, copper, lead, iron and zinc. It occurs in lenses in terraces formed by frequent faulting. Most of the ore requires milling.

Ore reserves: estimated Jan. 1, 1917, as 16,015 tons, average grade \$54.80 per ton.

Only the Prieta and Gloria mines have been operated since they were acquired by the company. The Prieta has a 3-compartment shaft, 1,040' deep. The Gloria is operated through a 1,600' incline shaft and a 700' vertical shaft, connected with the former, on the 500' and 700' levels. Stopping has proved persistence of veins in spite of faulting.

Equipment: in 3 units as follows: the Prieta-Gloria steam-operated compressor and hoisting plants; the Gloria-Fortuna-La Dura steam-operated compressor, hoisting, milling and generating plants; pumping plant, stores, offices, and shops located half way between the two groups of mines. A transmission line from the Gloria-Fortuna plant furnishes power for pumping.

The mines employ under normal conditions, 8 Americans and about 225 Mexicans. Owing to the revolution the property was closed down in September, 1913, but will be reopened as soon as it is safe to do so. Accumulated products are stored in the bottom of the mine under water. Mines Company of America seems to have several good properties, is well managed, and ought to make large profits when conditions are better in Mexico.

PARCIONERA CONSOLIDATED MINING CO.

MEXICO

Address: Jos. S. Qualey, pres., 25 Pine St., New York City. **Mine office:** Santa Eulalia, Chihuahua, Mex. Ernest Henderson, sec. Is a close corporation, shares \$100 par.

Property: a silver-lead mine, with some copper. Idle on account of Mexican revolution.

RIO PLATA MINING CO.

MEXICO

Office: 654 W. 51st St., New York.

Officers: H. W. Miller, pres.; Archibald Nesbitt, v. p.; Jas. H. Lee, sec.-treas., with Geo. F. Parker, Jos. J. Bonneau, L. Bonneau, John C. Hanson, W. E. Green, Jos. Coult, R. N. Brundage, L. O. Hedden, David W. Shanks, directors.

Inc. April 7, 1906, in Arizona. **Cap.,** \$2,000,000; shares \$5 par; outstanding \$1,872,590. Stock transferred at company's office. New York Trust Co., New York, registrar. Annual meeting in January, at Phoenix, Ariz. Protocolization of the company completed Oct. 15, 1910.

In 1911 company acquired control of the Trinity Cons. Hydraulic Mining Co. in California.

Comparative General Balance Sheet (Year Ending Nov. 30)

Assets:	Prop-erty	Cal. Mine Investm's	Treas. Stock	Cash	Other Current	Total
1915.....	\$1,298,779	\$632,436	\$127,410	\$4,214	\$98,357	\$2,161,196
1914.....	1,298,522	631,964	127,410	11,967	87,216	2,157,079

Liabilities:

	Capital Stock	Current	Suspense Account	Surplus Account	Total
1915.....	\$2,000,000	\$2,575	\$8,665	\$149,956	\$2,161,196
1914.....	2,000,000	4,697	.....	152,382	2,157,079

Income Account (Year Ending Nov. 30)

	Silver Sales	Inventory (+ or -)	Total Income	Expenses			Year's Surplus
				Oper.	Admin.	Divids.	
1915	\$ 545	\$	\$ 1,428	\$ 2,250	\$ 1,604	\$	\$(d) 2,426
1914	.....	.....	14,493	6,033	12,277	.....	(d) 30,887
1913	.....	-115,395	10,550	27,389	17,966	18,726	(d) 53,531
1912	95,330	+ 74,062	178,628	60,930	35,646	37,392	44,661
1911	422,443	- 12,989	410,997	150,534	43,515	149,554	67,393
1910	387,364	+ 34,764	425,557	140,324	40,169	140,073	104,990

(d) Deficit.

Dividends: initial dividend, 1½%, paid Dec., 1909; quarterly dividends, 2%, from March, 1910, to Dec., 1911, inclusive; none in 1912; Feb. 1, 1913, 1%; none since.

Property: the lands and reduction works formerly owned by the Cia Minera de Rio de Plata, S. A., of Mexico, includes 187 acres mining land, 2,700 acres ranch and timber lands and water rights, located 6 miles S. of Guazapares, Chihuahua, and 350 miles from El Paso. Holdings include the Santo Nino, David, Santa Teresa, Santa Barbara, Cleopatra, La Ultima and Enrique silver mines. The ore occurs in the Santa Barbara fissure vein, dipping 17°, with average width 4 to 6'.

Development: by tunnels, with about 3,000' of workings. Claimed to have \$2,000,000 in ore blocked out.

Equipment: includes hydro-electric plant and an auxiliary steam plant, 25-stamp mill, 60-ton concentrator and an 80-ton cyanide plant.

Operations have been greatly interfered with on account of the revolution.

RIO. TINTO COPPER CO.

MEXICO

Office: Perry Payne Bldg., Cleveland, Ohio. **Mine and works office:** Terrazas, Chihuahua, Mex.,

Officers: James Corrigan, gen. mgr.; H. A. Eye, supt.; Capt. M. D. Murray, mine supt.; H. L. Schneider, smelter supt.; J. M. Baker, smelter foreman; F. W. Topken, master mechanic.

Inc. in Ohio, holding property through a subsidiary Mexican company, and is operated as a close corporation under the control of Corrigan, McKinney & Co. The Rio Tinto Mexicano mine and works were bought 1908, for a price said to have been \$187,500, and this company also took over the property formerly held by the San Rafael Copper Mining Co.

Property: about 25 miles north of Chihuahua City, comprises a main tract of 153 hectares, and a smaller tract of 6 hectares, including nearly all the developed mineral property of the Terrazas camp, except a few lead mines. The larger tract includes the Rio Tinto mine, and properties formerly worked by the Rio Tinto Mexicano Mining Co., Boston & Mexican

Mining Co., Dragoon Mining Co. and San Rafael Copper Mining Co. The principal properties are the Rio Tinto Mexicano, San Rafael, Promontorio, Verde and Colombia mines, all connected underground. The company also owns the Savanarola group, at Savanarola, about 50 miles south of Chihuahua and 35 miles west of Ortiz, carrying silver-copper and lead ores.

The Rio Tinto Mexicano mine was opened 1860, closed 1902, and reopened 1905, and has been owned and operated by a number of different mining companies until purchased by the present company from Messrs. Enrique and Juan A. Creel.

Geology: the mine shows contact deposits between limestone and altered andesite, there being 5 known orebodies in a metamorphic zone traced 1,500 metres, the orebody, with a minimum of 2', maximum of 100', and average of about 20' width, being erratic but of very large extent. Ore also occurs between the bedding planes of limestone, near a large quartz ledge, and the orebodies, while erratic in size and occurrence, are connected and practically continuous. The limestone has an average dip of 45° N.-W., and the property has also some silver-lead ore. Ore near surface is mainly oxidized, but sulphides occur below. The oxidized ores range 2 to 5% in copper tenor, with traces of lead and zinc, with an average of about 3% copper, 2 to 4 oz. silver and 30 to 75c gold per ton. The gangue is mainly limestone, somewhat garnetiferous. Extensive diamond-drill borings show good orebodies.

Development: by a number of shafts to a depth of 440'; has about 3 miles of workings. The ground is firm, breaking well and requiring no timbering, pillars having been removed to give chambers up to 100' square.

The San Rafael mine has 2 shafts, the deeper being a 440' two-compartment shaft, known as the Verde. The Promontorio mine has 2 new shafts, nearly 1,000' apart, the main Promontorio shaft being 350' deep, with a surface gravity tram to ore bins. The Promontorio also has 2 old shafts. The Colombia mine has a 275' shaft, with about one-half mile of workings. Miscellaneous shafts include the Bronce of 120', Pedernal of 180', San Martin of 100' and Vinagre of 100'.

Equipment: includes steam and gas power. The San Rafael main shaft has two 100 h. p. boilers and a 100 h. p. hoist, with 4-drill and 14-drill air compressors. There are 5 gasoline hoists of 6 to 22 h. p. at various other shafts.

Ore is carried from mines to smelter by a mile long narrow-gauge railway, equipped with a 6-ton Porter locomotive and 5-ton iron ore cars.

Smelter: at Terrazas, 1 mile from the mine, connected by a one-half mile spur with the main line of the Mexican Central railroad, has two 300-ton 42x192" blast furnaces. The converter department has 1 stand and 3 shells, with a 40-ton electric traveling crane and a relining plant. The power plant has a 250 h. p. compound engine, direct-connected to a No. 8 Connersville blower, and a 100 k. w. generator supplies current for the other machinery.

Production: 1906-1910 inclusive amounted to 9,150,000 lbs. copper; 27,000 metric tons smelted averaged 2.5% copper, mining cost being \$3.50 per ton, and smelting cost \$3.50 per ton, or a cost for finished copper of 12.5c per lb. The ore, though low grade, exists in large quantities, and the mine bids fair to become a producer, capable of making 1,000,000 lbs. fine copper monthly.

The mine and smelter operated more or less continuously throughout 1912 and 1913, despite the revolutions which stopped almost all mining operations in this part of Mexico, but the intolerable conditions since then have kept it closed.

SAN FRANCISCO MINES OF MEXICO, LTD. MEXICO

Parral, Chihuahua, Mex. Harold A. Searle, sec., 65 London Wall, London, E. C., Eng. Rt. Hon. Earl of Denbigh, chrm. board of directors. Inc. March 27, 1913, in England. Cap., £650,000; outstanding £350,000; shares £1 par. Bonds: £200,000 convertible first mortgage debentures, in denomination of £100 and £20 each; int. payable April and October 1, was paid to Oct. 1, 1914; payment of the next six half-yearly instalments has been postponed for a period of 3 years so that in each of the 6 half years ending Oct. 1, 1920, a year's interest will become due, and on the postponed interest 6% interest will be allowed.

Accounts for period ended Sept. 30, 1916, showed mine expenditure, £44,269; cash, £50,698; creditors, £2,608, and accrued debenture interest, £25,080.

Property: a group of silver, gold, lead and zinc mines, 194 acres, 14 miles from Parral, formerly worked by the San Francisco del Oro Mining Co., Ltd. Examined by Knox and Allen, New York. Property covers nearly 1½ miles on the strike of the San Francisco vein, a fissure lode in limestone. The oreshoot worked has a length of 2,600' with minimum width of 5½'; 4th level is in primary ore; ore minerals are galena, blende, pyrite and chalcopyrite.

Development: by 3 shafts and 5 levels; deepest shaft, 484'.

Ore reserves: estimated at 390,000 tons; average grade, 21 oz. silver, 1.4 dwt. gold per metric ton, 12.5% lead and 17.4% zinc. The ore is delivered to the mill by aerial tram. Many mistakes were made in the original design and construction of the mill, but present management has started to reconstruct it, adding flotation equipment, and when rebuilt it will have a daily capacity of 200 tons.

The property has been forced to suspend operations intermittently as a result of the Mexican revolution.

SAN TOY MINING CO. MEXICO

Office: Oliver Bldg., Pittsburgh, Pa.

Officers: Joseph Dilworth, pres.; C. A. Blanchard, v. p., with Wm. L. Abbott, R. R. Brown, G. A. Deitch, D. L. Gillespie, Geo. E. McCague, Eugene Murray, J. C. Slack and D. B. Gillies, directors. Edward Hoopes, sec.-treas.; W. V. Paterson, asst. sec.

Inc. 1901, in Maine. **Cap.**, \$7,000,000; shares \$1 par; outstanding \$5,750,000.

Dividends: 6% in 1911; 1% in 1912; 2% in 1913; none since. Colonial Trust Co., Pittsburgh, transfer agent. Commonwealth Trust Co., Pittsburgh, registrar. Annual meeting, third Monday in February at Augusta, Me. Stock listed on Pittsburgh Stock Exchange and New York Curb. Shortly after flotation of the company stock sold up to \$1.25 per share; it has since sold down to 11c.

Comparative General Balance Sheet:

Assets—					
	Mines & Equip.	Supplies	Accts. Rec.	Cash	Total
1916	\$5,865,564	\$14,484	\$4,204	\$256,156	\$6,140,408
1915	5,865,564	12,156	4,114	290,412	6,172,245
1914	5,864,172	18,085	11,209	346,155	6,239,621
Liabilities—					
	Capital Stock	Undiv. Profits	Reserve	Accts. Pay.	Total
1916	\$5,750,000	\$322,639	\$67,231	\$538	\$6,140,408
1915	5,750,000	352,274	67,236	2,735	6,172,245
1914	5,750,000	420,849	68,772	.....	6,239,621

Comparative Statement of Earnings (Years Ending Dec. 31)

	Gross Value	Expenditures	Net Earn. & Misc. Inc.	Dividends	Surplus Year	Balance Surplus
1916.....	\$13,098	\$42,733	(b)\$29,635	.....	(b)\$29,635	\$322,639
1915.....	19,552	100,956	(b) 68,575	.....	(b) 68,575	352,273
1914.....	64,950	172,139	(b) 92,379	.....	(b) 92,379	420,850
1913.....	334,728	184,905	132,428	\$115,000	34,928	513,229
1912.....	314,884	(a)229,539	106,458	60,000	46,458	478,301
1911.....	793,319	321,314	496,493	360,000	136,493	431,844
1910.....	529,470	376,762	157,566	.....	157,566	295,350

(a) After deducting \$10,597, cost value of 526 tons ore on hand, Dec. 31, 1912. (b) Deficit.

Property: 5 claims, the Bustillos, La Fortuna, Independencia, Juarez and La Central, in the Santa Eulalia district, 12 miles S. E. of Chihuahua, adjoining the Potosi Mine of the Howe Sound Co.

Ore: lead, silver, occurring in chimneys and "mantas" (beds or blankets) in limestone. For detailed description of geology of the district, see Trans. A. I. M. E., Vol. LI (pp. 57-99).

Reported in June, 1917, that the American Metal Co. had bought the San Toy mine.

On Jan. 23, 1917, company secured control in a lease and option on the Bonney M. Co.'s property, 5 claims in the Virginia district, 5 miles S. W. of Lordsburg, New Mexico. The Lawrence Mining Co. previously held the lease, the San Toy paying \$50,000 for 35/60 of the former's shares. The full price is \$200,000, but the Lawrence M. Co. can abandon its right at any time without liability. Three shafts, 221', 340' and 398' deep, have opened copper-silver-gold ore in commercial quantities. Lessees late in 1916 netted \$10 per ton.

Development: the 2,060' La Central, 1,401' Alta, Juarez and Galdeano shafts, last two out of commission. New work totaled 2,396' in 1913, and 2,410' in 1914. In 1915 La Central shaft was sunk 400' and a small amount of drifting and crosscutting done in addition to 5,000' of diamond drilling, which was without any specific result.

Comparative Statement of Operations:

	Ore, Tons	Silver, Oz.	Silver, Oz. p. t.	Lead, Lbs.	Lead, %	Average Net Value Silver, Oz. Lead, Lb.
1914.....	2,918	110,824	31.5	.....	.....	51.48c
1913.....	7,129	554,181	78.5	.....	.....	57.45c
1912.....	7,851	485,712	66.3	260,989	1.8	60.07c
1911.....	12,173	1,433,071	117.7	1,275,778	5.9	51.87c
1910.....	20,181	879,492	43.6	1,584,528	3.9	52.10c
1909.....	25,509	1,410,630	47.8	1,810,397	3.1	50.77c

Ore is shipped to the smelter of the A. S. & R. Co., at Chihuahua. The political disturbances in Mexico have seriously hampered operations during the last three years; work was continued in a desultory way until September 9, 1915, when all American employees returned to the U. S. Operations will be resumed as soon as practicable.

SANTA MARIA MEXICO MINING ASSOCIATION MEXICO

Idle. Mine near Parral, Chihuahua, Mex. Wm. G. Gruber, pres. and gen. mgr.; Arthur H. Gruber, sec. and treas.

Inc. in Wisconsin. Cap., \$250,000; shares \$1 par.

Property: 50 claims, La Lolita, La Viola and Santa Clara groups, in the Galeana district of the San Blas mountains.

Development: is on La Lolita group, which has shafts of 75' and 150', showing oxidized ores, shipments from which are said to have averaged 15% copper.

SIERRA CONSOLIDATED MINES CO. MEXICO

Office: 1400 Alworth Bldg. Duluth, Minn.

Officers: J. B. Cotton, pres.; Robert Linton, v. p.; F. R. Kennedy, sec.-treas.; H. B. Paull, auditor.

Directors: T. F. Cole, J. B. Cotton, and L. D. Ricketts, term expires 1918; C. d'Autremont, Jr., F. R. Kennedy and H. B. Paull, term expires 1919; Robert Linton, E. R. Grochau and J. F. Bankerd, term expires 1920.

Inc. Aug. 18, 1909, in Arizona. **Cap.**, \$5,000,000; shares \$10 par; issued 76,500 shares, full paid, at \$10 each, \$765,000; and 223,500 shares, part paid at \$6 each, \$1,341,000; total outstanding \$2,106,000. Stock transferred and registered at company's office, 120 Broadway, New York. Annual meeting, first Tuesday after first Monday in May. Stock listed on New York Curb and traded in on Boston Curb.

Balance Sheet: as of Dec. 31, 1916:

Assets:		Liabilities:	
Sierra Mng. Co., S. A.—Stock Account.....	\$1,452,602	Capital Stock.....	\$2,106,000
Sierra Mng. Co., S. A.—Loan Account.....	604,029	Accounts Payable.....	60
Cash.....	155	Collateral Trust Notes.....	49,000
Accounts Receivable.....	21,000		
Investments.....	45,000		
Loss and Gain.....	30,382		
Suspense Items.....	1,892		
Total.....	\$2,155,060	Total.....	\$2,155,060

To further finance the company at this time there was authorized in 1915 the execution of a collateral trust mortgage for \$1,000,000, and the issuance thereunder of notes dated Oct. 1, 1915, payable on or before 3 years after date with interest at 6% per annum; notes to be issued in denominations of \$100 and multiples thereof. This company owns the entire capital stock of the Sierra Mining Co., S. A., which see below.

Sierra Mining Co., S. A.

Principal office: Ciudad Jurez, Chihuahua. Mines and works at Ocampo, district of Rayon, Chihuahua, Mex. This company is the Mexican title-holding and operating corporation for the Sierra Cons. Mines Co.

Officers: Jos. B. Cotton, pres.; Robert Linton, v. p. and gen. mgr.; H. O. Flipper, sec.; F. R. Kennedy, treas.; H. B. Paull, auditor; and Enrique N. Seyffert, comisario.

Inc. Dec. 11, 1908, in Mex. **Cap.**, 25,000 shares at \$20 each (Mexican currency).

Balance sheet: as of Dec. 31, 1916, shows assets, \$856,850, including property, \$243,074; current, \$35,717; equipment, etc., \$70,287; loss and gain, \$407,772

Liabilities: include capital, \$250,000; Sierra Cons., \$603,534; and accounts payable, \$856,850.

Property: at Ocampo, 110 miles from Temosachic, a station on the R. G., S. M. & P. R. R., covers about 50 square miles; also owns over 60,000 acres of timber land in the same district, including water rights and timber thereon; also owns real estate in Ocampo, together with valuable water rights and mill sites, mining concessions and rights. The company had reopened several of

the old mines on the property and had done about 13,000' of work when they were forced to cease operations in March, 1912, due to the revolution in Mexico. No work has been done since, but property will be reopened on short notice when conditions in Mexico permit. There are said to be six ore-shoots now developed that will produce 100,000 tons of ore, averaging \$12 per ton in gold and silver. The silver-bearing mineral of the ore is practically all argentite, with some associated gold, in a siliceous gangue; the ledge matter is an andesitic breccia cemented with quartz.

Equipment: includes the old El Salto 20-stamp mill. Machinery for the first unit of a 40-stamp mill is on the ground. Power is furnished by a 300 h. p. steam-electric power plant, at Durazno, 6 miles N. E. of Ocampo.

STATE OF COAHUILA

COAHUILA MINING & SMELTING CO., LTD.

MEXICO

Office: 614 Penobscot Bldg., Detroit, Mich. **Operating office:** Apartado 72, Monterey, N. L., Mex. **Mine office:** Jimulco, Viesca, Coahuila, Mex.

Officers: H. T. Ambrose, pres.; Frank J. Llewellyn, v. p.; Walter E. Parker, sec. and gen. mgr.; Archibald Cattell, treas.; preceding, with J. Kirby, Jr., Sidney B. Cohn and C. F. Jennings, directors; J. C. Treadwell, supt.; Alex. McCormick, mine supt.; Harry Reed, mill supt.

Inc. Jan., 1902, in Mexico. **Cap.,** \$500,000 gold; shares \$1 par; non-assessable, fully issued.

Dividends: 10% in 1902; 6% in 1904; 29% in 1905; 30% in 1907; 10% in 1909 and 16% in 1910, a total of 101%, or \$505,000. Annual meeting, first Wednesday in February.

Lands: include holdings in the Mapimi, Viesca and San Juan de Guadalupe districts. Properties include the Santa Maria, Sultana and other mines at Jimulco, carrying auriferous and argentiferous copper and lead ores, opened by a 700' main shaft, and a 1,000' main tunnel, with steam and electric power. The Alberto mine, in the Mapimi district, was said to have made regular shipments of high-grade ore to the Mapimi smelter, 1910. A 250-ton smelter, with steam and electric power, connected with the mines by rail, was blown in, early 1903, but was idle, 1909-13. The revolution in Mexico has practically stopped all mining in Coahuila and the mines are closed down until peace and safety again prevail.

CONTINENTAL MINING CO.

MEXICO

Mine office: San Antonio, Texas.

Officers: Otto Wahrmond, pres.; C. T. Priest, San Antonio, v. p.; S. G. Newton, sec.

Inc. April, 1905, as a reconstruction of Continental Copper Co. **Cap.,** \$1,000,000; shares \$10 par. Is closely allied in ownership and management with the Jimulco Mining Co.

Property: the Panuco mine with 65 hectares, opened in 1700 and worked at intervals since. Property was bought from the Panuco Copper Co., under whom it was badly mismanaged.

Ore: deposit is a chimney of breccia, cemented by metallic sulphides, mainly chalcopyrite, but with a little chalcocite, in a quartz gangue, the country rock being granitic. The ore is reported to average about 3½% copper.

Company owns a 40-mile railway, from Monclova to Panuco. Old company invested about \$1,000,000 in the property and improvements. Largest production, under former ownership, was 1,466,059 lbs. fine copper in 1902, and a small production was secured, July-Nov., 1907, by present company, estimated at 1,250,000 lbs. copper. Mine considered promising, though low in

grade, and management good. Closed down since 1913, on account of danger to life and property by revolutionary bands.

INTERNATIONAL ORE CO.**MEXICO**

F. E. Salas, mgr., Saltillo, Coahuila, Mex.

Company operates a small zinc plant handling 40 to 45 tons of concentrates per day in two 300 retort furnaces.

MAZAPIL COPPER CO., LTD.**MEXICO**

Office: 47 Peter St., Manchester, England. Mine address: Saltillo, Coahuila, Mex.

Directors: Alfred Crewdson, chairman; R. R. Crewdson, W. A. R. Heaven, Jacob Higson, Chas. Hopkinson and Jas. Wm. Purcell; R. H. Jeffrey, mgr.

Inc. Feb. 18, 1891, and reincorporated April 21, 1896, in Great Britain. **Cap.** increased 1903 to £300,000, shares £10 par, and again increased 1912 to £500,000; shares £1 par; issued, £422,490. **Debentures:** £120,000, at 6%. Has paid several dividends: 20% in 1910; 20% and a 5% bonus in 1911; 30% cash and 50% bonus in 1912.

Company does not care to give details concerning its mining operations. It owns and operates the Coahuila and Zacatecas railway, running from Saltillo to Concepción del Oro, 2 smelters and various mines, employing over 4,000 men normally. Op rations were suspended June, 1913, by the Mexican revolution, but were resumed in a small way in March, 1917.

Property: about 850 hectares of mineral land in 4 principal groups. The Aranzáú and Cabrestante mines, carrying copper ores, are the most important; the San Eljio, Naranjera, Cajón, San Francisco and Protero mines, carrying silver-lead ores, and the Promontorio group, producing mainly fluxing ores. Copper ores occur in irregular masses, in limestone, near granite-porphry contacts.

The various mines of the company have 83 different shafts and tunnels, many of which are small and worthless, remaining from old operations, with upwards of 25 miles of workings.

The smelters are at Concepción del Oro and Saltillo. The first named, of about 800 tons daily capacity, has 4 copper furnaces. The Saltillo smelter, built 1906, has a lead plant of 300 tons daily capacity and does a general custom business, as well as treating ores of the company. There are 3 blast furnaces and 1 reverberatory furnace. Transportation is by 4 aerial trams.

The Ferrocarril Coahuila y Zacatecas has 166 kilometres of main line.

Production: 1912, was 13,556,208 lbs. copper, 15,024,485 lbs. lead, 8,463,536 lbs. zinc, 1,572,012 oz. silver and 15,560 oz. gold.

SALTILLO, S. A.; COMPANIA MINERA DEL.**MEXICO**

Office: Primera de Galeana No. 2, Saltillo, Coahuila, Mex. Mine near Mazapil, Zacatecas, Mex. Lic. Miguel Cárdenas, pres.

Inc. June 15, 1899, in Mexico. **Cap.**, 100,000 pesos; shares 100 pesos par; fully paid.

Dividends: were 10,000 pesos in 1907; 15,000 pesos in 1908. Annual meeting, Jan. 31, each year.

Property: the Jesus Nazareno mine with 116 acres of mineral land and 2,099 hectares of miscellaneous lands, in the Nazareno mining district of Mazapil, 10 miles from a railway. The mine has an orebody carrying auriferous lead and copper sulphides sufficiently developed to produce 1,000 metric tons of silver-lead ore monthly.

Equipment: includes 5-mile private tram line, and 135-h. p. gas and electric plant. Presumably closed down owing to Mexican revolution.

TORREON, S. A.; COMPANIA METALURGICA DE.**MEXICO**

Torreón, Viesca, Coahuila, Mex.

Officers: at last accounts, Col. Carlos Gonzales, v. p.; Lic. Pragedise de la Peña, sec.; Lic. Pedro Torres Saldeña, treas.

Inc. June, 1901, in Mexico. **Cap.**, 4,000,000 pesos; shares 100 pesos par.

Property: a number of lead mines and several partly-developed copper mines in northern Mexico.

Smelter: of 1,250 tons rated daily capacity, is connected with all railway lines entering Torreón, treats the large production of the company's own mines and also does an extensive general custom business on gold-silver, lead and copper ores.

Equipped: with 10 blast furnaces, including eight 100 metric ton silver-lead stacks, and two 250-ton copper stacks, the blast furnaces using mechanical charging. There are 8 reverberatory roasters, for lead matte, which is calcined on 2 Dwight-Lloyd sintering machines and remelted. The works have a converter plant of 30 tons daily capacity. Water is furnished by 3 large wells. The works employed about 600 men.

Property was operated throughout 1912, but was forced to close down during the fighting that continued in this district, and has only been operated intermittently since 1914.

STATE OF DURANGO

AMAZON GOLD CO.

MEXICO

Mine office: Chacala, Durango, Mex. Jas. T. Dugan, pres.; Edward B. Sowers, mgr.; J. S. Wilkinson, supt., at last accounts.

Mine: known as the Candelaria, has auriferous, argentiferous and bis-muthiferous copper ores.

Equipment: includes a Bryan mill, 6-ton chlorination plant and 10-ton smelter. Closed down and no reports received owing to Mexican revolution.

AMERICAN-MEXICO MINING & DEVELOPING CO. **MEXICO**

Office: Watertown, S. D. **Mine office:** Velardena, Cuencame, Durango, Mex.

In July, 1915, company had debts amounting to \$14,518, and creditors began action for appointment of receiver. Is not regarded favorably. See description by Horace J. Stevens in Vol. X.

AVINO MINES, LTD.

MEXICO

Idle. Office: 638 Salisbury House, London, E. C., Eng. **Mine office:** Gabriel, Durango, Mex. Lionel W. Harris, chairman; Edw. Hooper and A. Glencross, directors; F. F. Fuller, sec.; Hooper, Speak & Co., cons. engrs.

Inc. March 6, 1909, in Great Britain. **Cap.**, £100,000, in 1,000,000 priority shares and 1,000,000 deferred shares of 1s par; issued, 500,000 priority shares and 978,429 ordinary shares. Was a reconstruction of Avino Mines of Mexico, Ltd., which was reorganized Feb. 24, 1903, as successor of company of same name, organized Feb. 13, 1899, which was the successor of Avino Syndicate, Ltd. Present company took possession of property Aug. 1, 1909. Stockholders of old company were given 1 ordinary share, par 1s, full paid, for each fully paid £1 share of the old company, with the right to buy priority stock at par, share for share. After payment of 200% on priority shares, they rank equally with ordinary shares. Shares are listed on the London Stock Exchange.

Accounts for year ending June 30., 1916, show a loss of £867, leaving a debit balance of £1,558; cash, £1,506; ore in transit, £5,350; ore on dump £2,123; calls in arrears, £250; creditors, £2,146; unpaid salaries, £2,284.

Lands: 166 acres, and a 350-acre dam site, 10 miles from Gabriel, on the Mexican International railway, the nearest rail point.

Property: includes Socavon mine, which has a 900' shaft and 1,050' tunnel, with several large tajos or pits, 1 being nearly 400' in width and of considerably greater length.

Ore is a complex mixture of auriferous and argentiferous lead and copper sulphides.

Production: for 14 months to June 30, 1910, was 43,350 long tons of ore, of which 17,937 tons was rejected and 18,094 tons shipped, yielding 910,499 lbs. fine copper, 261,000 oz. of silver and 993 oz. gold, giving a profit of £4,338. Operations during 1912 were seriously interrupted by revolutionary disturbances. As the present mill is not successful the company has been shipping ore to smelters, at such times as the revolutionary troubles in Mexico permitted. All work was stopped in April, 1913. During 1912-13, 6,199 tons were sorted out for shipments, of an estimated value of £21,840.

Ore reserves: are reported June, 1913, as 113,167 tons, averaging 1.8% copper, 9.7 oz. silver and \$6 gold per ton.

Equipment: includes a steam and a 300-h. p. electric plant, operated by a gas engine.

The mine has managers and ought to make money, when peaceful conditions once more prevail in Mexico.

BACA ORTIZ; COMPANIA RESTAURADORA DE MEXICO

Mine office: Tepehuanes, Santiago Papasquiario, Durango, Mex. Property is the Candelaria mine, carrying auriferous and argentiferous copper ore. Idle on account of revolution, 1912-17.

CARMEN COPPER CO. MEXICO

Idle. Office: 56 Pine St., New York. **Mine office:** Mineral del Carmen, El Oro, Durango, Mex. Geo. Moeser, pres.; R. D. Kent, sec.; F. C. Alley, special agt.

Inc. in New York. **Cap.,** \$750,000; shares \$50 par.

Property: includes El Carmen mine, 160 hectares, and a considerable acreage of miscellaneous lands, 45 miles from Rosario, the nearest rail point. The mine carries silver-bearing copper ores, with considerable development. Mill has 40 stamps, 3 crushers and Frue vanners.

EL ORITO MINING & MILLING CO. MEXICO

Officers: Wm. Grote, pres., Elgin, Ill.; A. W. Church, v. p.; C. R. Hopson, sec.; J. A. Waterman, treas.; with J. A. Rovelstad, E. S. Eno and F. H. Ackemann, directors. Robt. F. Fitz, mgr., P. O. Box 275, Los Angeles, Cal.

Inc. May 10, 1910, in Ariz. **Cap.,** \$500,000; shares \$100 par; outstanding, \$432,500. Annual meeting, third Monday in May.

Properties: 233 pertenencias, free milling gold property, at Penon Blanco, and 144 pertenencias, copper property, at Velardena, Durango, Mex.

Development: one vertical and one incline shaft, depth 375' with deepest workings at 475'. Total underground workings 1,500'.

Equipment: includes a 17-ton 3-stamp mill. Mines closed down owing to revolution, but management states operations will be resumed as soon as permissible.

ESPERANZAS MINING CO. MEXICO

Idle. Mine at Estación Symón, San Juan de Guadalupe, Durango, Mex. Joseph Steel, gen. mgr., at last accounts. **Cap.,** \$200,000.

Property: includes the Montaña de Cobre, Esperanza and other claims.

GUANACEVI TUNNEL CO. MEXICO

Letters returned from 55 Liberty St., New York. Mine at Guanacevi Santiago Papasquiario, Durango, Mex.

Inc. 1904, in Arizona. **Cap.,** \$5,000,000; shares \$5 par.

Property: in hands of trustee until conditions in Mexico permit of financing company sufficiently to carry on the extensive development planned.

Lands: 22 properties, about 700 hectares, including timber rights and original concessions, said to possess large bodies of gold and copper ore. The mine has 3 shafts, of 100' depth each, with tunnels of 1,250' and 1,400', the main

tunnel, 7x9', planned to be driven about 3 kilometers, management estimating that in this distance a large number of veins carrying lead and copper ores should be cut, the tunnel being estimated as likely to cost about \$250,000.

The Mexican Western railroad from Tepehuanes to Guanacevi should add materially to value of property.

The L. Diamond Co., of Boston, was never a representative of this corporation, but a number of brokers bought stock and combined to unload on the public at unduly high prices. Debts amounted to \$150,000 in 1912 and have since increased.

Idle.

LUCIA MINING CO.

MEXICO

Office: 15 William St., New York. **Mine office:** Pánuco de Coronado, San Juan del Rio, Durango, Mex. H. M. Hubbard, v. p.; Myra B. Martin, sec.-treas.

Inc. 1900, in West Virginia. **Cap.**, \$25,000; shares \$5 par. This company is controlled by the San Luis Mining Co. and its property is described under that title.

NATIONAL MINES & SMELTER CO.

MEXICO

Office: Magee Bldg., Pittsburgh, Pa. **Mine office:** Magistral, Durango, Mex.

Officers: S. H. McKee, pres.; Wm. L. Curry, v. p.; John S. Eberman, sec.-treas.; Renald Ailes, financial agt.; E. A. Kennedy, supt.

Inc. 1911. **Cap.**, \$2,500,000; issued, 1,700,000 shares. Authorized \$400,000 collateral income bond issue; issued, \$375,000. Company owns all the stock of the Santa Maria del Oro Mines Co., which company purchased property of the Lustre Mining & Smelting Co. from old stockholders, paying for same in stock and bonds of the National Mines & Smelters Co.

Property: the Magistral and Cocinera mines, 32 claims, 441 hectares, 1,089 acres of mineral lands, 397 hectares of mill and smelter sites, besides miscellaneous lands and leasehold timber lands. The Magistral mine is developed by 3 tunnels and 9 shafts and has a large body of slightly cupriferous pyrite with quartz and limestone gangue, carrying 0.5 to 5% copper, probably averaging under 1% copper, 1 oz. silver and 15 to 20 grams gold per metric ton.

The Cocinera mine developed an ore shoot 1,000' long, 15' wide and said to average \$10 in gold and copper with a little silver. Depth over 600'.

Ore reserves: in this and the Azurite mines are estimated by the management at 190,000 tons, developed in new ground since 1911. The old company claimed reserves of 185,000 tons in other and entirely distinct orebodies, in 1910.

Equipment: is complete, including a central power plant having two 360-h. p. Koerting and two 350-h. p. Crossley gas engines, one 200-h. p. and three 400-h. p. gas producers, a 2,300-volt 3-phase generator, two 6-drill Ingersoll-Rand air compressors and 10 hoists of 100 to 300-h. p. The 40-stamp mill, 750-lb. heads, has Huntington mills, 1 Ball mill and 10 Frue vanners.

The smelter has 6 blast furnaces, including two 150-ton hot-blast furnaces and three 200-ton furnaces, air for blast being heated by waste gases in a specially-designed MacDonald hot-blast heater. Shipping matte sent to the A. S. & R. Co. at Aguascalientes amounted to 8,000 tons, averaging 15-17% copper, \$155 gold and \$4 silver per ton.

The old company apparently spent a million dollars or so for installation before the mines were sufficiently developed to provide the ores necessary to keep the various plants running and in 1907-08 became financially embarrassed. The mines are not yet on a profitable basis, but with the new concentration plant, built in 1915, as the result of tests made by Henry E. Wood & Co., of Denver, it is expected that the property will yield a satisfactory return on the investment, as soon as operations become normal in Mexico.

PENOLES MINING CO. (CIA. MINERA DE PENOLES): MEXICO

Office: 61 Broadway, New York. Smelting works and mines at Mapimi, Durango, Mex. H. S. Mulliken, mgr. Controlled by the Metallurgische Gesellschaft of Germany.

Cap., 4,000,000 pesos, increased 1910 from 250,000 pesos; shares 100 pesos par. Has paid \$6,500,000 in dividends.

Property: the Ojuela mine with silver-lead ores in limestone, the San Juan mine, Paloma mines and options on the Cabrillas and Mariposa mines. Company produces iron, lead and silver, with a little copper as a byproduct.

Development: by shafts and tunnels to depth of 3,000', showing porphyry, diorite, lime and shale. The main veins strike N. W. with 45° dip. Twenty-two veins are traceable at surface, showing only carbonates or oxides of iron of little value down to 300'.

Equipment: includes steam and electric power, hoist, a 5-mile narrow-gauge railroad connecting the mine with Mapimi and a 1,500-ton smelter.

Company actively producing ore 1917, and enlarging its mineral holdings.

SAN LUIS MINING CO. MEXICO

Office: 15 William St., New York. **Mine office:** Panuco de Coronado, Durango, Mex.

Officers: David F. Beggs, pres. and treas.; C. P. Jacobs, F. C. Hanford, W. B. Raymond, Wm. T. Read and Walter S. Logan, directors; Myra B. Martin, sec.

Inc. 1900, in West Virginia, and cap. increased, 1905, to \$3,000,000; shares \$1 par. First dividend, 1%, was paid Jan., 1906, and a second dividend was paid July, 1916, both unearned. Direct title to this property is held in the name of Lucia Mining Co. Annual meeting, last Tuesday in February.

Property: 225 pertenencias, 500 acres, and a 25-acre mill site, in the San Lucas and Pánuco de Coronado districts of Durango. The mineral property shows limestone and porphyry, carrying fissure veins and contact deposits, estimated by the management to average 3% copper, 12% lead, 1% zinc, 35 oz. silver and \$4 gold per ton, mainly from sulphide ores. The mines were discovered 1650, and worked more or less irregularly until 1830, when closed on account of water and Indian troubles, remaining idle until reopened, 1901, by the present company.

The Potosina mine is said to show, at the western end, a considerable body of ore of smelting grade and a large quantity of milling ore.

The San Gonzalo mine, 450' deep, has a vein showing mainly low-grade ores carrying silver values above, with copper on the lower levels, and is also reported to have a 2' vein carrying 25 kgs. silver per ton, with some gold.

The Sidney has a 2' vein of galena, giving assays up to 45% lead, 4 oz. silver and 3 grams gold per metric ton, opened by a shallow shaft, but has been idle for some years on account of water.

The San Lucas mine, 19 hectares, about 35 miles N. W. of Gabriel, is an old property claimed to have nearly 2 miles of workings, carrying mainly lead and zinc ores, and is idle.

The San Pablo mine has parallel veins said to carry 6 to 36" paystreaks of sulphide ore, giving assays up to 16% copper, 360 oz. silver and 14 grams gold per ton.

Development: is by an abandoned incline shaft and a 175' vertical shaft, latter equipped with headgear and hoist.

Equipment: includes steam plants, claimed to aggregate 750-h. p. with 6 hoists and 2 air compressors of 12 drills combined capacity. Buildings include a machine shop, carpenter shop, smithy, offices, 4 general stores and a large number of dwellings for workmen, with a total of 175 buildings. The mill has 2 crushers, 1 jig and 4 Bartlett tables. Concentration seems to have proven more satisfactory than leaching.

The Trinidad leaching mill, of 120 tons claimed daily capacity, has 2 calcining furnaces and apparently treated only about 40 tons of ore daily, when in operation.

Idle on account of revolution.

SAN MATEO, S. A.; CIA MINERA.

MEXICO

Idle. Velardena, Durango, Mex. Carlos Michaud, pres.

Inc. 1911, as successor of the Hileta Gold & Silver Mining Co.

Property: 72 acres, including the Santo Tomas, Bolsa and other mines, and a 60-acre mill site. Claims are reported to show 5 fissure veins in limestone and porphyry, having a generally E.-W. strike.

Development: one vein of 12" to 3' width is developed by a 1,600' tunnel, with 6,000' of workings, carrying ore said to average 1% copper, 6% lead, 36 oz. silver and \$10 to \$50 gold per ton.

Equipment: includes steam and gasoline hoists, good for 1,000' each, and a 3-drill air compressor. There are 9 buildings. Shut down several years on account of political conditions.

STATE OF GUANAJUATO

CUBO MNG. & MLG. CO.

Office: 1025 Peoples Gas Bldg., Chicago, Ill.

Officers: H. L. Hollis, pres.; W. C. Boyden, v. p.; Alfred Cowles, treas., A. Hunter, sec.

Property: located in the towns of Cubo and Villalpando, 6 miles from Guanajuato, Mex.

Equipped: with 250-ton cyanide mill.

GUANAJUATO CONS. MINING & MILLING CO.

MEXICO

Office: 15 Broad St., New York, and Guanajuato, Gto., Mex.

Officers: Fred G. Corning, pres.; Robt. Mulford, v. p.; C. Van Rensselaer Cogswell, sec.-treas.; preceding, with R. A. Walker, W. Lawrence Green, Chas. G. Molin, Sidney Green, all of New York, and Geo. A. McGlone, Charleston, W. Va., directors.

Inc. 1899, in West Virginia. **Cap.**, \$3,000,000; outstanding, \$2,830,920; shares \$5 par; \$169,080 of the unissued stock has been set aside to retire the outstanding 7% bonds. State St. Trust Co., Boston, transfer agent. Old Colony Trust Co., Boston, registrar. Annual meeting in Jan., at Charleston, W. Va. Listed on Boston Stock Exchange and dealt in on New York Curb.

Bonds: authorized \$300,000; outstanding \$128,000 convertible debenture 7's, dated Jan. 2, 1904, due Jan. 2, 1924. Interest Jan. 2 and July 2, at New York office of company. Coupon and registered bonds, \$100, \$500 and \$1,000; convertible at 120 into stock at par; 10% of net earnings is set aside for redemption of this bond issue. Coupon No. 22, due Jan. 2, 1915, on the debenture bonds, was payable on May 15, 1915, but No. 23, due July 2, 1915, was deferred until further notice. Trustee, Columbia Trust Co., New York.

Dividends: 1¼%, 6¼c per share, paid July 31, 1906; 1½%, 7½c per share, Oct. 31, 1906, none since.

Balance sheet Dec. 31, 1913, the last reported, showed assets of \$3,495,586, which included mines, plants, etc., \$3,136,890; supplies, \$78,896; cash, \$96,996. Liabilities included: 6% bonds, \$5,000; refunding notes, \$53,800; surplus, \$200,000; sinking fund, \$28,409; undistributed profits, \$45,019; notes payable, \$10,466.

Income account for 1913, last reported, showed: Receipts—bullion and concentrates, \$670,142; expenditures, mining, etc., \$302,452; ore bought, \$176,585; treatment charges, \$39,186; bullion expense, \$23,413; taxes, etc., \$26,674; total, \$568,312. Gross profit, \$101,830. Deduct: bond interest, \$13,412; depreciation,

\$33,427; bond redemption reserve, \$5,494; total, \$52,333. Net profit, \$49,498; undistributed profit forward, \$45,522; total, \$95,019. Forward to surplus accounts, \$50,000. Undistributed profit, Dec. 31, 1913, \$45,019.

The company owns a large interest in the Carmen-Guanajuato Gold Mining Co.

Property: owns a number of silver-gold mines in the Guanajuato district; of these the Sirena is the oldest, having been worked for 100 years. Under normal conditions it has a monthly output of 7,500 tons milling ores. **Ore:** silver-gold, with value mainly silver. Vein varies in width from 3' to a maximum of 200'. Ore reserves of the Sirena mine were estimated 1913 as 800,000 to 1,400,000 tons blocked out, pillars and fill; Penafill lease, 180,000 tons.

Development: by shafts to depth of about 1,000'.

Equipment: includes 80-stamp mill, cyanide and electrical plants.

The revolution has greatly interfered with operations during the past few years, the property having been run on half time for a large part of the time.

GUANAJUATO DEVELOPMENT CO. MEXICO

Office: 50 Broad St., New York. **Corporate office:** Jersey City, N. J. Mine office at Guanajuato, Gto., Mexico.

Officers: Willard P. Reid, pres.; C. A. Decker, v. p.; P. E. Sharpless, v. p.; W. H. Porter, sec.-treas.; preceding, with Jas. T. Potter, Wright Johnson, Wm. B. Field, F. B. Medbury, John A. Martin, directors; John Pritzl, asst. treas.

Inc. Feb. 24, 1906, in New Jersey. **Cap.**, \$300,000 com. and \$600,000 pfd., decreased June 24, 1916, from \$1,000,000, 6% cum. pfd.; \$3,000,000 common; shares \$100 par. Preferred stock has preference as to assets and is subject to call at par and accrued dividends on any semi-annual dividend date. Stock transferred at company's office. Annual meeting, first Thursday after first Monday in April, at Jersey City, N. J.

Dividends: preferred, paid semi-annually Jan. and July 1, from 1906 to 1910, inclusive, none since.

Company controls the Pinguico Mines Co., Mexican Milling & Transportation Co. and Peregrina Mining & Milling Co. Properties are located at Guanajuato, Gto., and are held under Government titles by leases, options, etc.

Ores: gold-silver bearing quartz found in veins cutting bedded volcanic tuffs and intrusive rocks.

Company refuses to supply information.

Peregrina Mining & Milling Co.

Controlled by Guanajuato Dev. Co. Same officers, with P. E. Sharpless, W. W. Blackman, H. J. Milligan, Delavan Smith, W. B. Field and J. A. Martin, directors.

Inc. Feb. 21, 1905, in New York. **Cap.**, authorized and issued, \$1,000,000, 7% cum. pfd., and \$2,000,000 common. **Shares:** preferred, \$100; common, \$10. Annual meeting in April in New York.

Dividends: preferred paid 3½% in 1905; 1906 to Sept. 1, 1910, inclusive, 7% per annum; none thereafter until April 15, 1915, when 3½% as paid. Common none. Preferred dividends payable March 1 and Sept. 1, at 27 William St., New York. Last one, of 5% paid April 15, 1916.

Balance sheet for year ending Dec. 31, 1915, shows assets \$3,347,712, which included: property account, \$2,978,677; cash \$96,547; accounts receivable, \$31,646; metal pending settlement, \$72,805; supplies, \$30,339; investments, \$43,444; deficit, \$94,365. Liabilities include: current liabilities, \$6,282; accrued preferred dividends, \$338,333.

Profit and loss account for 1914 showed: balance, surplus, Dec. 31, 1914, \$281,224; 1915 earnings, \$55,557; total, \$336,801. Of this accrued preferred divi-

dends absorbed \$338,333; accrued pfd. dividends paid, \$35,000; depreciation, \$57,833; total, \$431,166; deficit, at end of 1915, \$94,365.

Property: about 175 acres, which include a group of old producing silver mines near Guanajuato. Output under normal conditions, 13,000 tons per month. **Ore reserves:** estimated Jan. 1, 1916, at 65,000 tons.

Equipment: includes milling and cyanide plants. Ore milled in 1915, 46,403 metric tons, with an operating profit of \$62,868. Revolutionary conditions have greatly hampered mining operations during the past few years.

Pinguico Mines Co.

Controlled by the Guanajuato Dev. Co.; same directorate. Inc. Sept. 13, 1906, in New Jersey. **Cap.**, authorized and outstanding, \$1,000,000 6% cum. pfd. and \$500,000 common, reduced from \$2,000,000 and \$5,000,000 respectively June 24, 1916. Shares: preferred, \$100; common, \$10. Preferred stock has preference as to assets and is subject to call at par, and accrued dividends on any dividend date. Stock transferred at company's office. Annual meeting, first Tuesday after first Monday in April at 15 Exchange Place, Jersey City, N. J. Fiscal year ends Dec. 31.

Dividends: preferred, 1907, to Oct., 1913, inclusive, 6% per annum; none reported since. Common, none. Preferred payable April and Oct. 1 at 27 William St., New York.

Property: 5 claims, 300 acres, covering 3,200' on the main Pinguico vein, near Guanajuato, Gto. **Ore:** silver-gold. **Development:** Pinguico shaft, 800' deep, and the Fortuna, 670' deep, with several miles of underground workings. **Equipment:** includes a 40-stamp mill and a cyanide plant. Capacity, under normal conditions, about 8,000 tons per month.

Political disturbances have interfered with operations during the past few years.

The Mexican Milling & Transportation Co. built and operates the 2 miles of railroad connecting the mine and the mill. The Guanajuato Dev. Co. refuses to give out any information.

GUANAJUATO REDUCTION & MINES CO.

MEXICO

Columbus, Ohio. Mines and mills at Guanajuato, Gto., Mex.

Officers: C. L. Kurtz, pres., Columbus, Ohio; Wm. G. Moore, v. p.; Geo. D. Bounton, v. p., Philadelphia; C. J. Kurtz, sec.-treas.; preceding, with C. J. Schlaechter, Wm. D. Sherrerd, Robt. T. Moore, Geo. W. Chase and L. O. Bailey, directors. W. G. Wheaton, auditor; H. P. Smith, gen. mgr.; F. L. Hudson, resident mgr.

Inc. 1904, in Colorado, as a consolidation of several silver and gold mines in the Guanajuato district. **Cap.**, \$7,500,000; shares \$100 par. Stock transferred at company's office, Columbus. Empire Trust Co., New York, registrar. Annual meeting, first Tuesday in Feb. at Colorado Springs, Colo.

Bonds: authorized \$3,000,000; outstanding, \$2,800,000, first mortgage 6%, 20-year, \$100, \$500, and \$1,000 gold bonds, dated July 1, 1904, due July 1, 1924; interest Jan. 1 and July 1, at office of the trustee, Empire Trust Co., New York.

Bond interest was deferred Jan. 1, 1915, and operations temporarily suspended in Aug., 1916, due to the revolution in Mexico and also to the inability to secure cyanide and other supplies.

The company was unable to convert its product into cash on account of the Mexican revolution and defaulted, July 1, 1914, interest on its first mortgage 20-year 6% bonds; this interest was paid in Jan., 1915. To Aug. 1915, the interest due Jan. 1 and July 1, 1915, had not been paid.

Comparative Income Account, Years Ended Dec. 31

	Gross Earnings	Operating Expenses	Net Earnings	Bond Interest	Balance for Year
1916.....	\$525,553	\$375,531	\$150,022	\$168,000	(b)\$17,978
1915.....	489,724	366,417	123,307	168,000	41,693
1914.....(a)	1,459,435	1,297,529	161,906	168,000	6,094
1913.....	1,149,176	839,674	310,813	168,000	141,502
1912.....	1,004,290	693,477	310,813	168,000	142,813
1911.....	930,280	648,247	282,033	168,000	113,033
1910.....	931,562	618,067	313,495	168,000	145,495

(a) Includes deduction of \$64,191 for conversion of accounts from 2 to 1 ratio to U. S. currency. (b) Deficit.

Cash balance, Dec. 31, 1916, was \$243,825, including \$93,803 from 1915.

During 1916 operations were more seriously affected by the revolution in Mexico than in any previous year. The causes were political, financial, transportation, labor, supplies, and withdrawal of staff. Instead of a normal 225,000 tons being treated, the quantity was only 61,030 tons, not 30%.

Property includes the Valenciana mine, practically idle in 1916.

Tepeyac mine: on which little development was done. Produced, in 1916, 1,708 tons (metric) averaging 363.4 grams silver and 3 grams gold. Cost was \$1.762, and profit \$3.031 per ton.

Maravillas—Cata mine: good ore opened in 1915 was further developed. Produced 4,764 tons containing 282.5 gm. silver and 2.84 gm. gold. Cost, \$1.576; profit, \$1.803.

Cata shaft: in 1916 the mine yielded 779 tons of 369.8 gm. silver and 2.7 gm. gold ore, at \$1.917 cost and \$2.925 profit per ton.

Mellado mine: during 1916 the Santa Margarita vein supplied the company's best ore, the yield being 11,561 tons, assaying 261.5 gm. silver and 2.32 gm. gold. Cost, \$1.286; profit, \$1.612 per ton. Contractors mined 3,276 tons from the principal workings.

Kurtz shaft: the 1916 output was 10,304 tons of 238.6 gm. silver and 2.54 gm. gold ore. Cost, \$1.037; profit, \$1.681 per ton.

Rayas shaft: during 1916 exploration cut high-grade stringers, rich in gold. In the Bautista hanging-wall lode is 6,000 tons averaging 700 gm. silver and 6 gm. gold per ton. Precautions were rendered necessary by ore thieves.

Garrapota mine: 1916 work revealed nothing special of note. Output was 5,032 tons at cost of \$1.204 and profit of \$2.203 per ton.

The average cost of all underground work was \$1.444 per ton.

Ore reserves: estimated as 141,452 tons blocked out, 245,665 tons probable ore, 483,327 tons on dumps, total 870,444 tons carrying 206 oz. silver and 2.03 gr. gold per metric ton.

The mill treated 64,030 tons of ore, 76% of which came from the mines, remainder from dumps. Average grade was 245.7 gm. silver and 2.49 gm. gold. There was also treated 1,095 tons of concentrate. Recovery was 80.18% of the silver and 85.33% of the gold. Cost of treatment was \$1.675 per ton, including \$1.266 for cyaniding (46c above normal). Silver was 15.637c per oz. higher than in 1915.

Equipment: includes the 180-stamp Bustos mill and the Flores cyanide plant. Crushed ore from the mill is sent through a 6,000' 8" pipe line to the cyanide plant.

Under normal conditions this property should be highly profitable.

MEXICAN MILLING & TRANSPORTATION CO. MEXICO

See Guanajuato Development Co. (Pinguico Mines Co.)

PEREGRINA MINING & MILLING CO. MEXICO

Controlled by Guanajuato Dev. Co., which see.

PINGUICO MINES CO. MEXICO

Controlled by Guanajuato Dev. Co., which see.

PROPRIETARY MINES COMPANY OF AMERICA MEXICO

Office: 15 Broad St., New York.

Officers: D. C. Catlin, pres.; E. J. Page, v. p.; Chas. E. Pope, 2nd v. p.; C. W. Pope, sec.-treas.; above with Horace E. Parker, Wm. A. Robinson, Jr., Robt. V. Norris and W. B. Cogswell, directors.

Inc. 1907, in Nevada. **Cap.**, \$3,000,000; shares \$5 par; \$2,250,500 issued. **Bonds:** authorized, \$750,000, 6% convertible; outstanding, \$703,400. New York Trust Company, registrar. Stock transferred at company's office. Annual meeting, second Monday in June. Is a holding company, controlling through stock ownership the Mineral Development Co., and the Providencia M. & M. Co. of Guanajuato, Mexico.

Latest financial report available, year ending May 31, 1914, shows assets: property, \$2,249,000; stock, bonds and notes of subsidiary and other companies, \$560,542; accounts receivable, \$31,076; cash, \$5,427; furniture, \$313; accounts since organization of company, \$132,632; loss and gain, \$8,700. Liabilities, amounting to \$3,737,193, include outstanding stock, \$2,250,500; outstanding bonds, \$703,400; stock exchanged for Min. Dev. Co. shares, \$6,380; accounts payable, \$5,996; contingent, \$21,417.

The 1915 annual report contains a reference to necessary "additional financing" when the orebodies of the Nueva Luz mine have been more thoroughly developed and when political conditions in Mexico permit the reopening of the Tajo de Dolores mine.

Mineral Development Company

H. Vincent Wallace, gen. mgr., Guanajuato, Mex. **Cap.**, \$1,000,000; shares \$1 par; \$800,000 issued.

Property: the Nueva Luz mine, the La Planta and Torre mines. La Nueva Luz mine, adjoining the Valenciana, is developed by a 2,035' shaft and a 1,130' crosscut, driven through the Veta Madre, below the Valenciana workings, which cut 3 veins reported to be from 5' to 32' wide, and to carry iron pyrite, zinc blende, lead sulphide, chalcopyrite, silver and gold. The 3rd vein intersected 1,069' from the shaft was 5' wide, and assayed 480 grams silver, ¼ gram gold and 10% zinc, per ton. Management plans drifting on the lowest level and diamond drilling to ascertain dimensions of these orebodies. Although the general manager, an Englishman, remains at the property, it is doubtful if active development work can be continued at the present time.

Providencia Mining & Milling Co.

Cap., \$1,250,000, of which \$250,000 is 7% preferred, convertible at 110. and \$1,000,000 common stock, 250,000 shares common in treasury.

Property: the Tajo de Dolores mine at Guanajuato, Mexico. The mine was closed down in April, 1914, and the outlook for an early resumption of operations is not bright. The 200-ton mill and cyanide plant has been leased for 3 years to the Cubo Mining & Milling Company for a yearly rental of \$20,000 U. S. currency and an option to purchase at \$100,000. Interest at the rate of 6% is charged until the option is exercised; rent paid is credited to purchase price. The Cubo Co. agrees to mill Tajo de Dolores ore for a period of 7 years at cost plus 10% until exercise of option and at cost plus 20% thereafter. The lease becomes operative when supplies can be shipped into the camp.

Company reported, March, 1917, that it was active. but no report of operations is ready.

SAN LUIS; CIA. BENEFICIADORA**MEXICO**

San Luis de la Paz, Gto., Mex. Owns the Ojo de Agua smelters. Idle.

STATE OF GUERRERO**PACIFIC COPPER CO., LTD.****MEXICO**

Address: F. C. Stephens, P. O. Box 1656, Mexico, D. F. **Mine office:** Petatlan, Galena, Guerrero, Mex.

Officers: Dr. W. S. Cockrell, pres.; Thos. Milan, v. p.; J. P. Taylor, sec.; H. J. Morden, treas.; F. C. Stephens, gen. mgr.; preceding, with J. N. Gilbraith and Carlos Eisenmann, directors.

Inc. May 16, 1906, in Mexico. **Cap.**, 10,000,000 pesos; shares 100 pesos par; non-assessable; fully issued. Company holds direct title to its property through the Compania de Cobre del Pacifico, and is in turn controlled through stock ownership by the Pacific Copper & Pyrites Co.

Property: 1,000 pertenencias, 2,471 acres, known as El Rey del Cobre group, near the Rio Murga, in La Union district, 10 miles north of Petatlan and about 28 miles N. E. of Zihuatanejo, the nearest port. The property shows contact deposits in metamorphic schist, the main lode having a N. E. strike, traceable 3 miles. No. 3 orebody, reported to have a maximum width of 197', carrying lenses of cupriferous pyrite, is developed by 2 crosscut tunnels, drifts and raises to depth of 234' below the outcrop. No. 5 orebody, about 1 mile to the S. E., has only been slightly developed; the nature of the ore in both is said to be identical. Ore is estimated to average 1.5% copper and 40c in silver and gold per ton, with 48% sulphur and 42% iron.

Development: by "A" shaft of 109', "B" shaft of 70', El Socavon drift tunnel of 400', No. 3 crosscut tunnel of 404', No. 4 crosscut tunnel of 486', No. 5 tunnel of 243', and No. 1 tunnel of 407', with a total of 3,050' of workings.

Ore reserves: estimated at 3,000,000 tons of ore blocked out, Jan., 1916.

Equipment: includes a hoist, not installed, good for 1,000' depth, and a small air compressor. There are about 35 buildings. Property lies in a very rugged country and is reached only by trails.

The property has been under development several years. Development work continued without interruption from the warring factions in the present revolution until 1915. Company is planning to build a railway to Zihuatanejo and to add equipment at the mines. The mine, though of low grade, apparently contains large orebodies and is considered promising.

PACIFIC COPPER & PYRITES CO.**MEXICO**

Office: 1429 Monadnock Blk., Chicago. John Howard McElroy, pres.; C. B. Greenleaf, sec.; Eugene Atkins, treas.

Inc. 1913, in Maine. **Cap.**, \$7,500,000; shares \$50 par. Is a securities-holding company, controlling the Pacific Copper Co., Ltd., through ownership of over two-thirds of that company's outstanding share capital.

RIO GRANDE & DOLORES SILVER MINING CO., LTD. MEXICO

Office: 37 Old Jewry, London, E. C., Eng. **Mine office:** Mineral de Guadalupe, La Union, Guerrero, Mex. Lieut.-Col. A. B. Haig, C. M. G., and Brooke Mockett, directors; A. Kitching, sec.

Inc. Dec. 11, 1877, in Great Britain. **Cap.**, £17,000; increased, Aug., 1881, from £10,000; shares £10 par, in £10,000 ordinary shares and £7,000 cumulative preference shares, fully issued and fully paid. After the pay-

ment of a 10% dividend on preference shares, remaining profits are divided equally. Debentures, £10,000, at 10%.

Property: La Nava mine, at Guadalupe, carrying copper ore, with values mainly in silver, developed by shaft and tunnel.

Equipment: includes steam and water power, with a 20-ton mill and leaching plant. Property employs about 100 men, normally, but for several years active operation has been prevented by the Mexican revolution.

STATE OF HIDALGO

ANTIMONY CORPORATION

MEXICO

Address: Room 1209, 71 Broadway, New York City.

Officers: Chas. F. Rand, pres.; Jos. S. Fay and Olof Wenstrom, v. p's.; Chas. F. Smith, sec.-treas.; preceding, with Freeman Hinckley, Robt. A. Manning and Geo. Tyson, directors. Olof Wenstrom, mine mgr.

Inc. Feb. 15, 1916, in Delaware. **Cap.**, \$1,000,000; shares \$5 par; 100,000 preferred; issued 10,000 preferred, 100,000 common, no bonds. Company organized to take over a deposit of jamesonite, a lead antimony ore, on one of the properties of the Cortez Associated Mines Co., in Zimapan, Mexico.

Property: 48 hectares, 120 acres patented, Zimapan, State of Hidalgo, Mex., said to show ore carrying jamesonite, consisting of 50.8% lead and 29.5% antimony, and carrying silver. The occurrence is fully described by W. Lindgren, and W. L. Whitehead, *Econ. Geol.*, July, 1914, p. 435, and R. W. Raymond, *E. & M. Journal*, Jan. 2, 1915, p. 9.

CORTEZ ASSOCIATED MINES

MEXICO

Office: 53 State St., Boston, Mass. **Mine Office:** Jacala, Hidalgo, Mex.

Officers: Joseph S. Fay, pres.; Olof Wenstrom, v. p.; Freeman Hinckley, sec.-treas.; preceding officers, Wm. R. Fay, Robt. A. Manning and Philip W. Wrenn, directors.

Inc. Jan. 3, 1910, in West Virginia. **Cap.**, \$1,500,000; shares \$3 par, non-assessable; issued, \$825,000. Company began business with \$275,000 cash, and Dec. 31, 1915, had on hand \$675,000 cash loans and accounts receivable. Boston Safe Deposit & Trust Co., transfer agent. Stock is listed on the Boston curb. Annual meetings, first Tuesday in March.

The Cortez Associated Mines is primarily a development and holding company, formed to explore and develop mining properties until they are ready to produce, and then to promote an operating company. Lands, 1,079 pertenencias, 2,666 acres, in 4 groups, in the districts of Jacala, Zimapan and Ixmiquilpan, about 20 miles distant. The lands include the entire old mining camp of Jacala.

Zimapan is 85 miles north of Mexico City and Jacala is 35 miles N. E. of Zimapan, this place being 43 miles from Sayula on the National railroad. The Pachuca-Zimapan R. R., under construction, has been completed to Ixmiquilpan.

The Jacala property shows thickly bedded blue limestone intruded by granular monzonite with alteration along the contact and mineralization of the metamorphosed limestone by copper and silver-lead sulphides. The intrusive mass is 1¼ miles long and 700' wide. The contact zone carries numerous orebodies showing chalcopyrite and magnetite below the 300' zone of oxidation.

Careful exploration has shown that most of the ore shoots are low in copper and carry but 1 to 3 oz. in silver. At the Santa Maria ore shoot, the copper ore is found in a narrow chimney of 4 or 5% ore; in the Humboldt and Abeja, there are a few thousand tons of 4% ore. Main develop-

ment is by the Cortez 1,770' tunnel, which has opened up about 35,000 tons of pyritic ore containing magnetite and chalcopyrite, the average copper contents being 1.72%. Several hundred thousand tons may possibly be developed here, and as the ore contains 50% iron, it will be valuable for a flux.

The Humboldt, Cortez, Abeja and Santa Maria show promise of making producing mines. The Humboldt has a magnetite-garnet outcrop, explored by the 1,304' Humboldt tunnel with drifts and a 130' incline winze, mostly in ore. The Santa Maria 394' shaft has developed a body of soft, leached copper-bearing gossan of 6,000 sq. ft. area. This shaft will connect with the Humboldt tunnel.

The Abeja shaft, 50', sunk 1912 through altered limestone to porphyry contact, shows massive, porous magnetite with chalcocite and oxidized copper minerals. This work will connect with the Cortez tunnel. The Gallo mine, east of the Humboldt, has a 350' shaft, connecting with the Humboldt tunnel, 1,055' from the portal.

Small silver-lead replacements in limestone also occur at Jacala, but the Carmen mine is the only one of promise. This is a well-known old producer, $1\frac{1}{2}$ miles north of Jacala, that yielded 40 oz. silver-lead ore for many years. The mine workings are on the contact between limestone and porphyry and have developed a replacement chimney of silver-lead ore in limestone, worked by an incline shaft to a depth of 900'. The company's new work has not yet cut the downward continuation of this ore shoot.

The San Nicolas group includes the Soledad and Ensino Largo mines. The Ensino Largo, 6 miles from Jacala, shows irregular replacements of rich silver-lead ore in crystalline limestone developed by a 900' tunnel. This tunnel will also develop the Soledad mine. Production from the Ensino Largo mine in 1912-13 was 72 tons, valued at \$99 per ton.

Zimapan lies in a broad, arid valley with the 4,000' deep Moctezuma canyon 9 miles west and the 3,000' deep Toliman canyon 6 miles west. The mines lie in the Toliman canyon and on the ridge between it and the Moctezuma river. The ore deposits appear around a large intrusion of monzonite porphyry either as contact deposits carrying copper, or silver-lead deposits in the surrounding limestone, especially along fissures and intrusive dikes. The latter form pipes, or chimneys, either vertical or inclined. The copper properties at this place are practically undeveloped, but a contact deposit showing disseminated copper pyrite, zinc blende and galena, promises to develop a large tonnage.

The Sirena lead-antimony mine lies 9 miles north of Zimapan. Ore occurs as a replacement deposit, in Cretaceous limestone, cut by a porphyry dike, and apparently follows the bedding of the limestone, dipping about 40° S. The ore is massive and consists of pyrrotite, arsenopyrite, blende and jamesonite, forming an orebody 700' long and 30' thick.

Ore reserves: estimated at 1,000,000 tons of lead-antimony ore averaging 8% lead and 4% antimony. Examination of this property has been made by Waldemar Lindgren and W. L. Whitehead. See *Economic Geol.*, Vol. IX, No. 5.

On Jan. 20, 1916, the company voted to sell the Sirena property to the Antimony Corporation, organized by Chas. F. Rand. The Cortez company receives 90,000 shares common stock, of which 50,000 shares are to be donated as treasury stock, to the Antimony Corp., and will be given as bonus to subscribers to preferred stock at the rate of one share of common stock bonus for every two shares preferred stock. See *Antimony Corporation*.

Property has been closed down since 1913, owing to revolutionary disturbances.

GRANADENA MINING CO.**MEXICO**

Closed down by revolution. Mine at Santa Barbara, Hidalgo, Chih. Mex., produces silver-lead ore with a small amount of copper. Fully described Vol. X.

HIDALGO COPPER MINING & SMELTING CO.**MEXICO**

Office: Avenida 16 de Septiembre No. 26, Mexico. D. F. Mine and works office: Zimapan, Hidalgo, Mex.

Officers: Sydney Ludlow, pres.; Ricardo T. Sobey, v. p.; R. A. Mills, sec.; Hedley Ludlow, treas.; preceding, with George A. Camphuis and W. H. Armstrong, directors; Hedley Ludlow, gen. mgr.; Jas. H. Armstrong, supt.; Plenio Lopez, engr.; Halarion Diaz, chemist.

Inc. Aug. 14, 1907, in Arizona. Cap., \$2,000,000; shares, \$10 par, is \$1,000,000 preferred and \$1,000,000 common stock. Annual meeting, third Monday in August.

Property: 44 mines, 500 acres, with a 500-acre mill site, said to carry copper ores, with small amounts of lead ore. Lands show monzonite-porphry and limestone, with contact orebodies. Copper ores are estimated by the company to average 2.8% copper and 800 grams silver per ton. The mines have a great variety of ores, including copper oxides and carbonates, carbonate and sulphide ores of lead, argentite and chalcoppyrite.

Development: by shafts and tunnels, with a total of 3,000 meters of workings, estimated to show 50,000 tons of ore, with 20,000 tons blocked out for stoping.

Equipment: includes a small steam plant and 16 buildings. Company employs about 800 men at the mines and works.

The 50-ton smelter, at Zimapan, 5 miles from the mine, receives ore by pack-train. Copper production is 20% matte, sent to the Aguascalientes smelter. Lead smelter running, 1913, after many years' idleness, on ore from Nevada group of mines, averaging 25% lead and 900 grams silver. Company plans further development of Purisima, Camino and Concordia groups, and was installing oil engines and electric light, etc., at smelter. Probably closed down, owing to disturbed conditions in Mexico. No recent returns secured.

PACHUCA; COMPANIA BENEFICIADORA DE**MEXICO**

See Santa Gertrudis Co., Ltd.

REAL DEL MONTE Y PACHUCA; COMPANIA DE**MEXICO**

Subsidiary of the U. S. Smelting Ref. & Mining Co., 55 Congress St., Boston, Mass. Salvador M. Cancino, pres.; D. S. Calland, director. Mine at Pachuca and Real del Monte, Hidalgo, Mex.

Inc. 1867, in Mexico, with 2,554 capital shares; all but 20 owned by the U. S. Sm. Ref. & Mng. Co.

The first discovery of ore was made shortly after the Conquest of Mexico by the Spaniards, and several of the principal properties were of large production prior to 1780, and at the time of the visit of Baron von Humboldt in 1790 constituted the most important silver producers in the Western Hemisphere.

Property: 180 mining claims, 1,736 hectares or 4,270 acres, and approximately 26,000 acres agricultural land, at Real del Monte, 7 miles from Pachuca.

Geology: of the district is extremely simple, as all veins are fissure in a uniform, deep-seated andesite boss which constitutes the entire mass for an area of over 100 square miles. While there are superficial capping rocks of other nature, they have no relation to the veins. The filling is quartz with a little calcite. The total mineral content of the

is never more than four or five per cent. and aside from the silver and gold minerals is almost wholly composed of iron pyrite with insignificant sprinklings of lead and zinc sulphides.

Development: by over 150 shafts, and the tunnels, drifts, etc., now open and accessible, aggregate over 100 miles in length. Past workings have embraced over 50 operating mines on the company's property, but the principal operations at present are confined to eight, worked through 16 shafts extending to surface and numerous interior shafts devoted to handling of men and materials. The deepest workings extend to a depth of 625 meters (2,050') below the surface and the average depth from which ore is handled approximates 1,300'.

Ore reserves: owing to the heavy expense of pumping, the reserves of ore actually blocked have been held for several years past at about $1\frac{1}{2}$ years of full production rate. During the past year entirely new developments have importantly added to this ratio. The eight operating mines referred to embrace a relatively small proportion of the known mineral bearing territory and operations are assured for many years to come.

Ores are transported from the shafts by electric surface haulage or aerial tramways to two cyanide plants, one of 800 tons daily capacity in the Real dei Monte district, the other 1,200 tons daily capacity for the Pachuca district. Approximately, 90% of the silver values and 96% of the gold are extracted by the cyanide process and by concentration. About 20% of the total recovered values are in the form of concentrates which are shipped to custom smelters; the balance in the form of doré bullion which is exported. A 50-ton Minerals Separation flotation plant was erected at the Omitlan cyanide plant in 1917.

Production: during 1915 amounted to 390,000 tons of ore averaging 13.5 oz. of silver and \$1.48 gold per ton. The average cost for the first nine months of 1915 was \$4.16.

In spite of Revolutionary activities and the fact that during several periods the properties have been completely cut off by rail and telegraph from the outside world for months at a time, operations have never been stopped and the entire organization, Mexican and foreign, has been held together. There have been no labor troubles of importance at any time and the only causes for cessation or reduction of operations have been due to difficulties in getting supplies on account of transportation causes. The plants are at present operating at about one-third of rated capacity.

SANTA GERTRUDIS CO., LTD.

MEXICO

(Controlled by Camp Bird, Ltd.)

Office: 1 London Wall Bldgs., London, E. C., Eng. A. A. Kelsey, sec.

Directors: F. W. Baker, chairman; L. Clerc, F. A. Govett, F. H. Hamilton, G. dePass, O. deRivaud.

Technical committee: J. A. Agnew, L. Chevillon, Wm. J. Cox, cons. engr. Hugh Rose, gen. mgr.

Departmental heads: general, C. A. Lantz; mining, T. C. Baker; accounting and purchasing, E. J. Craig; electrical, F. H. Walsh.

Inc. Dec. 31, 1909, in England. **Cap.**, £1,500,000; increased Jan., 1911, to £1,275,000; shares £1 par; all issued and fully paid. (Camp Bird, Ltd., owns 1,126,901 shares.)

Company organized to acquire from Camp Bird, Ltd. an option to purchase the controlling interest in the Compania Minera de Santa Gertrudis, Guadalupe, owning the Santa Gertrudis gold and silver mines, for \$9,000,000 Mexican currency, approximately £922,130. Consideration for the option was £222,869, payable £20,000 cash and £202,869 in fully paid shares; the vendors also agreed to provide subscribers for 1,072,131 shares at par, and

to provide £150,000 working capital, and also the purchase price of £922,130, the preliminary expenses to be repaid to vendors out of the first profits.

The name of the operating company is **Compania de Santa Gertrudis Inc.** Jan., 1910, in Mexico. **Cap., \$250,000.** Hugh Rose, gen. mgr. The company formed to treat the ores is known as **Compania Beneficadora de Pachuca, inc.** in Mexico. **Cap., \$500,000.** Hugh Rose, gen. mgr. All shares in both these companies are owned by Santa Gertrudis Co., Ltd.

Balance Sheet: (year ending June 30).

Assets:

	Property & Equip.	Invest- ments	Cash	Miscel.	Total
1916.....	£1,019,343	£431,739(b)	£100,982	£17,253	£1,569,317
1915.....	1,019,601	503,507(a)	99,459	17,722	1,640,289

(a) Includes: Cost of shares in Cia. Ben. de Pachuca, and Cia. de Santa Gertrudis, S. A., £252,100; Cia. de Santa Gertrudis, S. A., £2,459; Cia. Ben. de Pachuca, S. A. current account, £136,434; shares in Amistad y Concordia Aviado and Recuperadora, £93,762; shares in the Messina Transvaal Dev. Co., Ltd., Messina. Zoutpansberg, Transvaal, South Africa, £18,750.

Liabilities:

	Capital	P. & L. Acct.	Miscel.	Total
1916.....	£1,500,000	£22,030	£47,287	£1,569,317
1915.....	1,500,000	130,394	9,895	1,640,289

(b) Includes: Cost of shares as in (a), £252,100; Cia. Ben. de Pachuca, current account, £66,611; shares in Amistad as above, £99,277; and shares in Messina, £13,750.

Profit and Loss Account: for year ending June 30, 1916, shows receipts of £76,854, which includes £70,000 dividend declared by Cia. Ben. de Pachuca, S. A. Balance forward, £70,057, to which is added amount brought forward June 30, 1915, £55,393; total £125,450, of which dividend No. 5 of 1s. per share, paid June 30, 1916, absorbed £75,000; tax reserve £23,000; special reserve, £5,000; directors' extra remuneration, £421, leaving £22,030 carried forward.

Dividends: 15% in 1911-12; 15% in 1912-13; nil in 1913-14, owing to unsettled conditions in Mexico and Europe; 5% in 1914-15, paid Nov. 27, 1915, and 5% for 1915-16, paid June 30, 1916.

Property: 626 acres in the Pachuca mining district, State of Hidalgo, about 62 miles from Mexico City, examined by W. J. Cox, R. J. Frecheville, F. J. Pope and E. E. Chase. The ore carries silver-gold values in large fissure veins or crush zones, 50' to 100' wide in andesite. The great ore-shoot is 3,000' long, 18' thick and 600' high and prongs extend upward from the 800' or 900' level, but do not reach the surface.

Development: by shafts with extensive underground workings. New work in year ending June 30, 1916, totaled 14,865'.

A feature of work in 1916 was the discovery of highly mineralized wall rock on the hanging wall of the north vein on No. 14 and 16 levels. On No. 14 it was 45' wide and on No. 16, 42'. On No. 11 level the shoot was 102' long, assaying \$1.79 gold and 16.6 oz. silver across 4½' and on No. 14 it was 118' long, containing \$1.15 gold and 10 oz. silver across 7' of ore.

Ore reserves: estimated June 30, 1913, 1914, 1915 and 1916, respectively at 1,047,000, 1,194,000, 1,287,000, 1,214,000 tons, the last with an estimated recoverable content of 66,964 oz. gold and 13,392,981 oz. silver, recovery figured at 90%. At normal rate of production the present reserves would be sufficient for about 3½ years. Operating expenses under normal conditions about 18s. 6d. (\$4.44) per ton. For mining and milling practice, see Trans A. I. M. E., Aug., 1916, pp. 1,295-1,332.

Equipment: includes a 60-stamp mill and cyanide plant; wt. of stamps, 1,550 lbs. Mill also contains 10 tube mills; capacity, 25,000 tons per month. Crushing commenced June 14, 1911.

Production: (years ending June 30).

	Tons	Value	Gold, Oz.	Silver, Oz.
1916.....	277,616(b)	£379,651	12,550	2,286,450
1915.....	211,669(a)	249,728	10,727	2,000,856
1914.....	293,336	498,754		
1913.....	263,554	631,718		

(a) Operations were at 52.7% normal rate. (b) 56.6%. Ore averaged 33s 4d. (\$8). The recovery was 92.85%.

During June, 1917, 27,550 tons of ore was treated for \$41,063 profit. In the second quarter of this year, 85,705 tons yielded a mine profit of \$115,157. The mill operated at 86.5% capacity, but 100% capacity was expected during the third term.

Flotation is being tried on a working scale to see how far cyanidation may be eliminated. K. & K. machines are used, followed by Callow cells for cleaning concentrate.

Santa Gertrudis is a big mine, and if conditions allowed, it would make large profits, especially with silver at present prices.

STATE OF JALISCO

AGUILA CONSOLIDATED MINING CO.

MEXICO

Address: 185 Summer St., Boston, Mass.

Officers: D. E. Makepeace, pres., Attleboro, Mass.; E. B. Estes, sec-treas.

Inc. 1917 in Arizona. **Cap.**, \$1,200,000; shares \$1 par. Company is a re-organization of the Aguila Amalgamated Mining Co., described Volume XI. and which succeeded the Mazeppa Cons. Mining Co. Stockholders in the old company were given the option of exchanging their holdings on a basis of 1 share of new for each 5 shares of old and payment of 4c per share of new stock.

Property: near Cinco Minas, said to have one-half mile of workings and to show ore assaying from \$100 to \$160 per ton, mainly in gold and silver. Development work resumed in 1917.

AMAJAC MINES CO.

MEXICO

Address: Guadalajara, Mexico. W. L. Barclay, pres.; J. I. Higbee, v. p.; W. J. Pentland, gen. mgr.; C. A. Sidler, sec.-treas.

Inc. Dec. 16, 1910, in Delaware. **Cap.**, \$2,500,000; shares \$1 par. Company was formed for purpose of purchasing the Refugio, Animas, and Tres Estrellas mines in the Hostotipaquillo district. Later an option was taken on the Trinidad and Mexicano mines.

Property: the Refugio mine, 125 acres, was worked for 25 years prior to its acquisition by present owners, down to the 500' level. The main vein has a width of 5' to 15' with well-defined walls. Ore is said to carry gold and silver with average assay value of \$15.00 per ton. The Animas property, 144 acres, lies west of the Refugio and is apparently on the same vein. The ore is said to contain 20 ounces silver and \$3 to \$5 gold per ton.

Development: at both mines is by means of tunnels, the Animas having over 2,500' of workings. The Tres Estrellas property, 120 acres, is a mile from the mill and has not been developed at depth.

Equipment: includes a 15-stamp mill and a 50-ton cyanide plant in course of construction. Hydro-electric power is used. The revolution in

Mexico has interfered with operations and the mines have only been worked intermittently since 1914.

AMPARO MINING CO.

MEXICO

Office: 541 Drexel Bldg., Philadelphia, Pa. **Mine office:** Etzatlan, Jalisco, Mexico.

Officers: A. F. Bracher, pres.; W. H. Kister and A. S. Miller, v. p.'s; Henry Freund, treas.; with J. H. Stopp, P. C. Evans, E. A. Noppel, J. H. Scott, L. H. Adler, Jr., and C. K. Smith, Jr., directors. J. S. Williams, sec.; J. H. Howard, gen. mgr.; W. Howard, asst. mgr.

Inc. 1902. Cap., \$2,000,000; shares \$1 par; reduced from \$3,000,000 in 1907.

Balance sheet for 1916 shows total assets of \$4,009,195, including \$2,478,897 for property and plant, \$1,377,538 current (\$798,925 cash) and \$152,760 miscellaneous. Current liabilities at end of 1916 were \$428,056.

The income was \$1,297,236 gross, mostly from bullion and concentrate. Net profit was \$456,970. Dividends absorbed \$400,000. Mexican taxes amounted to \$120,675, plus \$20,665 for revolution expenses. American taxes totaled \$7,524. In Aug., 1917, \$60,000 was paid in dividends.

Property: includes the Canada, La Union, San Juan, Amparo, San Domingo and Natividad mines, and Rancho Embocado of 4,390 pertenencias 7 to 9 miles S. of Etzatlan, State of Jalisco.

Development: through general shaft to depth of 1,300'. New work in 1916 totaled 10,501'. Prospects at 1,100' are good, but at 1,300' ore is spotty. The ore contains gold and silver values with sulphides.

Ore reserves: of positive, probable, and prospective ore were 750,000 tons in 1908, 695,000 in 1909, 712,773 in 1910, 706,635 in 1911, 724,099 in 1912, 502,746 in 1913, 447,500 in 1914, 393,610 in 1915, and 472,350 in 1916; over 50% being positive in 1916. Shrinkage stoping is practised, resulting in reduction of costs.

Equipment: electrically driven throughout, including hoist, compressors, pumps, sorting plant, crushers, 50 stamps, 4 tube mills, concentrators, Dorr classifiers, Pachuca tanks and 3 Oliver filters; also a ranch for supplying meat, corn, vegetables, etc.

Production: 50,000 tons in 1908; 63,398 in 1909; 68,217 in 1910; 73,792 in 1911; 92,365 in 1912; 104,330 in 1913; 87,320 in 1914; 114,166 in 1915; and 90,000 tons in 1916.

In 1916 the ore assayed 9.95 grams (0.32 oz.) gold and 320 grams (10.2 oz.) silver per ton. The extraction was 75.6% and 78.9% of gold and silver by cyanidation, 18.4% and 9.2% by concentration, and 91.1% of the total contents. Flotation is to be tried in place of cyanide.

Costs were \$1.34 for mining, 14c for transport and crushing, \$1.88 for treatment, 48c for selling, 43c general, \$1.22 for taxes, 21c for revolution and 30c for miscellaneous, a total of \$5.98 per ton milled. Results are given with commendable detail.

Although the revolution hindered operations in 1916, results were almost normal and appear to be improving.

AYUTLA SMELTER

MEXICO

Owned by Carrizo Copper Co., at Ayutla, Autlan, Jalisco, Mex.

EL FAVOR MINING CO.

MEXICO

Offices: Makeever Bros., Journal Bldg., Boston, Mass., and 170 Broadway, New York. Mine at El Monte, Hostotipaquillo district, Jalisco, Mex.

Officers: Sanford Makeever, pres.; Dr. H. D. Meredith, v. p.; J. Makeever, treas.; M. M. Makeever, sec.; Walter Neal, gen. mgr.

Inc. July, 1906, in Ariz.; protocolized, 1906, in Mexico. **Cap., \$3,500,000;** shares \$1 par. Stock not listed. After 6 years of development the mine paid total dividends of \$210,000 in 1913-1914. Property said to represent investment of \$1,000,000.

Property: 476 acres mineral land and extensive surface areas at El Monte, 75 miles N. W. of Guadalajara, Jalisco, Mex. A branch line of the Southern Pacific R. R. runs to Quemada, near the mine, and the Chapala Hydro-Electric Co. furnishes power for \$50 per h. p. Mine shut down May 24, 1914, owing to Mexican revolution.

Vein reported as 10' to 14' thick with shoots of bonanza silver-gold ore workable to 1,300' by tunnels. Mine said to have 3 miles of underground workings open to 800' level. Mining costs reported to be 24c per ton.

Equipment: includes 150-ton silver cyanide plant, equipped with 20 stamps, crusher, tube mills, Dorr classifiers and thickeners, Oliver filters, Pachuca tanks, Wilfley tables. Extraction was only 54% of \$18 gold-silver ore, owing to manganese, but recent improvements are claimed to ensure nearly 90%. Total production to date reported as \$1,500,000.

KEYSTONE MINING CO.

MEXICO

Office: Shamokin, Penn. Is a reorganization of Keystone Copper Smelter Co., of Philadelphia, and is the holding company for the Mexicana Co., Tapalpa district, Jalisco, Mexico. W. H. Childs, gen. mgr.

Lands: about 100 hectares, in 5 groups, in Tapalpa, including the Mexicana, America and Palma groups; also timber rights to 50,000 acres of adjoining lands. Principal development is on La Mexicana group, 82 hectares, 15 miles west of Tapalpa, mine having a 200-metre crosscut tunnel, cutting 4 veins, with about 1 mile of workings. Veins are fissures in porphyry, averaging 5' width, carrying auriferous and argentiferous chalcopryrite, sphalerite and pyrite.

Equipment: includes steam and electric power and 30-ton mill. The entire plant was enlarged and remodeled and resumed operations in Jan., 1912. Presumably idle, 1915-17, owing to unsettled conditions in Mexico. Letters unanswered.

LA REGINA MINING CO.

MEXICO

Office: 2120 W. Tioga St., Philadelphia, Pa. **Mine office:** San Martin Hidalgo, Jalisco, Mex.

Officers: Chester P. Ray, pres.; F. W. Schmidt, v. p.; A. W. Brackmeyer, sec.-treas.; M. J. Slattery, gen. mgr.; John P. Delaney, supt.

Inc. Nov. 1, 1909. **Cap.**, \$1,000,000; shares \$1 par, as successor of Philadelphia Copper & Gold M., M. & Smelter Co. Debentures, \$200,000 authorized; issued, \$62,000.

Property: 73 hectares, including the San Vicente, La Perla, La Fe, La Concha, Ajax and other mines, shows veins of 3 to 25' width, carrying auriferous and slightly argentiferous chalcopryrite. The mine has 4 tunnels, at 150' intervals, and a 465' shaft. The Ajax mine shows a 12' vein, estimated to average 4% copper, 2 oz. silver and \$1.33 gold per ton. La Estrella del Norte mine has a 260' tunnel.

Development: property as a whole has 8 shafts, of 100' average depth, with a total of about 1,000' of workings, claimed to put in sight 125,000 tons of auriferous copper ore. Development in recent years has been confined to the gold-silver vein, said to show at depth of 115', ore averaging 2 oz. silver and 15 grams gold per ton.

Equipment: includes a steam hoist and air compressor, at the San Vicente group. The mill has a 25-ton Elspass mill, 25-ton experimental cyanide plant, Huntington mill and 3 Pachuca tanks. Idle on account of political disturbances in Mexico.

Material changes impending, 1917, and secretary deems it inadvisable to give particulars at present time.

MAGISTRAL-AMECA COPPER CO.

MEXICO

Office: 201 Hibernian Bldg., Los Angeles, Cal. **Mine office:** Ameca, Jalisco, Mex.

Officers: H. L. Percy, pres.; Fred M. Lyon, v. p.; Geo. C. B. Robinson, sec.-treas.; Jas. P. Harvey, gen. mgr., and H. N. Manington, directors; Percy A. Babb, cons. engr.

Inc. May 20, 1909, in Arizona. **Cap.**, \$1,500,000; shares \$1 par; non-assessable; issued, 1,255,300 shares. Holds direct title to lands through Magistral-Ameca Copper Co., S. A., inc. in Mexico. Annual meeting, second Wednesday in November.

Property bought of Las Moras Copper Mining Co. for \$100,000 by Messrs. Patrick Clark, Jas. P. Harvey, H. L. Percy and Fred M. Lyon. Mr. Clark selling his quarter interest to his associates for \$55,000.

Property: 74 pertenencias, 185 acres, known as the Mina Magistral, on the Hacienda Hegira, 8 miles S. W. of Ameca, has veins in diorite that are cut by porphyry dikes. The veins occur on dike contacts and show outcrops of silicified rock with quartz stringers and hematite. The vein varies from 4 to 25' in thickness and carries lenticular orebodies connected by mere films of quartz or fissures with wall rock impregnated with chalcopyrite. The Magistral ore shoot occurs where 3 veins intersect. The ore carries copper sulphides and averages from 4 to 7% in copper with about \$2 in combined gold and silver values.

Development: by 321' shaft, planned to be deepened to 350', and by tunnels with about 1 mile of openings, March, 1913, developing copper ground for width of 5 to 50', said to assay 4 to 8% copper. The Magistral was worked many years ago for bluestone, used by neighboring mines in the process of treating silver-lead ores.

Equipment: includes two 80 h. p. high-pressure boilers and a 150 h. p. tandem compound engine, with hoist good for 500', at the Magistral. The mines are connected with Ameca by a good wagon road, 8 miles long, with a 1½% grade, built with the idea of using it for railway tracks in the future. About 100 men are employed.

The concentrator was rebuilt, 1914, but owing to disturbed conditions in Mexico, operations have been greatly interfered with. No recent returns securable.

MASCOTA COPPER CO.

MEXICO

Office: 513 Germania Life Bldg., St. Paul, Minn. **Mine office:** Ameca, Jalisco, Mex.

Officers: Chris D. O'Brien, Sr., pres.; J. M. Bowler, v. p.; Byron J. Mosier, sec.-treas.; Chris D. O'Brien, Jr., gen. mgr., at last accounts.

Inc. June, 1908, in Arizona, as successor of Independence Mining & Smelting Co. **Cap.**, \$1,500,000; shares \$1 par.

Lands: 46 hectares, said to include an antigua mine, in the Guachinango division of the Mascota district, 24 miles from the Mexican Central line. The claims show an 8' fissure vein in porphyry, said to be traceable about 2,000' and proven to depth of 486'. The ore is reported to average 5% copper, 7 oz. silver and 6 grams gold per ton.

Development: includes 300' shaft and 375' tunnel, with 4,825' of workings, estimated to show 40,000 tons of ore, with 28,000 tons blocked out for stopping.

Equipment: includes 50 h. p. steam plant, with 3-drill Sullivan air compressor, a 25-ton wooden stamp mill, with 10 Allis-Chalmers gravity stamps, and a small concentrator, equipped with 2 Overstrom tables, a vanner, 4 slime tables and a sizer. Operations suspended on account of revolution. Still idle, 1917.

MEXICANA MINING CO.

MEXICO

Is the operating subsidiary company of the Keystone Mng. Co., of Shamokin, Pa., which see.

MOLOLOA MINING CO., LTD.**MEXICO**

Hostotipaquillo, Jalisco, Mex.

Officers: W. G. Miller, pres.; F. G. Stevens, managing director; W. M. Mathews, treas. and gen. mgr.; Edw. Fenley, supt., at last accounts. Inc. 1908, in Canada. **Cap.**, \$250,000.

Property: 130 hectares, include antiguas opened by the Spaniards in the 16th century, reopened in 1904. Said to have been abandoned by former owners because of vein faulting. Several fissure veins in andesite carrying gold-silver ore were worked in 1914 and shipments made to the El Favor mill.

SAN FELIPE MINING CO.**MEXICO**

Hostotipaquillo, Jalisco, Mex. Col. N. Z. Seitz, pres. and gen. mgr. Inc. 1902, in Arizona. **Cap.**, \$1,000,000; shares \$1 par.

Property: includes a 50-ton mill. The company is said to have paid dividends from stock sales and was considered by Horace J. Stevens as a rank bit of stockjobbery. Idle and probably defunct.

VOLCANCILLOS MINES**MEXICO**

Letters returned in July, 1917, from Avenida Borbon No. 6, Autlan, Jalisco, Mex.

Property: 28 pertenencias, 70 acres, and a 10-acre mill site, with 100 sq. miles of timber lands, held under a government concession in the Cacoma district, including the Volcancillos and adjoining mines. The Volcancillos group, 12 miles W. of Autlan, shows diorite-porphry dikes, with contact deposits 5 to 80' wide, the largest one containing chalcopyrite ore assaying 4 to 15% copper, 4 oz. silver and nearly \$5 gold per ton.

Development: includes a 300' two-compartment shaft with about 1,000' of workings and several tunnels, 1 having a back of about 150' but still in the oxidized zone. The mine is estimated by the management to show about 100,000 tons of ore. The ore deposit, discovered 1860, was opened by Edward Blake, was operated under bond and lease for a while by the Cacoma Mining & Smelting Co., but reverted to Mr. Blake and still remains in his family.

Equipment: includes a steam plant with 40 h. p. hoist, good for 1,000' and a 10-ton mill and smelter, now abandoned. The ore from the Volcancillos is sold to the local Indians, who have been metal workers from time immemorial. The natives buy the crude ore, paying 4c per lb. for the copper content. They crush and concentrate the ore, smelting the concentrate in little furnaces, making copper cakes which are skillfully fashioned into pots, kettles, and other articles.

MEXICO, D. F.

EL ORO MINING & RAILWAY CO., LTD.**MEXICO**

Offices: 24 Lombard St., London, E. C.; 61 Broadway, New York. T. Dundas Pillans, sec.

Directors: R. T. Bayliss, chairman; H. W. Barnett, Capt. H. V. Hart Davis, Alfred Naylor, L. Breitmeyer, P. L. Foster, J. H. M. Shaw, R. M. Raymond, managing director in Mexico. **Staff:** A. F. Main, gen. mgr.; F. Jenkin, asst. mgr., El Oro, D. F., Mexico.

Registered, July 27, 1899, in London, to acquire the capital stock of the American Mng. Co. and the American Railroad & Lumber Co., the former owning the El Oro Gold & Silver mine in the El Oro district of Mexico, and the latter owning the railroad connecting the mine with the Mexican National Ry. Purchase price was £886,072; paid £820,084 in cash and £65,988 in stock. The two American companies have since been dissolved.

Cap., £1,150,000; outstanding, £1,147,500; shares £1 par. Annual meeting in October. Listed on London Stock Exchange.

Accounts for fiscal years ending June 30:

	Bullion Recovered	Railway Receipts	[Deprec. on Exch.]	Loss on Exch.	Deprec. of Invest's	Profit
1915....	£75,541	£7,944	£25,000	£20,444	£21,343	£78,398 (d)
1914....	415,436	35,497	25,000	23,242	.....	103,690

(d) Deficit, which, with £34,229 provision for income tax and £1,202 written off improvements, deducted from credit balance forward, left £77,240 carried forward; cash, £120,238; treasury bills, £19,805; bullion, £2,171; debtors, £7,203; investments, £26,643; creditors, £50,483.

No statement of accounts was rendered at company meeting in Dec., 1916, owing to non-receipt of mine accounts.

Dividends: Aug., 1900, from profits to June 30, 1900, 5%; 1900-01, 11¼%; 1901-02, 15%; 1902-03, 15%; 1903-04, 7½%; 1904-05, nil; 1905-06, 12½%; fiscal years ended June 30, 1907 to 1911, inclusive, 15% each; 1911-12, 12½%; 1912-13, 10%. Nil since, due to political disturbances. Total dividends to July, 1913, £1,783,625.

The El Oro Mng. & Ry. Co., Ltd., owns 42,687 shares (par £1) of the stock, and £14,000 7% debentures of the Suchi Timber Co., Ltd., which declared a dividend of 5% on June 30, 1913.

Property: the San Antonio, San Rafael, Trianon, Diamante, Ofir, and Carmen No. 2 claims, 786 acres, at El Oro, 100 miles northwest of Mexico City. In 1912-1913, the adjoining Ofir claim, 11½ acres, was bought for £130,000 cash. This claim controls the rights of the San Rafael vein in depth.

Ore: values are mainly in gold. Orebodies vary in width from 10' to 60'.

Development: by shafts from 1,500' to 1,600' deep.

Ore reserves: June 30, 1913, estimated as 448,053 tons; value \$8.11 gold and 3 oz. silver per ton, total value \$9.90 per ton; compared with 301,934 tons, value \$9.26 per ton, on June 30, 1912.

Equipment: includes a 200-stamp mill, 8 tube mills and a cyanide plant. Crushing was continued with 100 stamps until April, 1914, when, owing to revolutionary disturbances in the district, all operations were

suspended. Milling on a small scale was resumed Oct. 1, 1914, but had to be again suspended in Feb., 1915.

Mine and mill operations were resumed Oct., 1916.

Recent production for fiscal years ending June 30:

Year	Tons Milled	Value	Costs	Profit	Yield
1913.....	433,708	\$5.04	\$3.59	\$1.45	\$2,188,723
1912.....	387,157	5.75	3.79	1.96	2,228,190
1911.....	360,294	6.63	3.90	2.73	2,389,340
1910.....	316,138	8.10	5.17	2.93	2,562,705
1909.....	265,181	8.56	5.42	3.14	2,442,374

ESPERANZA, LTD.

MEXICO

Office: No. 1 London Wall Bldgs., London, E. C., Eng. **Office of American company:** 54 William St., New York.

Directors: R. J. Frecheville, chairman; F. W. Baker, F. M. Crisp, W. F. Fisher, A. A. Kelsey. C. L. Johnson, sec.

Reg. Oct. 6, 1903, in Great Britain. **Cap.,** £455,000; shares £1 par; all issued and credited, except seven, as fully paid. Acquired by agreement with the Guggenheim Exploration Co., and the Venture Corporation, Ltd., 449,800 shares of \$5 each, all the capital except 200 shares, in the Esperanza Mng. Co. of New York, inc. in New Jersey and owning gold and silver mines covering 384 acres, adjoining the El Oro mine at El Oro, Mexico. Purchase price, £454,993 in fully paid shares.

Financial report for 1915 shows a profit of £23,692, making with balance brought forward, £32,929; dividends absorbed, £20,498; taxes, £7,612, leaving £4,818 balance to be carried forward.

Esperanza Mining Co., the American company, had \$412,665 cash and \$347,560 realizable assets; current liabilities, \$88,238, for the two years ending Dec. 31, 1915.

Dividends: now paid semi-annually: 1903-04, 10%; 1904-05, 14 months, 82½%; 1906, 160%; 1907, 105%; 1908, 70%; 1909, 25%; 1910, 30%; 1911, 30%; 1912, 15%; 1913, 10%; 1914, 5%; 1915, 5%, interim, paid July 31.

Ore: gold and silver in veins from 3' and 5' to over 50' wide.

Development: total underground workings amount to 159,969', of which 4,502' were done in 1915. The limits of the San Carlos vein have been ascertained and no additional ore was found. On the Descubridora vein, 1,953' of work were done besides 290' of diamond drilling in hole No 20 on the 7th level. The Descubridora shoot showed about 8,000 tons of ore, **Jan.,** 1916, and drilling has proven the presence of ore in the ground lying east of the San Rafael vein.

Work on the San Rafael vein on the 14th and 15th levels was discouraging, values being too low to warrant exploitation. Some of the ore contains lead and zinc. Further diamond drilling may be done.

Over half the 1916 development work was done on the upper levels of the San Rafael and old West veins where additional low-grade ore was opened up. On the Sirio, the shaft was dewatered and old workings reopened.

Ore reserves: estimated Jan. 1, 1916, as 156,000 dry metric tons of developed and probable ore, which should yield an approximate working profit of \$532,000 gold. Estimate, which shows a slight increase over figures of previous year, does not include old stope filling, nor 200,000 tons of sand tailing, estimated to yield \$200,000 gold.

Equipment: includes 120-stamp mill, tube mills and a cyanide plant.
Production:

Year	Tons Milled	Value per Ton	Costs per Ton	Profit per Ton	Rec. %
1915.....	22,684(c)	.....	.....	.....	.....
1914.....	166,212(b)	.....	.....	.....	.....
1913.....	207,281(a)	.....	.....	.....	.....
1912.....	229,076	\$7.31	\$6.01	\$1.30	80
1911.....	272,235	6.17	4.43	1.76	88

(a) Includes 121,438 tons of tailing. (b) Includes 45,237 tons of tailing. Mill was closed down from April 21 to Aug. 31, 1914, due to revolutionary conditions, and in Feb., 1915, the plant was again closed down. A little development work was done during the year. (c) Production for January and February, 1915, was 22,684 tons with a gross value of \$143,486. Working profit amounted to \$57,304.

Other properties are being investigated with a view to prolonging the life of the company. An interest has been secured in the Anglo-Colonial Co., Ltd.

Mine was closed down Feb. 25, 1915, owing to revolutionary disturbances and milling operations could not be resumed during the year.

ESPERANZA MINING CO.

MEXICO

Office: 25 Broad St., New York. Controlled by Esperanza, Ltd., which see.

MEXICO MINES OF EL ORO, LTD.

MEXICO

Offices: 2 St. Helen's Place, London, E. C., and 18 Rue Laffitte, Paris.

Directors: E. M. Clarke, Don Guillermo de Landa y Escandon, F. J. Fournier, H. Higgins, and Sir R. J. Price, M. P. F. L. Allan, resident manager, El Oro, Mexico; J. Vincent, asst. mgr.; C. R. Pinder, cons. engr.

Reg. Oct. 14, 1904, in England. **Cap.** £210,000; shares £1 par; increased from £180,000 in July, 1914; 180,000 shares issued and fully paid; 30,000 to be issued for acquisition of the Nolan properties. Shares were being issued in Feb., 1917.

Financial statement for year ending June 30, 1916, issued Feb. 17, 1917, showed that owing to suspension of operations due to the revolution, there was a loss of £21,855. Balance forward on June 30, 1916, was £59,073, compared with £91,127 the previous year.

Dividends: including bonuses—

Year	Year
1907-08..... 5s.	1911-12..... 16s.
1908-09..... 12s. 6d.	1912-13..... 18s.
1909-10..... 14s.	1913-14..... 18s.
1910-11..... 16s.	

Property: company was formed to acquire by agreement with the Exploration Co., Ltd., 26.63 hectares, 65.79 acres, total with surface rights 75 acres, adjoining the Esperanza mine, near the town of El Oro, Mex. The land, formerly held by the Mexico Venture Syndicate, Ltd., includes the Mexico gold and silver mine.

The properties of the Compania Miniera de Oro Nolan were acquired in Jan., 1915, for 30,000 fully paid shares.

The ore is gold-silver, occurring in fissure veins.

Development: by shafts. The North shaft is 1,547' deep, the South shaft, 1,687'.

Ore reserves: June 30, 1916, were estimated at 505,300 tons, containing \$10.40 gold and 6.4 oz. silver per ton.

Equipment: includes a 40-stamp mill, 7 tube mills, and a cyanide plant.

Milling operations started in Oct., 1907, were suspended in April, 1914, owing to revolutionary conditions. In year ending June 30, 1915, the mill worked 5 months. At the end of 1915 the mine was producing a limited tonnage, but supplies were rapidly becoming exhausted, with little prospect of obtaining transportation for more.

Ore treatment was resumed in Aug., 1916, and to end of December the quantity handled was 31,000 tons. In Feb., 1917, 7,300 tons yielded \$167,000, of which \$106,500 was profit.

Production	Tons Milled	Yield	Value per Ton	Costs per Ton	Profit per Ton
1914-15.....	30,825	£84,650	.....	.....	.....
1912-13.....	158,395	1,669,540	\$10.5	\$4.1	\$6.5
1911-12.....	142,884	1,555,095	10.8	4.3	6.5
1910-11.....	136,408	1,528,229	11.2	4.3	6.9
1909-10.....	136,372	1,392,336	10.2	4.7	5.5
1908-09.....	101,105	1,257,560	12.4	5.6	6.7
1907-08.....	62,394	807,971	12.9	6.3	6.6

This famous and very efficiently managed property appears to have passed the zenith of its career and to have become a liquidating proposition.

STATE OF MICHOACÁN

ARIO COPPER CO.

MEXICO

Idle owing to political disturbances in Mexico. **Mine office:** Ario de Rosales, Ario, Michoacan, Mex.

Officers: Frederick Moser, pres.; Geo. H. Walsh, Jr., treas.; A. P. Stramler, supt.

Cap., \$2,000,000; shares \$10 par. Holds lands through Ario Copper Co., S. A. **Inc.** April 13, 1907, in Mexico. **Cap.,** 500,000 pesos.

Property: 126 hectares, including the Flora, Roma, Bohemia, San Antonio and San Valentin mines, old properties showing silver and copper ores, about 5 miles from the Inguaran mines, on the projected line of the Morelia y Tacambaro railway, partly constructed.

Development: principal work is on the Flora and Bohemia mines, with 7 shafts aggregating 500' depth, and 12 tunnels aggregating 2,600' length. La Roma has ore assaying up to 25% copper. Equipment includes steam and gasoline power.

Patzcuaro, 70 miles distant, is the nearest railway point.

INGUARAN; COMPAGNIE D'.

MEXICO

Office: 56 Rue de Provence, Paris, France. **Mine office:** Inguarán, Ario, Michoacán, Mex. Ch. Laforgue, gen. mgr.; Maurice Armand de Lille, agt.; J. L. Philips, supt.

Inc. Jan. 15, 1898, in France. **Cap.,** 12,000,000 francs, shares 500 francs par. [s controlled jointly by the French house of Rothschild and, the Banque Mirabaud; a considerable portion of the company's stock is owned by the

Companie du Boleo. Property is said to have cost 1,500,000 pesos, and company reported to have expended about \$8,000,000 thereon, which is undoubtedly overestimated.

Property: 185 hectares, and a mineral zone of 5,000 additional hectares, in the Tacambaro district 70 miles north of the Balsas river, Michoacán, lying on the plateau of the volcano Jorullo, 1,500' above the plains.

Geology: the Inguarán mountain is traversed by a dike 2,000 to 3,000' wide, of fine-grained pink granite, or granodiorite sprinkled with grains of copper glance and copper pyrite. This dike is traceable several miles across country. The granite rock is sprinkled with specks of chalcocite and chalcopyrite forming a disseminated, or so-called porphyry deposit whose payable ores occur in belts or bands in the dike. Proven depth of the ore is about 300 meters, at which point it apparently cuts off.

Development: by a 2,500' tunnel and 2 main shafts, deepest 350', with levels opened at 80' intervals. Both ore and country rock are exceedingly firm, little timbering being required. Estimates of size and value of the orebodies vary greatly, but the best authorities estimate an average of 3.25% copper, with 2,000,000 to 3,000,000 metric tons of ore blocked out. The ore is not well adapted to wet concentration as the metallic sulphides are firmly interlocked with the granitic minerals, but it is admirably adapted to treatment by froth flotation of the Minerals Separation Co., and apparently could be put about 8 or 10 into 1.

The Inguarán was the particular bugaboo of the copper situation at the end of the nineteenth century, the exigencies of the buyer's demanding that there always be some mine, just about to begin production, that can make several hundred million pounds of copper yearly at a merely nominal cost. The Inguarán has a large body of low-grade ore, but it is not equal in quantity or quality to that of several of our other "porphyry" coppers.

The property has been idle some years and cannot become a serious producer until rail connections are secured; judging from the very leisurely progress of the past decade it will become a large producer about the time that Gabriel blows his horn.

MICHOACAN RAILWAY & MINING CO., LTD.

MEXICO

Address: G. A. Mitchell & Co., secretaries, 2 Suffolk Lane, Cannon St., London, E. C., England. **Mine office:** Angangueo, Michoacán, Mex. **Works office:** Ocampo, Zitacuaro, Michoacán, Mex. G. A. Mitchell, C. H. Potter, W. J. H. Moll, and T. B. R. Scott, directors.

Inc. Jan. 29, 1889, in Great Britain. **Cap.**, £105,364; shares £1 par, in £21,015 "A" non-cumulative 7% preference shares, £12,190 "B" non-cumulative 7% preference shares, £70,745 ordinary shares, and £1,414 founders' shares; issued £99,370. Debentures, £27,090 of 5% prior lien bonds, and £103,000 of 4% mortgage bonds. Is £61,800 in arrears of interest on mortgage bonds. The railway rights originally held have been disposed of to the Michoacán & Pacific Railway Co., in which the company has a £60,000 share interest in addition to £18,600 bonds held.

Report for 1914 shows income, £3,343 and loss of £5,188; for 1915, £1,554 income with loss of £5,825.

Property: 537 hectares known as the Angangueo silver mines, opened by tunnels and variously reported to have 14 to 30 kilometers of workings, was leased, 1909, for 10 years, to the American Smelting & Refining Co. and this lease has been extended until July, 1933, at a minimum annual rent of \$50,000 (Mexican) and ½ the net profits.

Conditions in Mexico resulted in intermittent work by the A. S. & R. Co. The Government operates the railway to a limited extent.

STATE OF NUEVO LEON

MONTEREY MINING, SMELTING & REFINING CO., S. A. MEXICO

(Compania Minera, Fundidora y Afinadora, S. A.) Monterey, Nuevo León, Mex. Juan M. Weber, general manager. Cap., \$8,000,000; shares \$100 par.

Property: includes the Ocampo and Santa Elena mines, at Mineral de la Mula, carrying gold, copper and lead ores; La Cruz y Anexas mines, at Pánuco de Coronado, carrying silver-lead and copper ores; the Cinco de Mayo group at Lampazos, Nuevo León, producing iron fluxing ores; and a mine at Naica, Chihuahua, Mex.

Company operates a lead smelter and silver-lead refinery, in direct competition with the American Smelting & Refining Co., at Monterey. The smelter also handles small quantities of copper, which is disposed of in the form of matte.

Production: 1912: was 13,919,107 kgs. lead, 238,555 kgs. silver and 3,158 kgs. gold. Probably idle since revolution started in Mexico.

MONTEREY SMELTING & REFINING CO. MEXICO

Monterey, Nuevo León, Mex. Controlled by American Smelting & Refining Co., which see.

STATE OF OAXACA

LA FORTUNA MINING CO. MEXICO

Idle. **Office:** 221 Colorado Bldg., Washington, D. C. **Mine office:** Apartado 21, Ocotlan, Oaxaca, Mex.

Officers: C. E. Miller, pres.; Wm. H. Brown, first v.p.; E. D. Stinson, 2nd v.p.; Amos Tyree, sec.; W. H. Brown, treas., at last accounts.

Inc. 1906 in South Dakota. Cap., \$250,000; shares \$10 par; non-assessable; outstanding, \$230,000.

Property: 30 hectares, known as the Treadwell group, about 3 miles from Ocotlan and one-half mile from the Oaxaca-Taviche branch of the Mexican Southern railway, shows a well-defined nearly vertical fissure vein of 2 to 12' width, cutting bedded andesite tuffs, greatly leached and oxidized to depth of 300'.

Development: by a 400' vertical shaft, with 700' of workings, two 100' prospect shafts and 4 tunnels of 700' aggregate length. Workings show chalcoppyrite, with quartz gangue, estimated by company to average 4.5% copper and 200 grams silver per metric ton. Some ore was shipped returning 14% copper and 600 grams silver per metric ton.

Equipment: includes a 30 h. p. boiler, hoist and a small air compressor for hammer drills.

Is a copper mine, whose silver output is a by-product only. Idle since 1912 owing to conditions in Mexico.

SAN MARTIN y ANEXAS, S. A.; COMPANIA MINERA. MEXICO

Office: Apto 145, Oaxaca, Mex. **Mine office:** San Martín de los Cansecos, Oaxaca, Mex.

Officers: Frank M. Leonard, pres. and gen. mgr., 312 E. 2nd St., Tucson, Ariz.; Lic. Jesús Acevedo, v. p.; Ranulfo Bravo, sec.-treas. and supt.; preceding with Frank J. Woods and Alfredo Castillo, directors, at last accounts.

Inc. Jan. 15, 1907, in Mexico. **Cap.**, 400,000 pesos; shares 10 pesos par. in 35,000 fully paid shares and 5,000 assessable shares, issued 37,995 shares.

Property: 53 pertenencias, including El Billete de Banco, King Dodo, La Liga, Las Virginias, La Maria and La Roseta mines, about 10 miles from Ocotlan. Property shows diorite cut by a 6' vein carrying silver ore assaying 5 kgs. silver and 50 grams gold per ton.

Development: a 160' shaft, on the Maria, an 80' shaft on the Billete de Banco and a 350' tunnel on La Liga claims.

The political conditions in Mexico have stopped operations, but company keeps up tax payments and keeps watchmen at the mine. Property considered promising.

TEZIUTLAN COPPER CO.

MEXICO

Inc. in New Jersey. **Cap.**, \$1,000,000; shares \$100 par. Is controlled, through ownership of entire stock issue, by Teziutlán Copper Mining & Smelting Co., which see. Fully described Vol. V, Copper Handbook.

TEZIUTLAN COPPER MINING & SMELTING CO.

MEXICO

Offices: 82 Beaver St., New York. **Mine offices:** La Aurora, near Teziutlan, Puebla, Mexico; and Tjutla, Oaxaca, Mexico.

Officers: S. W. Reynolds, pres.; C. J. Peabody, v. p.; D. C. Brown, v. p. and gen. mgr.; R. E. Safford, sec.-treas.; with E. W. Gould, Jr., R. H. Cromwell, W. F. Gillesby and Isaac Jackson, directors.

Inc. April, 1905, in New Jersey. **Cap.**, \$10,000,000; shares \$100 par. Controls, through entire stock ownership, the Teziutlán Copper Co., and has a close working agreement with the Compañía Metalúrgica Mexicana. State Street Trust Co., Boston, transfer agent. Annual meeting, first Thursday in June.

Dividends: have been paid as follows: \$100,000 in 1903; \$350,000 in 1904; \$495,216 in 1905; \$800,000 in 1906; \$800,000 in 1907; \$300,000 in 1908; none in 1909-10; \$400,000 in 1911; \$400,000 in 1912 and \$800,000 in 1913; none since on account of revolution in Mexico, causing suspension of work.

Property: La Aurora and Ocote mines, the former with 4,560 acres, 12 miles from Teziutlán, and about 180 miles E. of the City of Mexico, with a 16-acre smelter site, and 2,500 acres of miscellaneous lands, including La Chignautla limestone quarry, about 3 miles from the smelter. The climate is equable, and the mines are surrounded by fine arable lands, with an adequate supply of good labor.

Los Ocotes group, 240 hectares, bought Oct., 1905, is 2½ miles N. of San Martin, Ejutla, Oaxaca, Mex., and includes the San Juan mine, which is one of the few copper properties that has paid for development from production, since inception, and in addition, has given a profit, the mine having been a steady producer since 1900. This property shows 4 fissure veins, in porphyry. The one worked in the San Juan mine varies from 2 to 30' in width and has lenticular shoots of quartzose-chalcopyrite ore without zinc, antimony, arsenic or bismuth. The ore averages 4 to 5% copper, and 15 oz. silver per metric ton, with a trace of gold, and the mine has produced considerable ore carrying up to 11% copper and 4 kgs. of silver per metric ton.

Development: by 4 shafts, 1 for ventilation. The San Juan or main, is 830' deep, and is connected on the 7th level with the Dolores shaft, 200 meters to the N., of 164 meters depth having 9 levels. The San Francisco shaft, 475 meters S. of the San Juan, is not yet connected with the main workings. The mine is quite dry, making only about 25,000 gals. of water daily. Ore reserves were estimated March, 1912, at 1,000,000 tons.

Equipment: at the San Juan mine of Los Ocotes group includes steam, gas and electric power, with steam hoists good for 500 meters depth, at the San Juan and Dolores shafts, and a 6-drill Rand air compressor. There also is an old mill erected by the former owners near the San Juan shaft.

The company owns a private narrow-gauge railway, of 12 miles length, from La Aurora mine to Teziutlán, where connection is had with the Inter-oceanic Railway of Mexico. This line has 2 Shay mountain-climbing locomotives, with a Rogers switch engine at the works. A railway is projected from Teziutlán to the port of Nautla, on the Gulf of Mexico, a distance of 100 miles, which would give a direct outlet, and reduce transportation charges, which are very high at present.

The company has 2 aerial tram lines, the lower of 50 metric tons hourly capacity, carrying ore and limestone, and the upper, of 15 metric tons hourly capacity, with automatic loading and dumping devices, carrying limestone only.

A new 500-ton concentrating mill at Aire Libre, Puebla, Mex., electrically operated, and of the most modern and complete equipment, was practically completed at end of 1913, when all work had to be suspended on account of revolutionary conditions.

Smelter: 17 kilometers from Teziutlán, was remodeled and blown in April 8, 1910. Buildings are of concrete and steel and the flow of material is by gravity throughout. Ore is brought from the mine in trains of 4 cars each, passing over a gravity tramway equipped with scales and dumped in two rows of six 250-ton ore and flux bins, having pneumatic gates. There are two 500-ton blast furnaces, doing semi-pyritic smelting, requiring about 7½% charges of coke, charged by cars taking current from a third rail, with motors mounted on the axles, ore being dumped into 65-ton charge hoppers above each furnace. Each hopper is divided into 6 vertical sections, for half the height, each section having 2 gates, operated hydraulically by banks of levers in front of the furnace, permitting charging to any part of each furnace desired, as charging can be done at 10 different points independently. The discharge of the water-jacket piping is visible. The furnaces have 11' circular settlers, of 4' 6" height, with 18" linings, provided with cooling pipes. Under the furnace floor is a 4x7' concrete-lined slag tunnel, which also cares for drainage, slags being granulated and washed out by a jet of water into the river, the launder having a 45' fall. A 10' steel balloon flue leads from the furnaces to the 150' steel stack, of 14' diameter, set on a 30' concrete base.

The converter department, occupying an extension of the furnace building, has a 30-ton electric crane, of 40' span. There are 2 stands and six shells, with fusible discs, tilted electrically. Blister copper is cast into 110-kg. pigs, in tilting moulds carried on trucks, and converter bars, averaging 98.6% in copper tenor, are exported through Vera Cruz for refining at the Perth Amboy works in New Jersey.

The power plant at the smelter has 5 Connersville blowers of 10,000 cu. ft. capacity each, driven by 100-h. p. individual motors, for furnace blast, and a 40x42" Nordberg double blower, rope-driven by a 350-h. p. motor, for converter blast. There are 2 hydro-electric power plants and the cost of

electric power is figured at \$14 per h. p. year, exclusive of interest and insurance. The 1,000-h. p. hydro-electric installation at the smelter takes water from the Totoyic or Xolat river, through a 3,600' flume, under a head of 150', the company having a government concession for 2,500 liters of water per second from that stream. The second hydro-electric power plant, on the Atexcaco river, 9 kilometers from the smelter, has about 3,000 h. p. available, partially developed by a 1,500-k. w. hydro-electric plant of 4 units, driven by Pelton wheels under a head of 1,340', delivering current at 6,000 volts, which is carried by double transmission lines, each of capacity adequate for the entire load, and stepped down to 440 volts in a transformer station at the smelter.

Production: 6,788,404 lbs. fine copper in 1902; 6,786,488 lbs., in 1903; 7,512,252 lbs. copper, 286,012 oz. silver and 3,057 oz. gold in 1905. The plant has a capacity of about 12,000,000 lbs. fine copper yearly, and was producing early 1911, at the rate of nearly or quite 1,000,000 lbs. fine copper monthly. Employs 2,500 men when working at capacity. The Teziutlán is the most promising and successful copper mine in southern Mexico, and management is considered good. Closed down since 1913, owing to Mexican troubles.

In July, 1917, it was reported that coke and other supplies were being sent to works for resumption of smelting.

STATE OF PUEBLO

AJUICHTLAN MINING & MILLING CO.

MEXICO

Address: Monterey, Mexico. Mines located in district of Toliman, State of Queretero, Mexico, about 25 miles northeast of Bernal station on the National railway, are reached by coach over good roads from Tequisquiapam.

Ore: is gold-silver, occurring in veins in shale. Vein has well defined walls, an average width of 9 metres, and dips east 50°. Average assay of ore from upper level is \$8 per ton, with \$4 to \$6 ore on the level 50 metres below. Ore is blocked out for 50 metres above upper level, company claiming to have 250,000 tons of \$7 to \$12 ore blocked out in the workings. There is a 65-ton mill on the property, water being obtained from a shaft in the arroyo. Output not reported. Mail returned in 1917.

PUEBLA SMELTING & REFINING CO.

MEXICO

Office: 35 Nassau St., New York. **Mexican office:** Isabella Catalica No. 33, Mexico City, Mex. **Mine office:** Cuyuaco, Pueblo, Mex.

Officers: Harvey C. Garber, v.p.; H. H. Nieman, sec.; B. P. Thom. treas.; preceding, with P. W. Lupher, Wm. B. Reed, Jr., and I. W. Lofand, directors.

Inc. Oct., 1912, in Delaware. Cap., \$5,000,000; shares \$5 par; non-assessable. Debentures, \$1,000,000 at 6%. Guaranty Trust Co., New York registrars. Owns a 72% stock interest in the Cia. Minera Explotadora El Magistral y Anexas, and also sundry lands acquired from the Bankers Mining & Development Co., for \$4,250,000 in stock and bonds of the Puebla Smelting & Refining Co.

Property: 28 claims, 1,600 acres mineral lands, 120 acres timber lands, 800 acres coal lands, a 25-acre smelter site and 100 acres miscellaneous lands in the Magistral district.

Ore: property shows limestone porphyry and diorite, orebodies occurring as contact deposits between limestone and diorite, and as replacements in the limestone. Ores carry oxides and carbonates of copper with small quantities of silver bromides, sulphides and free gold in the oxidized

zone. The deeper workings show chalcopyrite associated with hematite having garnetiferous quartz gangue in the sulphide zone.

Development: by numerous tunnels of from 200 to 750' with about 6,700' of workings, showing ore said to average 3.5% copper, 70 grams silver and 1.5 grams gold per ton.

Equipment: company claims to have a power plant consisting of two 400 h. p. Babcock & Wilcox water-tube boilers, a 300 h. p. Allis-Corliss engine, a 200-h.p. Hughes-Philips Corliss engine, and a 225-k.w. Westinghouse generator.

Due to the revolution the property has not been operating since 1913.

STATE OF SAN LUIS POTOSI

MEXICAN LEAD CO.

See Mexicana, Cia. Met.

MEXICANA; COMPANIA METALURGICA.

MEXICO

Offices: 82 Beaver St., New York, and No. 26, Ave. 16th de Septiembre, Mexico City, D. F.

Officers: D. C. Brown, 1st v.-p.; C. J. Peabody, 2nd v.-p.; R. E. Safford, sec., asst. treas., preceding with H. H. Dean, G. F. Peabody and R. H. McCarter, directors.

Inc. 1890, in New Jersey. **Cap.,** \$4,000,000; shares \$100 par; fully issued; in \$1,000,000 cumulative 8% preferred stock, \$1,250,000 guaranteed 6% second preferred stock, and \$1,750,000 common stock.

Bonded debt \$2,774,700 first gold 5s. dated July 1, 1901, due July 1, 1981; interest A. and 0.1, at company's New York office. Coupon (principal may be registered) \$1,000, and registered in multiples of \$100. Guaranty Trust Co., New York, trustee. Authorized \$3,000,000, of which \$732,700 held alive in sinking fund. Subject to call at 110 and interest. Sinking fund, 2% per annum of amount outstanding; bonds so purchased being kept alive and the interest thereon added to the fund. Interest paid without deduction for normal income-tax.

Guaranty Trust Co., New York, registrar. No dividends to date.

Property: interests are extensive, including control of numerous subsidiary mining, transportation and land companies, among the more important being the **Sombrerete Mining Co.**, and the **Mexican Lead Co.**, at Sombrerete, Zacatecas, Tex., the **Montezuma Lead Co.**, **Alvarez Lead & Timber Co.**, **Mexican Mineral Railway Co.**, and **Potosi & Rio Verde Railway Co.**

The **Veta Rica** mine owned outright at Sierra Mojada, is an important silver-lead producer. Development is by a 600' shaft.

Other important producers are the silver-copper mines at **Concepcion del Oro**, State of Zacatecas. The **San Pedro** and **San Pablo** mines at Monterey are also important producers of lead and the mines of the San Pedro district at San Luis Potosi are heavy producers of silver, gold and lead ores, constituting the main supply of ore for the company's custom smelter, at San Luis Potosi.

The **smelter**, treating about 1,000 tons daily, has a modern equipment, including 12 furnaces for the reduction of gold, silver and lead ores, and a special copper department of 100 tons daily capacity. The works have steam and electric power, and employ about 1,000 men. In addition, there has lately been completed the Carmen 250-ton cyanide plant for cyanidation of lower grade ores from the San Pedro mines.

The company is a large producer of lead and silver, with outputs of

copper and gold, secured mainly as by-products, and is active and enterprising in the rejuvenation of old properties and the development of new mines.

NATIONAL METALLURGICAL CO.

MEXICO

(A subsidiary of the American Smelting & Refining Co.)

Office: 120 Broadway, New York. Smelter at Matehuala, San Luis Potosi, Mex.

Inc. Aug., 1901, in Colorado. Cap., \$1,000,000; shares \$25 par. Bonds have been retired. Annual meeting, last Tuesday in July.

The principal mines of the Matehuala district, San Luis Potosi, Mexico, are connected with the smelter by a 7-mile narrow-gauge railway.

The smelter, connected by a spur, with the Mexican Central railway, receiving ore by rail and burros, has 3 blast furnaces with a 30-ton reverberatory furnace used for flue dust. Product is matte, averaging 45% copper, 50 to 200 oz. silver and 1 oz. gold per ton, shipped to the Aguascalientes smelter for conversion.

SAN LUIS POTOSI SMELTER.

MEXICO

See Mexicana; Compañía Metalurgica.

SANTA MARIA DE LA PAZ; NEGOC. MIN.

MEXICO

Office: 10 Cinco de Mayo, San Luis Potosi, Mex. Mine office: Matehuala, Catorce, San Luis Potosi, Mex. Pedro Barrenechea, pres.; Edgardo Mead, sec.; W. B. A. Dingwall, gen. mgr. at last accounts.

Inc. in Mexico. Cap., 240,000 pesos; shares 25 pesos par. From 1885 to 1904 inclusive, the mines yielded 11,327,210 pesos worth of ore, and the company paid 5,778,270 pesos dividends therefrom.

The mines, which are extensively developed, carry gold and silver-bearing copper and lead ores, with values mainly in silver and lead, the gold and copper being by products. The ores are mined to depth of 1,500'.

Equipment: includes steam and electric power. The reduction plant includes a 300-ton concentrator with Blake crushers and Chilean mills, and a smelter with two 40-ton furnaces. Company employed about 1,500 men, but closed down 1913, on account of revolution.

TIRO GENERAL DE CHARCAS MINE

MEXICO

Mine address: Charcas, San Luis Potosi, Mex. Owned by Cia. Metalurgica Nacional de Matehuala, controlled by the American Smelting & Refining Co. Mine was formerly owned by the Cia. Minera del Tiro General, S. A.

Property: 72 pertenencias, 178 acres, with 46-acre mill site, and 50-acre farm, in the Venado district. The mine, an antigua, discovered 1583, was worked on a small scale for 3 centuries, and in a larger way since 1859. It shows 2 main ore zones, carrying fissure veins in porphyry, near a limestone contact, with a generally E.-W. strike and dip of about 70°. The N. vein of 3 to 8 meters width, with known length of 500 meters, is opened to depth of 1,961', showing chalcopyrite and sphalerite estimated by the management to average 2% zinc, 480 grams silver and 8 grams gold per metric ton. There are 9 tunnels, 4 reported by the management to be of 656' each, and 5 of 1,312' each, the mine having 13,123' of workings. The mine and works, when operating normally, employ about 1,200 men.

Equipment: includes a 700-h. p. steam plant, with hoists of 100-h. p. and 175 h. p. and a 10-drill air compressor, and some use is made of malacates on the shallower shafts. Buildings include an engine house, combination smith and carpenter shop, machine shop, general store, office, laboratory, warehouse, a hospital, 5 dwellings for officials, and accommodation for 40 Mexican families. There is a 10-stamp mill and a 150-ton concentrator, having Blake crushers and 5 sets of rolls, with trommels and other necessary equipment. The mill has 10 Sutton, Steele & Steele pneumatic dry concentrators, treated

sulphide ores and giving a preliminary lead concentrate, cut out from the final zinc concentrate, the latter being a 45% zinc product, secured largely from rosin jack.

See American Smelting & Refining Co. and Matehuala, Cia. Met. Naç. de.

TIRO GENERAL; CIA. MINERA DEL, MEXICO

Sold property to the Cia. Metalurgica Nacional de Matehuala, San Luis Potosi, Mex., which is controlled by the American Smelting & Refining Co.

STATE OF SINALOA

CHOIX CONSOLIDATED MINING CO., LTD. MEXICO

Office: 516 Grant Bldg., Los Angeles, Cal. Mine office: Choix, Sinaloa, Mex.

Officers: R. A. Thomas, pres.; A. E. Pomeroy, 1st v. p.; C. J. Heyler, 2nd v. p.; J. R. Thomas, sec.; A. M. McDermott, supt; preceding with E. R. Jeffrey, A. J. McDermott, W. W. Thomas and A. Gleason, directors.

Inc. May, 1902, in Arizona. Cap., \$5,000,000; shares \$1 par, nonassessable; issued, \$3,155,534. Is protocolized under laws of Mexico. Owns 45% of the stock issue of Los Platanos Development Co. Annual meeting, first Monday in October.

Property: 269 hectares, some distance from a railway, on both sides of the Rio Fuerte, in El Fuerte district of Sinaloa and Urique district of Chihuahua. Orebodies are claimed to be large, occurring as contact deposits between diorite and limestone and porphyry and limestone, with fissure veins in granite and quartzite carrying gold and silver. Property includes several antiguas.

Shipments of 1,062 tons of ore, to the Aguascalientes smelter, gave returns of 19.5 to 28% copper, with gross values of \$127,915.44 and net values of \$47,940.61.

A 100-ton smelting plant, purchased 1911, has been received, but not installed, owing to revolutionary disturbances in Mexico. Company awaiting peaceful conditions before resuming operations.

EL MAGISTRAL COPPER CO. MEXICO

Mine office: Choix Fuerte, Sinaloa, Mex.

Officers: H. L. McNair, pres.; Hon. C. F. Wright, v. p.; A. G. Nash, sec.-treas.; preceding, with Hon. W. S. Lieb, Thos. H. Carvin, H. R. Woodward, John J. Dowdle, John P. Fiebig, John G. Whitmore and Hon. G. E. Green, directors at last accounts.

Inc. June 15, 1906, in Maine. Cap., \$1,000,000; shares \$10 par. Owns the entire capital stock of San Lucas Copper Co. No returns secured. Probably closed down owing to revolution.

LOS PLATANOS MINING CO. MEXICO

Mine office: Choix, Fuerte, Sinaloa, Mex.

Officers: A. M. McDermott, pres. and gen. mgr.; C. F. Iredell, v. p.; J. L. Davidson, sec., with R. E. Small and W. W. Thomas, directors. E. B. Hosford, mine supt.

Inc. Dec., 1909, in Arizona. Cap., \$1,200,000; shares \$10 par, nonassessable; issued, \$280,000. Operates through Cia. Exploradora de Los Platanos, S. A., inc. in Mexico. Merchants' Trust Co., Los Angeles, transfer agt. Annual meeting, first Monday in October.

Property: 96 acres, bought of Choix Cons. Mining Co., Ltd., 3 miles from Choix, and 40 miles from Fuerte, the nearest rail point. The eastern extension of the Kansas City, Mexico & Orient railway is planned to pass within 10 miles of mine.

Property shows diorite, cut by dikes of andesite, crossed by shear zones, of 30 to 100' estimated width with length of 2,500'. These zones carry ore shoots connected with a system of cross-fractures. The upper portion of one vein shows flakes of native copper, near surface, succeeded by a leached zone. The other vein is entirely leached near surface, except for occasional copper stains, and small bunches of ore. Ore is estimated by management to average 7% copper, 1.5 to 2 oz. silver and 60c to \$1.50 gold per ton.

Development: includes 1,500' of workings, estimated by the management to show 12,000 tons of ore. Records of 1,093 tons of ore shipped show average returns of 21.8% copper and 5.5 oz. silver per metric ton. The discard from these shipments, about 7,500 tons, is estimated to average 4% copper and 1.5 oz. silver per ton.

Equipment: includes a hoist, and several buildings. Idle several years owing to unsettled conditions in Mexico.

SAN LUCAS COPPER CO.

MEXICO

See El Magistral Copper Co.

SINALOA SMELTING & REFINING CO., S. A.

MEXICO

Subsidiary of the Pacific Smelting & Mining Co.

TAJO; MINAS DEL.

MEXICO

Mine at Rosario, Sinaloa, Mex. Owned by the Bradbury Estate, Bradbury Bldg., Los Angeles, Cal. Is one of the great gold-silver mines of Mexico, showing a big fissure vein in andesite, developed to 1,000' in depth. Working \$8 ore from old fills and pillars, above 600' level, 1916. Has a very complete equipment with 1,000-k. w. gas producer-electric plant.

The mill was handling about 250 tons per day, 1916. In June, 1917, milling was restricted by shortage of cyanide.

WEST COAST MINING & SMELTING CO.

MEXICO

Idle. **Office:** 30 Church St., New York. Mocerito, Sinaloa, Mex. Howard L. Haines, pres.; Chas. M. Hicks, sec.

Inc. 1906, in Maine. Cap., \$2,500,000; shares \$1 par; nonassessable; in \$500,000 of 7% cumulative preferred stock and \$2,000,000 of common stock.

Property: 6 groups, 387 acres, 5 to 20 miles from Mocerito, and 12 to 40 miles from Carbo. Principal property is Los Tajos group, 357 acres, showing andesite, cut by narrow fissure veins of 4' average width that are said to carry chalcoprite ore. The River mine, has a 150' shaft, on a vein of 5 to 8' reported width, carrying ore said to average about 5% copper and \$3 per ton in gold and silver.

Equipment: a 70 h. p. steam plant, a small compressor and 6 drills. The 30-ton experimental concentrator has a Blake crusher, 2 rolls, 2 Bartlett tables and 3 screens. The smelter, at the mine, has a 50-ton water-jacket blast furnace.

STATE OF SONORA

ABUNDANCIA MINING CO., S. A.

MEXICO

Address: Puerticitos, via Cananea, Sonora.

Inc. May, 1912, in Mexico, by O. L. Neer of Douglas, Ariz.; Apollo Fuller, of Boston, and W. C. Webster, Los Angeles.

Property: lease and bond on the Abundancia claim, 30 hectares, 5 miles west of Cananea on west slope of mountain. Formerly held by West Cananea Mining Co. and later bonded by Copper Queen Consolidated Mining Co., relinquished 1909. Was shipping from 150 to 200 tons monthly of 9% ore from open cuts and tunnels at last accounts.

AMERICAN-MEXICAN SMELTING & REFINING CO.

MEXICO

Is a subsidiary company of the Pacific Smelting Co. T. C. Kirkland.

mgr., Fundicion, Sonora Mex. Idle owing to revolutionary conditions during most of 1914-16.

ANITA COPPER MINES CO., S. A.**MEXICO**

Office: Fundicion, Sonora, Mex. Geo. M. Ryall, pres.; T. C. Kirkland, asst. gen. mgr.

Inc. 1904 in Mexico, and now controlled by Pacific Smelting & Mining Co. Sub. Pacific Sm. & Mng. Co.

ARNOLD MINING CO.**MEXICO**

Mine office: Santa Cruz, Sonora, Mex. E. D. Arnold, pres.; A. O. Koppes, mgr.

Property: the Del Pilar mine, about 35 miles N. W. of Cananea, developed by a 400' shaft, showing ore said to carry 10% copper. Employs about 25 men. Property was reported sold to the Manhattan Development Co., for \$88,000, May, 1913. No recent information obtainable.

BONANZA MINING CO.**MEXICO**

Office: Cananea, Sonora, Mexico.

Officers: Geo. Kingdon, pres.; C. T. Knapp, v. p.; Geo. Young, sec-treas.; Casey Stites, asst. sec.; preceding officers and M. J. Elsing, directors. Is the operating Mexican corporation of the Superior Bonanza Mining Co., which see.

Inc. June 7, 1904, in Mexico. Cap., authorized and issued, 10,000 pesos; par value of shares \$1 (Mexican). Holds title to the mineral properties of that company, located near Imuris, Sonora, Mex., consisting of 198 pertenencias, or approximately 491 acres. Controlled through stock ownership by Greene Cananea Copper Co. Purchase was made in 1911, but the mine has not been worked since that time. Contains a silicious ore, low in copper content, but with notable quantities of gold. Was purchased to provide a reserve of flux for the iron in the Cananea ores.

BOSTON SONORA MINES CO.**MEXICO**

Inc. about Dec., 1911, in Arizona, by Thomas Patterson, Wm. A. Clark, H. C. Wilderson, James V. Howard and Royal B. Young, all of Massachusetts. Cap., \$1,000,000; shares \$5 par.

Property: at Cananea, Mexico, includes several claims near the Calumet-Sonora (Carnegie Lead & Zinc Co.) ground, crossed by several replacement veins showing bunches of good ore in the shallow pits and prospect shafts thus far put down. Is a prospect only.

BUFA MINING, MILLING & SMELTING CO.**MEXICO**

Idle. Office: 1030 I. N. Van Nuys Bldg., Los Angeles, Cal. Mine at La Bufa, Sahuaripa, Sonora, Mex. Wm. E. Richardson, pres. and gen. mgr.; H. A. Sibbet, v. p.; Baron W. Riley, sec.; Frank R. Richardson, treas.

Inc. 1902, in Arizona. Cap., \$1,500,000; shares \$1 par. Has paid 5 dividends, last being \$60,000, July, 1905.

Property: 123 acres, a 10-acre mill site, and 5,000 acres ranch lands, showing 6 fissure veins, of which 2 under development average 4' width, opened by a 600' incline.

Ore: said to give average assays of 10% copper, 10% lead, 4% zinc, 150 oz. silver and \$2.50 gold per ton, from argentiferous tetrahedrite and copper sulphides.

Development: shafts of 300' and 600', and a 225' tunnel, with 8,000' of workings and about 20,000 tons of high-grade ore said to be blocked out, with a considerable amount of low-grade ore on the dump, for eventual treatment.

Equipment: includes a 120 h. p. plant at the mine, with 2 hoists, 2

Rand air compressors and 7 power drills. Mine buildings include several small shops, a store, sawmill and about 20 dwellings.

The 35-ton concentrator has a small sampling mill attached. There also is a 20-ton leaching plant.

The smelter, at the mine, receives ore by gravity tram. Equipment includes 10-ton and 25-ton reverberatory furnaces, built of silica brick, made on the ground. Fuel is inferior wood, cut on the premises. Product is a matte carrying 50% copper, 600 to 800 oz. silver and 1.5 oz. gold per ton, shipped, by burro, to Aguascalientes, via Guaymas, for refining, some rich ore being shipped also. Production, 1906, was about 750,000 lbs. fine copper. Management said to be waiting for peace to resume operations.

CADENA DE COBRE MINING CO.

MEXICO

Address: care C. A. McDonald, sec., Bisbee, Ariz. **Mine office:** Sahuaripa, Sonora, Mex.

Officers: Emil Marks, pres.; C. H. Holz, v. p.; M. Newman, treas.; R. F. Koehler, J. Pennypacker and John Treu, directors; Arthur Houle, cons. engr.

Inc. Jan. 5, 1905. **Cap.**, \$1,000,000; shares \$1 par. The former directors issued to themselves 550,000 shares of stock, and when this was learned the old board resigned and suit was brought, resulting in the cancellation of the stock so issued, it having been a grab, pure and simple.

Property: 84 hectares, in Los Chinos mountains, on the Yaqui river, shows iron outcrops up to 300' in width.

Development: by the 96' Bisbee tunnel, showing ore assaying 4 to 25% copper, with small gold and silver values, and 2 shorter tunnels. Idle on account of revolutionary disturbances in Mexico. Property was fully reported on by Arthur Houle, E. M.

CALUMET-SONORA MINING & MILLING CO.

MEXICO

Bonds foreclosed, Feb. 13, 1915, and property sold to R. P. Burgan for \$82,000. New company organized as Carnegie Lead & Zinc Co., which see.

CANANEA CONSOLIDATED COPPER CO.

MEXICO

Owned by Greene Cons. Copper Co., which is controlled by the Greene-Cananea Copper Co., which see.

CANARIO COPPER CO.

MEXICO

Address: Hon. J. B. Wright, Tucson, Ariz.

Officers: J. P. Harvey, pres.; F. O. Schellenberg, v. p.; Hon. J. B. Wright, sec.; E. J. Chapman, treas., and William McDermott, directors.

Inc. in Arizona. **Cap.**, \$2,000,000; shares \$1 par; 600,000 issued. Registrar & Transfer Co., New York, transfer agent; Commercial Trust Co. New Jersey, registrar. Company owns all the capital of El Canario Copper Co., of Mexico, which see.

CARACAHUI MOUNTAIN COPPER CO., LTD.

MEXICO

Office: 3222 Jefferson St., Kansas City, Mo. **Mine** near Llano, Magdalena, Sonora, Mex.

Officers: M. H. Greene, pres. and gen. mgr.; Chas. M. Howell, v. p.; H. J. Sprink, sec.-treas.; preceding officers, T. McClure, J. C. Brewer, Thos. James and Wm. R. Berryhill, directors.

Inc. May 20, 1907, in Arizona. **Cap.**, \$1,500,000; shares \$1 par, non-assessable; issued \$964,000. Annual meeting, first Tuesday in June.

Lands: 2 groups, 50 hectares, 9 miles S. E. of Llano, said to show 20 paralld veins in granite, 8 in a cross section of about 250', reported as 4 to 60' in width, and traceable 1 mile, carrying cuprite, malachite and chalcocite. Ore said to average 10 to 40% copper, 4 to 40 oz. silver and \$2 to \$10 gold per ton.

Development: by shafts of 50' and 410', and a 195' crosscut tunnel.

Equipment: includes a 40 h. p. boiler and 8x10" hoist good for 1,000' depth, with smithy, superintendent's house and 6 dwellings for workmen. Idle since 1910, but company has no bonded indebtedness, pays all taxes and expects to resume work as soon as peace is restored in Mexico.

CARMAN CONSOLIDATED COPPER CO.

MEXICO

Mine near Arizpe, Sonora, Mex. Joseph Backus, of Virginia, Minn., pres., reported to have taken over the property for an indebtedness of \$50,000 in 1916 and to be planning organization of new company.

Inc. 1906. Cap., \$500,000, increased to \$750,000; shares \$2.50 par. Held title to lands through Compania de Oro y Plata, S. A., inc. in Mexico.

Lands: 351 pertenencias, 877 acres, in 9 groups, in the vicinity of the Pedrazzini and Chispas mines, show several strong veins, with 1,911' of workings. The Carman and Don Placido groups have dumps carrying about 1,100 tons of ore, claimed to average 4.65% copper, 62.2 oz. silver and 0.21 oz. gold per ton. The Blanca Rosa group gives ore assaying up to 16.8% copper, 77 oz. silver and 0.42 oz. gold per ton. The Maria group has given ore assaying 3% copper, 107 oz. silver and 1.32 oz. gold per ton. Los Toros group has given ore assaying 4.2% copper, 29% lead, 38 oz. silver and 0.03 oz. gold per ton. Shipments to El Paso smelter have given returns ranging from \$82.98 to \$4,575.79 per ton.

CARNEGIE LEAD & ZINC CO.

MEXICO

Offices: Mills Bldg., El Paso, Tex., and Palladio Bldg., Duluth, Minn. **Mine office:** J. H. Sanford, Jr., mgr., Aptdo. 265, La Mesa, Cananea, Son., Mex.

Officers: R. P. Burgan, pres.-gen. mgr., 716 Oliver Bldg., Pittsburg, Pa.; Jesse Norton, v. p.; C. A. Williams, sec.; W. W. Wells, treas., with D. T. Helm, J. F. Edmonds, J. H. Sanford, Jr., and C. W. Stilson, directors.

Inc. 1915, in Arizona. Cap., \$500,000; shares \$5 par; 64,749 shares outstanding. Transfer office: 510 Sellwood Bldg., Duluth, Minn. Annual meeting June 12. Company is a reorganization of the Calumet-Sonora Mining & Milling Co., described in Vol. XI, which defaulted on payment of interest on the bond issue. Bonds were foreclosed Feb. 13, 1915, and on Feb. 27 the property was sold for \$82,000, to R. P. Burgan, who immediately organized the present company. Shareholders in the Calumet-Sonora Co. were allowed to subscribe for stock in the new company for from 10 to 15% of their holdings in the Calumet-Sonora Company.

Debentures: \$100,000 authorized; \$33,800 issued July, 1917; balance offered stockholders Nov., 1917, in 25% payments, 8 months apart.

Financial statement of March 31, 1916, gave current assets as \$717,070 with \$77,570 assets in excess of liabilities. Statement of receipts gave total of \$125,321, of which \$89,756 was from treasury stock; disbursements amounted to \$116,214 leaving \$9,107 on hand, included were: \$59,500 Carnegie Nat'l Bank; \$12,364, Cananea Cons. Copper Co.; bonds \$17,800 and legal expense \$2,000. Receipts from concentrates April 1 to June 1, 1916, were \$78,364.

Property: 8 claims, Catalina, Chivera, Morena, Norton, Diamonte, Sultana, Topo Chico, and Zenith, comprising 255.3 hectares or 631 acres, about 2½ miles N. W. of Cananea, shows fissure veins cutting both diabase and the more recent volcanic tuffs which form the foothills and table lands of the Cananea mountains. Many of these veins show as mere discolorations, or bleaching of the rock, but in places widen into broad masses of leached, silicified ledge matter, resembling the outcrop of the Duluth Cananea. Three veins have been opened by underground workings.

The Chivera mine has thus far been the chief producer of the company.

It has an inclined shaft, 625' deep, with levels at 60', 200', 300', 400', 525' and 625'; developing a well-defined fissure vein in indurated volcanic breccia, or tuff, of varying width that opens out into an orebody 300' long and 150' wide, composed of large and small angular blocks of country rock cemented by argentiferous galena, chalcopyrite and sphalerite, with less abundant tetrahedrite, mixed with quartz. The orebody is in places a glittering mass of galena, but as a whole is a complex mixture of lead, copper and zinc sulphides, the mill feed carrying 4.7% lead, 0.4 to 0.8% copper and 9% zinc. The ore minerals disseminated through the mass of breccia above the 525' level, appear to be concentrating in a narrower ore shoot, 300' long and 50 to 60' wide on this level.

Development: enlarging shaft to 3 compartments from 400' to surface. Loading pockets are planned to facilitate the loading of the ore. Churn drilling is contemplated. Development work reported from Jan. 1 to April 1, 1916, as 620'.

Equipment: includes an electric hoist, a 1,435 cu. ft. electric driven Rand compressor, General Electric motors for all machinery, a 36x24" Farrel crusher, a new set of Allis-Chalmers rolls, 3 Deister slime tables and ample storage bins. Machinery is run by electric current supplied by the Cananea Cons. Copper Co. at 2½ c. per k. w. hour.

Ore is hauled over a surface tram to the concentrating mill. Latter is an old mill, brought from Missouri and altered for local conditions, but a makeshift at best. In this mill the silver-lead ore is taken out and the middling containing zinc and copper are sent to the dry, or electrostatic mill. Tailings average 0.21% lead, 0.12% copper and 0.77% zinc. The dry mill contains Huff electrostatic separators, which separate the copper from the zinc. Concentration is 8.5 into 1, being 87.9% of the lead, 74.8% of the zinc and 70% of the copper in the ore; the lead concentrates carry 33 oz. silver per ton, averaging 70% lead. Shipments of concentrates on hand or in transit up to June 13, 1916, was reported as a total of 1,659.44 tons; lead 592.14 tons; zinc 747.21 tons; copper 320.08 tons.

In addition to the workings mentioned, there is the No. 2 Catalina shaft, now idle and dismantled, 225' feet deep, vertical, with levels at 70', 110', 145' and 212', exposing an oreshoot 2½ to 6' wide and as much as 60' long, but cut by cross faults and not continuously minable. The ore shoot has been practically mined out to the 145' level, yielding about 1,800 tons of antimonial copper-lead ore carrying zinc. This ore is higher in value than that now milled. The vein expands west of the mine into a large outcrop which is the most promising surface exposure seen on the company's property and warrants deep exploration.

The company has a large acreage, at least 2 very promising surface outcrops and a dozen or more fissure veins and should, with proper development, become a large producer of low-grade complex ores. The treatment problem has been solved; total mining and milling costs reduced to \$4.50 per ton and the property splendidly equipped for work. Company plans putting a raise through from the 625' level to surface for ventilation; also sinking to the 700' level.

Plans are drawn for a new concentrating plant and company plans to go ahead with the building of this mill and also a railroad spur to connect the mill and mine. The company will spend \$400,000 on its new improvements. The mill will have a capacity of 500 tons daily and should raise the recovery above 80%, the present recovery. Plans include jigs, tables and oil flotation for slimes and tailings.

Ore reserves estimated October, 1917: broken ore 75,000 tons; ore developed 405,000 tons, with large bodies of probable ore not included in above.

CHICAGO EXPLORATION & DEVELOPMENT CO. MEXICO

Address: Mina Mexico, Sonora, Mex. W. E. Pomeroy, mgr.; Geo. Squire, smelter supt.; Chas. Gercken, mine supt.

Property: 45 miles N. E. of Tonichi, the end of a branch line of the S. P. de M. R. R., produces silver-copper ore and concentrates.

CIENEGUITA CONSOLIDATED MINES MEXICO

Office: 25 Broad St., New York. Is a reorganization of the Cieneguita Copper and Cieneguita Securities companies.

Officers: James F. Whitney, pres., August Gauch, v. p.; R. C. Davenport, sec.; preceding, with Theodore Martin, Geo. D. Christy, C. Trumbull and F. W. Hunt, directors.

Property: 1,100 hectares, about 40 miles S. W. of Sahuaripa, Sonora, is covered by rhyolitic rocks, mostly fragmental and cut by a diabase dike. The Chipiona and the Cargona groups lie close together and the Ostimuri-Tayapa group about 2 miles to the S. E. The rocks are cut by vertical veins, 1 reported to be from 3' to 50' wide, traceable 3 miles and to carry ore shoots averaging about 2¼% copper and 40 oz. in silver.

Development: mainly by tunnels, one of 1,200' with 2 shallow shafts and a total of about 3 miles of workings. These workings are not sufficient to block out any large amount of ore, but show that the property has merit and may develop into a large mine.

Equipment: includes 100-h. p. steam plant, a 6-drill compressor and all necessary mine buildings and houses for employes.

A small smelter has Blake crushers and rolls, a 75-ton calcining furnace and two 50-ton reverberatory furnaces, burning wood. Smelting plant inadequate and poorly adapted for the ore. Idle, pending restoration of peace in Mexico.

CONSOLIDATED SONORA MINES CO. MEXICO

C. P. Shaver, sec., care Bank of Thibodaux, Thibodaux, La. Operating office: Douglas, Ariz. Mine near Fronteras, Sonora, Mex. Jas. Beary, pres.; Chas. P. Shaver, sec.-treas.; Chas. McHenry, supt.

Cap., \$3,500,000; shares \$1 par. Is a close corporation.

Property: 1,140 hectares, slightly timbered, on both sides of the Fronteras river, about 25 miles S. E. of Douglas, shows numerous outcrops of ore carrying lead, silver and gold.

Development: on the Mary L. claim includes a crosscut tunnel, intersecting a vein at 425' and a 325' shaft sunk at this point on the vein, is all in ore with 125' of drifting on the 50' level and a 430' drift on the 300' level. Shipments to the Douglas smelter, though profitable, did not pay mining and development costs and mine was closed down, Jan., 1913, on account of repeated depredations at the property and danger to the men from the revolutionary disturbances. Still idle, Dec., 1917.

CONSUELO MINING, MILLING & POWER CO. MEXICO

Subsidiary of the Mines Co. of America, which see.

COPETE CONSOLIDATED COPPER CO. MEXICO

Office: 15 William St., New York. Mine office: Francis C. Nicholas, mgr., Box 394, Nogales, Ariz.

Officers: Wm. T. Read, pres.; F. C. Hanford, v. p.; Myra B. Martin, sec.-treas.; preceding, with Ralph Melczer and John C. Morrow, directors.

Inc. March, 1906, in West Virginia. Cap., \$1,000,000; shares \$1 par, non-assessable; issued 549,170½ shares. Annual meeting, first Wednesday in March.

The company was organized to develop the property formerly owned by the Copete Mining Co., under an agreement with that company, title to the property being vested in the Melczer Mining Co., legalized in Mexico, and the entire stock issue of which is held by the Copete Consolidated Copper Co.

Property: 120 pertenencias, comprising the Last Chance, Copetito, Jalisco, Santiago, and El Copete claims, about 173 acres, at El Copete, Sonora, shows an immense gossan capping, apparently the remnant of a great blanket vein, the greater part of which has been eroded away.

Development: by several tunnels and a 615' shaft with about 7,000' of workings. Ores are mainly gold with considerable iron pyrites and some copper, giving average assay values of \$6 per ton. The bottom of the ore zone seems to have been reached at about 300'. Idle, owing to revolutionary disturbances.

It is believed that those in control of the company will use every effort to bring the enterprise to a successful issue and the past may be considered a closed chapter. Those interested in the history of the company will find it given in Vols. X and XI, The Copper Handbook.

COPETE MINING CO.**MEXICO**

Office: 15 William St., New York. Myra B. Martin, sec.

Inc. 1900, in West Virginia. **Cap.**, \$5,000,000; shares \$5 par. Owned stock of the Melzer Mining Co., transferred, 1906, to Copete Consolidated Copper Co., which see.

CRESTON COLORADO CO.**MEXICO**

Subsidiary of the Mines Co. of America, which see.

CUBAÑA CONSOLIDATED COPPER CO.**MEXICO**

Idle. Mine near Arizpe, Sonora, Mex.

Inc. Jan. 6, 1903, in Arizona. **Cap.**, \$500,000; shares \$1 par.

Lands: 244 hectares, bought for \$20,000; show 6 orebodies, of 4' to 20' width, of which 3, carry estimated values of 12% copper, 10 oz. silver and \$2 gold per ton.

Development: 6 shafts, deepest 102', and a number of tunnels, longest 250' and 575', with a total of 1,415' of underground openings. Mine is about 30 miles from Cananea. Sample carload smelter shipments returned 23% copper, with fair gold and silver values. Property considered promising.

DEMOCRATA CANANEA SONORA COPPER CO.**MEXICO**

Office: Fourth National Bank Bldg., Cincinnati, Ohio. Mine at Cananea, Sonora, Mex.

Officers: H. H. Hoffman, pres.; C. E. Hoffman, v. p. and gen. mgr.; Herbert H. Hoffman, treas.; H. W. Santen, sec.; preceding, with R. C. Swing, directors.

Inc. May 8, 1905, in Arizona. **Cap.**, \$3,000,000; shares \$10 par; issued \$2,869,970. Central Trust Co., registrar. Annual meeting, last Tuesday in May.

Property: 18 hectares, 44.5 acres, lying between the Capote and Veta Grande, in the heart of the Greene Cananea mines. Orebody is of contact metamorphic origin, consisting of a breccia of fragments of altered limestone, cemented by quartz, bornite and copper pyrite, in a fracture zone 50' wide in limestone. The orebody lies about 300' north of the Democrata shaft and also outcrops in 2 patches of garnet rock surrounded by diorite porphyry, good carbonates being mined at the surface.

Development: comprises a 600' shaft and 1,600' tunnel, with 2 other shafts of 90' and 180', together with 3 tunnels of 300', 110' and 60', aggregating 5 miles of underground workings. On the 500' level, the known orebody proved to be larger than previously estimated and the stopes yielded 3% ore. The East orebody near the Kirk mine, developed by tunnel workings, has also materially increased the proven ore reserves. Average assays at present are 3½% copper and 1.5 oz. silver per ton.

Equipment: includes electrically-operated hoist and air compressor, power being obtained from the Cananea Consolidated Copper Co. Smelter contains 3 blast furnaces of 250 and 300 tons daily capacity, making 36% matte. A converter and electric power plant being installed, July, 1917.

Property was closed down Sept. 1, 1907, to Sept., 1912, since which time the mine operations have been intermittent due to the Mexican revolution. Work was resumed in 1915. When in full operation company employs 500 men.

Production: in 1916, 8,950,600 lbs. copper; 306,000 oz. silver; 1,265 oz. gold. Property is a valuable one.

DOLORES MINING & DEVELOPMENT CO.**MEXICO**

Address: care J. E. Dawson, pres., Oakland, Cal.; J. F. Torney, sec.

Inc. Jan., 1910, to take control of the Empire Mining Co., S. A., a company protocolized in Mexico, which owns the Major Domo claim, 5 miles from Cananea, Sonora, Mexico, and 7 other properties, including the Golden Cross silver mine, Magdalena district, Sonora, Mex. See Empire Mining Co.

DULUTH-MOCTEZUMA MINING CO.**MEXICO**

Office: Room 610, Lonsdale Bldg., Duluth, Minn.

Officers: Geo. H. Crosby, pres.; Cassius Bagley, v. p.; A. O. Rabideau, sec.; all of Duluth.

Inc. 1909, in Minnesota. Cap., \$500,000; shares \$10 par; \$300,000 issued.

Has no holdings of any kind. Mexican holdings forfeited on account of excessive taxes. Minnesota iron lease sold for enough to clear up indebtedness on same.

DULUTH-SONORA COPPER CO.**MEXICO**

Office: 809 Sellwood Bldg., Duluth, Minn. Mine near Cananea, Sonora, Mex.

Officers: B. Silberstein, v. p.; R. P. Burgan, 2nd v. p., with W. D. Underhill, sec.; Theron H. Hawkes, treas.; preceding, with Geo. M. Tallant and A. F. Norton, directors. P. C. Probert, mine and smelter supt. and purch. agt.

Property: about 3,621 acres, embracing a part of the former holdings of the Calumet & Sonora Co., and the South Cananea, or Mitchell, property. The latter shows a strong vein with wide silicious outcrop and has been developed by a 400' shaft and some underground work, but an examination of dumps fails to show ore. Norton shaft, one-fourth mile distant, now filled with water, is said to be 293' deep and to show good ore, but none is seen and outcrop is unpromising. Remainder of property considered of questionable value. Property has been examined by Verne A. Hart and Walter Harvey Weed. Idle since 1910. Is a prospect only.

EASTERN CANANEA DEVELOPMENT CO.**MEXICO**

Idle. Mine about 18 miles N. E. of Cananea, Sonora, Mex. John Martin, supt., at last accounts.

Property: said to show copper sulphide ore, developed by shaft, is held under lease and bond from M. L. Fay, of Duluth, Minn., who controls the Fay Cananea Copper Co., which owns the mine through the Cananea Eastern Mining Co., S. A., a Mexican corporation. No returns secured.

EL CANARIO COPPER CO.**MEXICO**

Owned by Canario Copper Co., which see for officers.

Address: Hon. J. B. Wright, sec., Tucson, Ariz.

Property: the El Canario mine, 15 miles E., and the Lillie and Lillie Segunda mines, 3 miles W. of Nacozari, Sonora, Mexico. The El Canario adjoins La Caridad of the Moctezuma Copper Co.

Development: El Canario ore carries copper in the form of enargite. The main vein is said to be large, made up of "disseminated, replaced and enriched porphyry." A 400' tunnel, in a vertical depth of 300', has cut 15' of sulphide ore and was expected to cut the main orebody within 50'. Shipments to Douglas were expected to be made early in 1918, and a 300-ton flotation plant has been designed.

The Lillie mine is considered to be one of the richest and most promising in the district. The vein outcrops boldly for several thousand feet and is 3 to 50' wide; it has a footwall of quartzite. Development is by 3 tunnels; No. 3 will gain a depth of 600' on dip of the vein, and was expected to enter the ore zone within 500' from portal. A winze below No. 1 tunnel opened 45-53% copper ore, with fair gold contents. Three carloads of 22% ore had been sent to Douglas to Nov. 30, 1917, but 40% ore is to be shipped. This ore is packed by burros to Nacozari at a cost of \$2.50 per ton. A compressor is to be erected.

The Lillie Segunda adjoins the Lillie on the S. and E. It is said to have a

"gigantic porphyry orebody, 1,000' wide and about 6,000' long." The company's engineer is reported to have said, "I fully believe that Lillie Segunda is one of the most extensive and highest grade disseminated porphyry coppers that has ever been discovered in North America." The deposit is being developed by shafts.

Company apparently has three promising properties, about which the management is highly optimistic.

ELENITA DEVELOPMENT CO.

MEXICO

Office: 1400 Alworth Bldg., Duluth, Minn.

Officers: Henry B. Paull, pres.; E. J. Maney, v. p.; F. R. Kennedy, sec-treas.; preceding, with Thos. F. Cole, C. d'Autremont, Jr., I. B. Joralemon, directors.

Cap., originally \$200,000, was increased, 1907, to \$400,000; shares \$10 par; paid in, \$7; issued 27,310 shares. Owns entire stock issue of the Lomita Mining Co., S. A., a Mexican corporation that holds direct title to the land.

Property: the Bonanza de Cobre mine, 1,628 acres, at Cananea, lies north of the smelter and extends to a point nearly opposite the Puertecitos mines of the Greene Cananea.

Development: by 2 shafts and 5 tunnels, mine being wet at slight depth and giving, as far as developed, mainly silver-lead and zinc ores with a little copper. Property inactive since early in 1913.

EL GLOBO MINING & MILLING CO.

MEXICO

Mine near Nacozari, Sonora, Mex.

Inc. 1905, in Arizona. Cap., \$400,000; shares \$10 par.

Property: 80 hectares, about 20 miles east of Nacozari, the nearest rail point. Mine has a shallow shaft and a 1,600' crosscut tunnel, cutting a vein with a back of about 1,000'. Ore values are mainly gold and silver.

Equipment: includes a 25-h. p. electric plant, with a 15-stamp mill having 2 Wilfley tables and a small cyanide plant.

Idle many years.

EL TRIUNFO CONSOLIDATED MINING CO.

MEXICO

Idle. Mine office: Bacoachi, Arizpe, Sonora, Mex.

Officers: A. C. Charlot, pres. and gen. mgr.; Dr. S. Newton Leo., v. p.; A. L. King, treas.; preceding, with T. B. Johnstone, Albert Reineman, Julius G. Miller, Henry Stern; Wm. H. Freystadt, I. Neuberger, A. H. Wand, D. Powdermaker, Dr. Moritz Gross, Adolph Oltmann and John H. Brown, directors; John Martin, supt.

Inc. in Arizona. Cap., \$2,000,000; shares \$1 par. Property is held through a Mexican corporation with cap. of 10,000 pesos, shares 100 pesos par, entire stock issue of which is owned by El Triunfo. Annual meeting, 1st Monday in October.

Property: 136 acres, in 12 different groups, principal property, about 4 miles from the Picacho mines, about 8 miles S. W. of Bacoachi, 2 miles from the Sonora river and about 75 miles by wagon road from Cananea. Lands carry 5 orebodies, of 2' to 5' average claimed width, said to be traceable 2 miles, and to carry azurite, malachite, bornite, chalcopyrite and chrysocolla, all silicious, and occasional native silver, with a claimed average value of 5% copper, 25 to 600 oz. silver and \$3 gold per ton.

Development: about 7,000' of workings, main shaft 400' deep, connecting with a tunnel for extraction. There are 5 shafts, 6 tunnels and various open cuts. The main vein is a fissure of 4' to 5' width, and practically vertical dip, carrying oxidized ores to shallow depth, succeeded by sulphides.

Equipment: includes a 90-h. p. steam plant at the mine, small sawmill, 50-ton reverberatory furnace and 26 buildings. Wells provide water for boilers and potable use.

A 50-ton mill has a 25-h. p. steam engine and 4 Behrend tables, with a 3-mile pipe line to the Sonora river, where there is a small pumping station.

Company paid a dividend of 1% in Aug., 1911. During 1912, company operated its smelter (reverberatory), shipping matte to El Paso, running

\$625 per ton. Closed down since 1913 on account of unsettled political conditions and insecurity of property rights during revolution.

Smelter was blown in in 1908 and shut down after a few days; again blown in in 1911. Transportation facilities are poor, nearest railroad station being at Cos, 38 miles distant by mule trail.

EL VAN COPPER CO., S. A.

MEXICO

Mine near Nacozari, Sonora, Mex. Property not operated for several years and several claims forfeited to government for non-payment of taxes.

EMPIRE MINING CO.

MEXICO

Last Address: Dolores Mining & Development Co., P. O. Box 533, Sta. L., Oakland, Cal. **Mine address:** care Ben Bound, supt., Cananea, Sonora, Mex. Company is the Mexican holding company of the Dolores Mining & Development Co.

Cap., 10,000 pesos.

Property: 95 hectares, including the Major Domo copper mine, a few miles from Cananea. A 200' shaft is reported to show a N. E.-S. W. vein, 2½' to 3' wide. Company also owns the Dolores, Empire, Bonanza, Spanish, Golden Cross and Providencia, silver-gold properties, amounting to 65 hectares, in the Magdalena district, Sonora, Mex. Planned erecting a 3-unit Pittman mill at the Golden Cross property, 1½ miles S. W. of Cananea. No recent reports received. Presumably idle.

ESMERALDA COPPER CO.

MEXICO

Has no representative at former mine office: Llano, Magdalena, Sonora, Mex. F. C. Emery, pres.; W. D. Fredericks, mgr., at last accounts.

Property: 88 hectares, has about 300' of workings, showing copper ore, with silver said to increase at depth. Presumably idle.

ESQUER y CIA; ALEXANDER

MEXICO

Idle. Mine at Baroyeca, Alamos, Sonora, Mex. J. J. Esquer, mgr., at last accounts.

Property: the Mexicana, Esperanza and other mines, developed by shafts and tunnels, carries auriferous and argentiferous copper ores.

FAY-CANANEA COPPER CO.

MEXICO

Probably dead. **Last Address:** 2105 East Superior St., Duluth, Minn. Mine near Cananea, Sonora, Mex. Described in Vol. XII.

GARRETSON-SAHUARIPA CO.

MEXICO

Idle: Mine at Calera, Sahuaripa, Sonora, Mex. W. H. Farnsworth, pres.; Laurens Enos, v. p.; W. H. H. Davenport, sec.; D. B. Sherman, treas.; John A. Moore, supt., at last accounts.

Inc. 1903, in Arizona. **Cap.,** \$600,000; shares \$100 par, non-assessable; issued, \$450,000.

Property: 96 hectares, and 14,000 acres of surface rights, about 30 miles S. E. of Sahuaripa, includes La Calera mine, having 6 orebodies, 2 under development, of 3' to 6' width, estimated by company to average 2% copper, 45 oz. silver and \$14 gold per ton, which is interesting, if true. Mine has about 1,200' of workings.

The smelter, 1 mile from the mine, receiving ore by pack trains, has a 50-ton 29"x48" Garretson pyritic water-jacket blast furnace, burning charcoal and wood, which apparently has not worked well. Idle awaiting construction of the Sonora Central railway from Tonichi, which has been surveyed to pass through this property.

GREENE CANANEA COPPER CO.

MEXICO

Office: 42 Broadway, New York.

Officers: W. D. Thornton, pres.; John D. Ryan, v. p.; Jos. W. Allen, sec.-treas.; E. J. Dudley, asst. sec.; W. S. Harper, asst. treas.; H. B. Paull, aud.; Myron M. Parker, Philip L. Foster, W. D. Thornton, Jas. McLean, Wm. E. Corey, John D. Ryan, Jos. B. Cotton and Jos. W. Harriman, directors.

Inc. Dec. 26, 1906, in Minnesota. **Cap.,** \$60,000,000; shares \$100 par; issued \$50,000,000. New York Trust Co. and Old Colony Trust Co., Boston, transfer agents; Bankers Trust Co., New York, and State Street Trust Co., Boston, registrars. Shares listed on the New York and Boston Stock Exchanges.

The Greene Cananea is a securities holding company only, but it is practically the only one in which the public now own shares. The relations of the company with its subsidiaries is as follows: Greene Cananea Copper Co., controlled by stock ownership, the Greene Cons. Copper Co., a West Virginia corporation, and the San Pedro Copper Co., S. A., a Mexican corporation. The Greene Cons. Copper Co. owns nothing but the entire capital stock of the Cananea Cons. Copper Co., S. A., Mexico. The Cananea Cons. Copper Co., S. A., and the San Pedro Copper Co., S. A., own, jointly, the property formerly held by the Indiana-Sonora Copper & Mining Co. The company also owns the Superior Bonanza Mining Co. and through this, the Mexican operating company, the Bonanza Mining Co., S. A. The subsidiary corporations named are listed and described elsewhere in this volume, so far as organization, finances and officers are concerned, but the physical properties are described here because the properties are operated together and no description would be complete, or easily understandable, if the properties were described separately. The Cananea Duluth, Cananea Central Copper Co., America Mining, Cananea Development, Sierra de Cobre Mining and Indiana Sonora companies, are all dissolved.

The Greene Cananea Copper Co. was organized for the purpose of acquiring the outstanding capital stock of Greene Cons. Copper Co. and Cananea Central Copper Co. To that end there was authorized to be issued 2,500,000 full paid shares of the aggregate par value of \$50,000,000.

The Greene Cananea exchanged its shares for the stock of the two subsidiary corporations on the basis of $1\frac{1}{2}$ shares for each share of Greene Consolidated, and $1\frac{2}{3}$ shares for each share of Cananea Central. By this transaction the corporation has become the owner of 961,398 shares out of 1,000,000 outstanding shares of Greene Cons. Co.'s stock and has acquired all of the 600,000 full paid shares outstanding of the Cananea Central stock. The privilege of exchanging the balance of the Greene Cons. Copper Co.'s stock not owned by the Greene Cananea Copper Co., is still open, the exchange basis being $\frac{3}{10}$ of a share of Greene Cananea stock, par value \$100, for each share of Greene Cons. Copper Co.'s stock, par value \$10 and stock is reserved for such exchange.

In June, 1917, shareholders in Greene Consolidated voted to sell their assets to Greene-Cananea for \$21,000,000, and to dissolve their own corporation. This is estimated to save \$300,000 per annum. The basis of sale was one share of Greene-Cananea at \$100 par for each two shares of Greene Consolidated at \$10 par. All but 2,000 shares were exchanged on Aug. 15, 1917. The San Pedro Copper Co. is also to be dissolved. Cananea Consolidated will eventually become the only operating concern for Greene-Cananea, the only holding company.

On July 18, 1913, par value of the shares was changed from \$20 to \$100 per share. All shares of \$20 par value have been exchanged for shares of \$100 par value, with exception of 6,931 shares, so that there are now issued and outstanding: 486,851 shares, \$100 par; 6,931 shares, \$20 par; 191.8 shares, \$100 par, the latter represented by fractional scrip which was issued when par value of shares was changed and which scrip is not entitled to dividends but which is exchangeable in aggregates of \$100 for full shares, making a total outstanding capitalization of \$48,842,900.

Dividends:	Par Value		
	Rate	Shares	Amount
1917(a).....	\$6.00	\$100	\$2,930,526
1916.....	7.00	100	3,418,947
1915.....	...	100	.....
1914.....	2.00	100	972,645
1913.....	1.25	100	1,093,143
1912.....	0.75	20	1,819,877

(a) includes dividends paid Aug. 27. Present rate \$8 per annum.

Income for 1916 was \$3,435,879, all from dividends of subsidiaries and interest on deposits.

Cananea is a community of 16,000 inhabitants, located 40 miles south of the international boundary line, on a branch railway of the Southern Pacific lines of Mexico.

The ores from all of the mines of the various companies are treated at the works of the Cananea Cons. Copper Co., S. A., the principal Mexican corporation, producing blister copper. The yield in 1916 was 62,250,067 lbs. copper, 11,692 oz. gold, and 1,975,734 oz. silver.

The following description covers all of the subsidiary companies of the Greene Cananea Copper Co.:

Property: mineral lands held under title from the Mexican government amount to 14,062 hectares, or approximately 34,738 acres. The surface lands owned by the company comprise 130,414 hectares, or approximately 322,123 acres. All of the mines, works, offices, warehouses, stores, etc., of the company are located on its own land and in addition the company owns valuable residence properties in Cananea, which are occupied by its local officials and employees.

Geology: the producing mines of the company are situated in the Cananea mountains, which rise from the headwater valleys of the San Pedro and Sonora rivers in northern Sonora. The mines are distributed along a mineral belt, or series of belts, about 6 miles long, in a N. W.-S. E. direction, and about 2 miles wide. The oldest geological formation of the Cananea mountains is pre-Cambrian granite, which is overlaid by Cambrian quartzite, in turn overlaid by Cambrian limestone. Breaking through these rocks, and covering much of the mineral belt, is a series of eruptives of Tertiary age, in which 12 different rocks may be recognized, one, a bedded tuff, the others massive. Three main classes of ore deposits may be recognized: (1) Deposits containing secondary chalcocite together with iron pyrite either massive or disseminated along shear zones in diorite porphyry; (2) Contact deposits containing chalcopyrite associated with iron pyrites and some zinc blende in a matrix of altered limestone; (3) Disseminated chalcopyrite associated with zinc blende in a diorite porphyry breccia.

The principal producing mines of the Cananea property are the Cobre Grande, Kirk, Veta Grande, Oversight, Capote, Chivatera, Sierra de Cobre, Eureka, Elisa, Henrietta and Puertecitos mines. Also owns the Cananea Duluth and American mines. The Henrietta and Eureka mines were idle in 1916.

The Cobre Grande mine was the original mine of the Cananea Consolidated Copper Co. Idle for some years; has been worked for ore to be used in the converters. The ore occurs in a strong and wide vein traversing both altered limestones and igneous rocks.

The Kirk mine is situated in an extensive area of highly-altered limestone capped with diorite porphyry and cut in pieces by small, irregular dikes and intrusions of the same material. The ore is not adapted to concentration and it is necessary to hand-pick it as mined. The sorted ore carries a desirable high percentage of lime and iron. In 1916 large additions were made to the lean fluxing ores developed in 1915.

The great mines of Cananea are the Veta Grande, Oversight and Capote, which have had large bodies of high-grade ore and now have large bodies of direct smelting ore and also contain great deposits of concentrating ore. This ore and the associated first-class ore contains copper in chalcocite, disseminated through diorite porphyry in broad shear zones. Ore reserves in these mines were considerably increased, especially in the Veta Grande.

The Capote mine differs from the Veta Grande and Oversight in that the ore occurs not only disseminated in diorite porphyry but also in the underlying granite. There are 3 principal ore shoots connected by continuous ore on the various levels. The ore in the upper levels is chiefly chalcocite, but the new shoot now being developed, consists of massive pyrite with primary chalcopyrite and bornite in granite. This mine has

attained a depth of 1,050', and has ore on each level from the 1st to the 10th. The Capote mine yields both concentrating and direct smelting ores. A new 5-compartment shaft was completed to the 12th level in 1916, to provide an outlet for the new orebody on the lower levels, and has been completely equipped.

Much of the ore is large pyrite, a mass on the 5th level, 220' long with a maximum width of 100', carries over 2½% copper, but there is much leaner ore in the mine which is unprofitable at present.

The Chivatera has a large body of oxidized ore containing about 2% copper, but averages 12-15 oz. silver and some gold. As the orebody now stands it contains several years reserves on the basis of 150-200 tons daily production, and there is a considerable territory lying ahead of present exploration that gives promise of important development. There was a decrease in ore opened in 1916, but its grade was higher.

The Sierra de Cobre property was acquired by purchase from the Phelps-Dodge interest several years ago, and since its acquisition has proved to be one of the largest and most profitably productive mines of the Greene Cananea Copper Co.

The ore from this mine occurs in limestone. Fissures extending out from the "Eureka" fault have acted as channels for mineralizing solutions, making ore along the veins and for a considerable distance into the walls, replacing the limestone by pyrite and chalcopyrite along the bedding planes. There appear to be notable bodies of heavy sulphides on and below the level of the Combination tunnel which passes through this property to the Elisa mine, and these are now being developed with very satisfactory results. The Sierra de Cobre property also has an extensive area of undeveloped ground lying in the limestone areas, along which smelting ore has been found in the Kirk mine and elsewhere.

The Elisa mine contains a number of lenses of ore lying approximately parallel to a nearly vertical fault between limestone and the diorite porphyry. These lenses occur in the limestone at the fault and back of it for a distance of 150', along a zone some 1,500' in length. The ore consists of a garnet matrix containing chalcopyrite and iron pyrites. It is a very desirable ore for the smelter, being more than self-fluxing, containing about 20% of lime in addition to the iron. Recent developments in the Elisa mine have been exceedingly satisfactory and a large amount of first-class ore has been opened up on the deeper levels. The ore from this mine is now delivered through the Combination tunnel to bins at the Capote mine.

The Henrietta is a small mine whose ore occurs on a contact between diorite porphyry and quartz porphyry. The orebodies are not large and the ore is silicious. New development work in the vicinity of Henrietta has not yet shown workable orebodies.

The Puertecitos mine and the town of that name are located at the N. W. end of the mineral belt and at the terminus of the narrow-gauge railroad of the company. The Puertecitos mine ore deposit has a great outcrop of limestone altered by contact metamorphic action to lime-iron-garnet rock and containing carbonates of copper and some chalcopyrite and bornite. Large areas of this outcrop contain enough copper to warrant mining, which is carried on by means of large quarries. The ore as mined is not sufficiently rich to be sent direct to the smelter but has to be broken and hand-sorted, yielding about 4 tons of waste material to each ton of ore.

Recently a large amount of underground development work has been done at Puertecitos with highly satisfactory results, the ore being fit for direct smelting; the mine is developed sufficiently to yield 450 tons a day if needed.

The Elenita mine, one of the earliest producers of the camp, located southwest of Puertecitos, has been reopened with a view to again putting it in the producing class. The ore from the mine is similar to that of Puertecitos.

The **Cananea Duluth** mine has an orebody about 1,200' long with a maximum width of 200'. This orebody is a neck of diorite intruded in bedded tuffs. The intrusion is shattered, altered and for 200' to 300' below the surface is impregnated throughout with pyrite and copper minerals. On the 600', the lowest level, the central portion is not commercial; the values being concentrated around the border of this long canoe-shaped orebody. The ore carries good silver and gold values, with about 2% copper. Practically all of the product of this mine is concentrated before smelting. The shaft is being sunk below 600'.

The **American** mine, idle since 1907, produced only such ore as was obtained through development work. Not fully developed, though there are sufficient indications of ore occurrences to warrant a resumption of development operations. Mine has a 3-compartment shaft to the 100' level and ore bins of 900 tons capacity.

Development: total development work since the organization of the company, Dec., 1906 to 1917, is 524,294', which does not include 279,200' done under previous management. Development work done in 1916 amounted to 57,549', compared with 7,870' in 1915 and has kept well ahead of mining.

Equipment: power is delivered from a central power plant located at the smelter, and electrical power is used exclusively except for the steam pumping plant at Ojo de Agua. The power house, also containing the boiler plant, contains three 1,500 k. w. horizontal Curtis turbines, delivering current to the switchboard at 2,300 volts. The entire electrical equipment of turbines and engines has a capacity of 5,850 k. w. alternating current and 500 k. w. of direct current. Electrical energy is transmitted to various parts of the camp at from 2,300 to 11,000 volts. The furnace blast is supplied by 7 Curtis engines and 1 piston blower, having a combined capacity of 176,000 cu. ft. of free air per minute. The blast is conveyed to the furnace through a pipe 6' in diameter. Converter blast is supplied by 5 blowing engines having a total piston displacement of 55,000 cu. ft. of free air per minute, and is conveyed to the converters through two 30" pipes. In the power house there is also one 6,000-cu. ft. capacity Ingersoll-Rand compound condensing air compressor, furnishing air to the mines for drilling and other purposes; also one 1,200-cu. ft. Ingersoll-Rand compressor, used to furnish air for ramming converter lining and for sundry pneumatic tools around the works.

The report for 1916 states that the power plant is overloaded, and plans are under consideration for increasing its capacity.

There are eleven boilers, with a total capacity of 4,260 b. h. p. Crude oil, imported free from the United States, under a Federal concession, is used as fuel. The waste-heat boiler plant nearby consists of 8 water-tube boilers having a combined nominal capacity of 2,450 b. h. p., heated by the waste gases of 2 reverberatory furnaces. In connection with this waste-heat plant there is a battery of 4 Green economizers, consisting of 288 tubes each. All boilers are equipped with Foster superheaters. The feed water is carefully measured after a simple treatment for the removal of scale-forming material, and is fed to the boilers by means of electrically-operated plunger pumps. The power house is equipped with 2 counter-current barometric condensers, each having a separate water pump and separate dry air pump. All engines are operated condensing excepting those whose exhaust is used in heaters.

The principal water supply of the company comes from Ojo de Agua, 9 miles from the town, where a pumping plant, with water-tube boilers, using crude oil as fuel, runs a Reidler high-duty compound condensing engine delivering 1,500,000 gals. of water per day against a pressure of 967'. A 10" main connects the pumping plant with a 600,000 gal. tank located on a hill near the concentrators. The Ojo de Agua water is used exclusively for domestic purposes and for feed water for the boilers and is delivered under substantial working pressure. A very well equipped fire department, with a complete system of mains to pressure tanks, is main-

tained. Water from the mines is delivered to the concentrator through wooden pipes and is there used in milling operations.

At the Sierra de Cobre mine, in the Capote basin, there is an Ingersoll-Rand air compressor having a capacity of 2,500 cu. ft. of free air per minute, which is directly connected to a 2,300-volt A. C. motor. This machine is used to boost the pressure in the mains in the outlying districts. Fuel oil is stored in 3 main tanks with a capacity of 10,000 bbls. each.

The main shops near the smelter include machine, boiler, blacksmith, foundry, pattern and electric shops, all well-equipped, up-to-date, and served by both standard and narrow-gauge tracks. A large warehouse, for the company's supplies, and a framing mill, in which timbers for all of the mines are framed, are located on the southern slag dump.

The concentrating department has a capacity of 2,800 tons per day, and consists of a crushing plant, sampling mill, 2 concentrating mills, a settling system and a slime plant. The concentrator is now being remodeled and oil flotation system added.

The crushing plant has storage bins holding 2,000 tons, ore from the mines being delivered in Ingoldsby side-dump cars of 30 tons capacity each. From the storage bins ore is fed to a 30" conveying belt by automatic feeder. This belt delivers the ore to 2 grizzlies, inclined at 48° with 1" openings. The screened ore falls on an 18" conveyor, transferring it to a 24" conveyor, taking it to the mill bins of 4,800 tons capacity.

The oversize from the grizzly goes to two 36" picking belts, where first-class ore and also pieces of wood and steel are sorted out. The ore left on belt is then delivered to crushing bins and fed by automatic plunger feed to five 10x20" Blake crushers of the Cananea type, which reduce the ore to 1½" size. This crushed ore passes to 16x36" rolls, breaking to pieces that which passes a 2" ring. This product is delivered to a 24" conveyor, which delivers to the mill bins, together with the grizzly undersize. The crushing plant is electrically driven and has a capacity of 2,000 tons per 10 hours. An automatic sampler at the head of the 24" conveyor cuts one-fortieth of the total ore, which is ground and automatically cut to sample. All rejects drop to elevator and return by conveyor to mill bins.

No. 1 mill consists of 2 sections of 600 tons capacity each. No. 2 mill is a steel structure, containing 2 sections of 800 tons capacity each. The mills are supplemented by a settling system and a slime plant containing 100 vanners. The 2 mills have practically the same flow sheet, although in Mill No. 1 fine grinding is carried further in rolls.

The ore from the 4,800-ton storage bins is fed by automatic feeders into each section. Concentration begins on all material finer than 2" ring. The course of the ore in all 4 sections is as follows:

The ore is delivered to two ¾" trommels, the undersize passing to two ¾" trommels. The undersize of the latter goes to two 3/16" trommels and the undersize from these to four 2 mm. trommels. The various coarse sizes from screenings are passed to Hartz jigs, and all tailings from jigs coarser than ¾" ring are passed through rolls, elevated and returned to screen, so that no material coarser than ¾" goes to the Hardinge mills. The coarser material is concentrated on 20 concrete Hartz jigs in each section. The jig tailings finer than ¾" pass to 3 Hardinge mills and are ground to about 2 mm. The discharge from the Hardinge mills is deslimed in a drag belt classifier, the coarser sands are classified, the resulting product being treated on 30 tables. The very fine sands and slimes are treated on 36 vanners. Tailings from tables and vanners are settled out and sent to the slime plant for further treatment.

The tailings, containing a gross value of nearly \$2 per ton in copper, silver and gold, are impounded in a coarse tailings dam, the slime settling above the dam. The clear water is pumped back for re-use in the mills but is first passed through precipitating tanks, where the dissolved copper is precipitated and recovered. The concentrates are delivered in narrow-gauge cars to the spreading beds.

Flotation being incorporated in the treatment, it was found necessary

to grind all the ore to pass 48-mesh, necessitating the use of more machinery than formerly, such as Hardinge mills, using steel balls, filters, Dorr thickeners, etc. Flotation as applied to Cananea ores was more or less experimental, which is another factor in increased costs. Installation of flotation plant well advanced in June, 1917.

All ores, concentrates, fluxes and secondaries for blast-furnace treatment are weighed and delivered to the main receiving bins by the company's narrow-gauge railroad. The bin system consists of 11 wooden and 8 steel bins, having a combined capacity of about 3,000 tons. From the receiving bins all material is discharged on a conveyor belt, which passes through the sample mill on its way to the spreading bed plant. In the sample mill the ore is crushed to about 4" through a 24x36" Farrel crusher. One-tenth of the ore stream is cut out and passes through a 10x20" crusher of the Cananea type; one-tenth of this is cut and passed through a Gates gyratory crusher, then one-fifth is cut and passed through a set of 17x27" rolls, when the final sample is cut out, amounting to about one-four-thousandth of the original material. This final sample is quartered down, dried and prepared for the laboratory. The reject from the sample mill is elevated back to the main conveyor system. All material is sampled in this manner with the exception of concentrates, which are hand sampled.

The ore after passing the sampling mill is conveyed to the spreading beds and distributed evenly over the entire length of the bed by an overhead belt which is automatically tripped. The bedding plant is of steel construction, being 453' long, and 198' wide, and contains 3 ore beds of about 9,000 tons capacity each. The composition of each bed is known in advance and in this way an even mixture is assured to the furnaces. When a bed is completed it is reclaimed by a machine which advances into the face of the pile and discharges on to a conveyor which delivers the mixed charge into bins over the blast furnaces, each bin having a capacity of 75 tons. The reclaiming machine has a capacity of about 175 tons per hour. The charge is dropped by gravity from the 75-ton bins above the furnaces into measuring hoppers holding 2,000 lbs. There are 5 such hoppers to each furnace, and these are discharged either directly into the furnace or on to the feed floor by means of arc gates.

The blast furnace building contains 8 blast furnaces, 48x210" at the tuyeres. There are 4 settlers, 10' 5"x19' inside of brick lining, each settler serving 2 furnaces. The slag overflows continuously into self-dumping slag cars of 45-cu. ft. capacity. Trains of 6 to 8 cars are hauled to the dump by electric locomotives. The matte is tapped from the settlers into 66-cu. ft. cast-steel ladles and transferred to the converters by electric cranes.

The gases from the furnaces are discharged into a steel balloon flue, thence through 2 cross-flues and 2 goose-necks into the main brick dust chamber. From here the gases pass through a flue to another chamber, thence to a brick-lined steel stack. All flue dust is drawn from the dust chamber and balloon flue into small cars and trammed to the reverberatory furnaces. The coke bins at the west end of the furnace building have a capacity of about 3,000 tons.

The roaster building contains ten 18' six-hearth McDougal calciners. There is a special bedding plant for the roasters, consisting of 4 bins of 500 tons capacity and 2 beds of 3,000 tons each. The mixed roaster charge is reclaimed and delivered by conveyor belts into 60-ton bins over and charging into the roasters. The roaster product is hauled by electric motor in 5-ton cars to the reverberatory furnaces.

The reverberatory plant consists of two 19' 6"x100' oil-fired furnaces. The waste gases fire three 300-h. p. and five 250-h. p. boilers placed parallel, and then pass through 4 units of Green economizers containing 1,152 tubes, thence through a brick flue 130' long to a stack 12' 6" in diameter by 152' in height. The slag is skimmed into 112-cu. ft. electrically-tilted slag cars and hauled to the dump by electric locomotive. The matte is tapped into 66-cu. ft. ladles and hauled to converter buildings in ladle cars, from which it is transferred to the converters by electric cranes.

The converter building contains 3 electric cranes of 40, 50 and 60 tons capacity, 6 electrically-operated stands of the Great Falls type of converter, with 7 basic-lined shells, 12' in diameter, for same.

The copper from the Bessemer converters is poured into the ladles of 2 straight-line electrically-operated casting machines, each equipped with tilting ladles of 66 cu. ft. capacity. Each machine has a chain of 39 molds, casting bars weighing about 260 lbs., dumping into bosh from which they are removed by drag conveyor to the bullion platform. The bar bullion is then stacked by an air-operated radial crane, picked up on trucks, weighed, and loaded into standard-gauge railroad cars. The converter slag is skimmed into ladles, transferred by crane to slag cars, hauled by electric motor to pits and reclaimed by a 10-ton steam shovel. It is then delivered in narrow-gauge cars to the receiving bins of the main spreading bed system.

The converter gases pass through balloon flues of steel construction and enter into a steel dust chamber, with a circular arch roof having a 13' radius. The gases then pass to a steel stack 12' in diameter by 125' high.

The daily capacity of the entire reduction works is 3,600 tons of gross charge.

In 1916, dust-bins were constructed at the blast-furnaces, dust and fine-ore bins at the roasters, and fettling system at the reverberatories.

The company owns and operates 36 miles of standard and narrow-gauge railway, including branches, spurs and sidings. The narrow-gauge line is double-tracked from the smelter to Capote basin, and laid with 50-lb. steel rails. The equipment includes 2 standard-gauge and 9 narrow-gauge locomotives, all oil burners, and about 140 cars, most of which are 25 and 30-ton steel ore cars. The railway system has direct rail connection with the Nogales and Naco branches of the Southern Pacific Lines of Mexico, and by this line with the El Paso & Southwestern railroad at Naco, Ariz.

The Cananea Consolidated Copper Co. operates practically all of the public utilities in Cananea. Its Public Service Department operates the water system; an electric light system; a telephone system operating 200 drops and approximately 450 telephones; and sundry other minor public utilities. The company's Mercantile Department operates a lumber yard, a large department store located near the smelter and 9 branch stores scattered throughout the various camps. The rental properties of the company include 619 buildings, consisting of rooming houses for its employees, residences, bunkhouses, etc.

Production: output and earnings since beginning of operations:

	Tons Mined.	Mng. Cost perTon.	% Cu.	Copper, Lbs.	Silver, Oz.	Gold, Oz.	Cost per Lb. Cu. Cents	Earnings
1917 (d).....				21,030,000				
1916.....	1,143,608	\$2.612	2.258	48,663,381	1,464,808	8,710	11.395	\$4,906,513
1915.....	285,701	2.492	2.700	16,335,081	635,997	3,773	11.086	1,410,543
1914.....	413,766	3.146	2.201	21,858,920	907,310	6,055	10.724	638,956
1913.....	765,063	2.854	2.863	44,480,512	1,497,938	8,021	9.631	2,344,592
1912.....	1,121,946	2.902	2.146	48,187,847	1,559,996	7,232	10.310	2,586,749
1911.....	945,160	2.355	2.414	44,897,466	1,339,839	5,892	9.843	1,318,473
1910.....				45,771,925	1,187,820	5,483	11.437	459,202
1909.....				44,547,689	933,649	5,877	11.613	544,167
1908.....				18,619,609	447,063	2,379		214,141
(b).....				58,180,856	766,422	6,100		3,220,247
(a).....				247,144,706	2,006,679	13,795		9,870,763

(a) July 31, 1906. (b) Aug. 1, 1906—Dec. 31, 1907. (d) First half.

In 1915 the concentrator treated 79,649 tons ore at a cost of \$0.8263 per dry ton. The smelter treated 220,049 dry tons ore at a cost of \$2.7146 per ton.

The property was closed down in Aug., 1914, due to revolutionary conditions in Mexico; operations started in June, 1915, were suspended in Oct., resumed again in December, 1915, and were continuous to June 22, 1917, when work was suspended again. This time the trouble was a dispute over taxes, which in 1916 amounted to \$1,156,754, which was paid to the Mexican Government. Recently the Cananea company abandoned 7,703 mining claims to escape the excessive taxes demanded. No notification

to the Government was necessary, but the Department of Finance said taxes must be paid on these claims, otherwise the company could not export metals produced. This resulted in a shut-down, which still existed, Dec., 1917; but steps are being taken for resumption of operations.

Future possibilities of Greene-Cananea as a constructive copper are great and are unappreciated at the present time.

Cananea Consolidated Copper Co.

Mines and works: Cananea, Sonora, Mexico. C. E. Mills, pres. and gen. mgr.; Geo. Young, sec.-treas.; Casey Stites and W. S. Harper, asst. sec'ys; T. Evans, traffic mgr. and purch. agt.; G. W. Prince, smelter supt.; F. J. Strachan, mill supt.

Inc. Sept. 30, 1899, in Mexico. **Cap.**, 20,000 pesos, shares \$1 gold par. Entire stock owned by Greene Consolidated Copper Co., the C. C. C. Co. being merely the operating company, holding direct title and right to operate the property, as is necessary under the laws of Mexico. Description of the property owned by this company is given under the title Greene-Cananea Copper Co., which corporation absorbed the Greene Consolidated Copper Co., now dissolved.

In addition to the properties owned by the Cananea Consolidated Copper Co. previous to the formation of the Greene-Cananea Copper Co., it now owns an undivided three-fifths interest in the properties formerly owned by the Indiana Sonora Mining Co., and it also owns a controlling interest in the Superior Bonanza Mining Co., which company's properties are located near Imuris, in the State of Sonora, Mexico.

No separate financial statement of the Cananea Cons. Copper Co. is issued, but the combined balance sheet of the Greene Cons. Copper Co. and the Cananea Cons. Copper Co., S. A., as of Dec. 31, is as follows:

Assets:	Prop. & Equip.	Copper			Total
		Current	On Hand	Supplies	
1914.....	\$10,010,029	\$4,253,403	\$228,123	\$689,767	\$15,181,322
1915.....	10,055,191	5,188,334	105,662	535,219	15,884,405
1916.....	10,279,182	8,511,793	248,202	844,555	19,899,462

Liabilities:	Capital Stock	Current	Reserves		P. & L. Surplus	Total
			Miscel.			
1914.....	\$10,000,000	\$243,358	\$281,006	\$29,585	\$4,628,373	\$15,181,322
1915.....	10,000,000	270,997	102,906	19,523	5,490,979	15,884,405
1916.....	10,000,000	727,728	263,942	8,300	8,899,492	19,899,462

Total income in 1916 was \$16,859,771; total expenditures were \$9,951,258. In 1916 there was mined 1,143,508 tons domestic ore at a total cost of \$2.61 per ton. The yield per ton was 2.258% copper, 1.368 oz. silver, 0.008 oz. gold.

Greene Consolidated Copper Co.

Company was organized and controlled by Col. Wm. C. Greene and his friends until Feb. 18, 1907. The early history of the company fully given in Vol. X. Absorbed in July, 1917, by the Greene-Cananea Copper Co. (which see), which always held 95% of Greene Cons. stock. Paid total dividends of \$13,044,400 to 1917.

San Pedro Copper Co., S. A.

A Mexican corporation; subsidiary of the Greene Cananea Copper Co.

Officers: Geo. Kingdon, pres.; H. B. Paull, v. p.; Geo. Young, sec.-treas.; J. W. Allen, asst. treas.; Casey Stites and W. S. Harper, asst. sec'ys.; L. D. Ricketts, gen. mgr.

Directors: L. D. Ricketts, Geo. Kingdon, H. B. Paull, Geo. Young, Casey Stites.

Inc. July 28, 1906, in Mexico. **Cap.**, 5,000 shares; \$10 par (Mexican); all issued and outstanding. The entire capital stock is owned by the

Greene Cananea Copper Co. Balance sheet Dec. 13, 1916, shows assets, \$1,873,052, which includes property and equipment, \$1,052,200; current, \$820,852. Liabilities: capital stock, \$25,000; current, \$883,060; surplus, \$964,992. Total income in 1916, \$1,417,650; expenditures, \$764,671.

Dividends paid in 1916 amounted to \$100,000.

Principal mines are the Cananea Duluth and America; also owns the following claims: America Copper Belt, El Oriente, Las Dos Naciones, Seguro, Square, Swanea and owns a 40% interest in the Sierra de Cobre mines, the other 60% being owned by the Cananea Cons. Copper Co., S. A.

Owing to increased taxation, company's holdings in 1917 were reduced to 1,324 acres. Ore bins and rail extensions were made. The Cananea-Duluth shaft is being sunk below the 600' level. Development totaled 12,755'.

Production: 1916, 86,851 tons of ore, at a cost of \$3.04 per ton. The yield per ton was 2.919% copper; 1.916 oz. silver; 0.016 oz. gold. Cost of production was 11.082c per lb. of copper. (See Greene Cananea Copper Co.)

GUERRERO MINING CO.

MEXICO

Is the Mexican incorporation of the Victor Mining & Smelting Co., which owns 2 properties in Magdalena district, Sonora, Mexico, 10 miles S. W. of Cananea. Properties about one-half mile apart, contain 15 and 32 pertenencias, respectively.

HARRIS COPPER CO.

MEXICO

Sold its property, La Caridad group, to the Moctezuma Copper Co., of Phelps, Dodge Corp'n, Feb., 1916. Company has no assets.

HERMOSILLO COPPER CO.

MEXICO

Office: 914 Columbus Savings & Trust Bldg., Columbus, Ohio. Operating office: Aptdo, 98, Hermosillo, Sonora, Mexico.

Officers: J. L. Zimmerman, pres.; C. P. West, v. p.; R. D. Wood, sec-treas.; preceding, with A. J. Rusling, F. E. Resler, L. A. Clark, E. C. Plyley, Gilbert Holmes and Dr. H. W. Whitaker, directors. Jas. Penman, gen. mgr.

Inc. Feb. 13, 1909, in Mexico. Cap., \$1,500,000; shares \$1 par; non-assessable; issued, \$1,031,052. Authorized bond issue, \$200,000 of 7% convertible gold bonds; amounts outstanding Dec., 1915, \$24,100.

Company was a reorganization of the Verde Grande Copper Co., whose old shareholders were given new stock, share for share, by paying 25c cash per share.

Property: about 1,300 acres, with 200 acres of mill and smelter sites in the Hermosillo district, about 28 miles N. W. of Hermosillo, consists of 9 claims, reported by the management to carry porphyry and lime cut by granite. The Picacho and Verde Grande have contact deposits in limestone, near igneous intrusives, carrying oxidized ore giving assays of 67% copper, 8 oz. silver and \$1 gold per ton. La Cobriza group and La Verde have contact deposits between granite and quartzite, of 30' to 60' claimed width, traceable 7,000'; carrying auriferous and argentiferous copper ore said to assay 5.5 to 20% copper, with gangue of talcose limestone. Company reports 7 orebodies under development of 10 to 100' width, averaging 5.44% copper, 8.66 oz. silver and 75c gold per ton.

Development: 20 shafts and tunnels with over 7,000' of workings, reported to show over 200,000 tons of ore.

Equipment: consists of a 100-ton Allis-Chalmers blast furnace, a 30-h. p. hoist, 6-drill compressor, etc. Smelter is 1½ miles from principal workings.

Owing to the Mexican revolution the work done for the past few years has been mainly churn drilling. Company expects to operate smelter and vigorously develop mine when peace is restored.

Making tests on ore with oil flotation process, with the intention of installing plant.

INTERNATIONAL COPPER ORE CORPORATION

MEXICO

Office: 424 Scarritt Bldg., Kansas City, Mo. A. M. Conard, pres. Nogales, Ariz., at last accounts; his record is enough to discourage

ordinary investor. **Mine office:** Noria, Sonora, Mexico. Is the Mexican operating corporation of the Sonora Copper Smelting Co.

INTERNATIONAL MINES DEVELOPMENT CO. MEXICO

Main office: 523 Los Angeles Investment Bldg., Los Angeles, Calif. **Eastern office:** Room 1606, 20 Broad St., New York.

Officers: Max Muller, pres.; P. Schabarum, v. p.; N. S. Haughwout, sec.-treas.; above, with Augustin Freese, H. J. Wendler, S. A. Josephi and C. F. O'Brien, directors. A. C. Barke, mgr.

Cap., \$3,000,000; shares \$1 par; \$2,400,000 issued. Stock listed on New York Curb.

Property: the Santa Rita, Santa Gertrudis, Santa Ana and El Carmen mines, 160 acres, in Sonora, Mexico, about 200 miles from Bisbee, Ariz. Company also reported to have a 5-year option on the Ash Peak mine near Clifton, Arizona. The Mexican properties have been silver-gold producers in the past, but have not been developed; owing to revolutionary conditions will probably remain undeveloped for some time to come. Their position is aggravated by being in the Yaqui zone. The Santa Rita is an "antiqua," an old Spanish mine. It was worked by a 1,500' open-cut and numerous arrow drifts, etc. The veins contain a number of pockets of rich ore. Seventeen adobe furnaces were kept in blast in the early times. The nature of all the Mexican mines of this company, which are close together, is in the treatment of large bodies of fair-grade milling ore amenable to cyanidation.

Company is to do new work, 1918. Stock quoted at 15c, Sept. 2, 1917.

JANITA MINING CO., S. A. MEXICO

Office: Sellwood Bldg., Duluth, Minn. **Operating address:** Bisbee, Ariz.

Officers: Martin Pattison, pres.; Byron M. Pattison, v. p. and mgr.; Samuel E. Shattuck, sec.-treas.

Property: about 1,000 hectares, known as the Juanita group, adjoining Carnegie L. & Z. Co. property, 3 miles N. W. of Cananea, is traversed several narrow fissure veins in volcanic tuff beds. These veins carry rich ores with chalcopyrite, galena and sphalerite. No. 1 shaft is 125' deep and there also is a 75' shaft. Work suspended since 1912 owing to political disturbances in Mexico. Is an undeveloped prospect.

COBRIZA DE COBRE MEXICO

Address: Rafael Elias, Cananea, Sonora, Mexico.

Property: 14 claims, adjoining Carnegie L. & Z. property on S. E., with several veins in bedded volcanic tuffs with complex, silicious lead-silver ore. Developed by 200' shaft with short drifts in ore.

COBRIZA MINING CO. MEXICO

Office: 19 S. LaSalle St., Chicago, Ill. L. A. Weyburn, sec. Mine at Cananea, Sonora, Mexico.

Officers: Sam'l Kerr, pres.; J. E. Bentley, treas.; with J. H. Strong and Emery, directors. Robt. Mitchell, gen. mgr.

Inc. June 5, 1905, in Arizona, and legalized in Mexico. Cap., \$250,000; shares \$1 par, increased Mar. 15, 1917, to \$1,000,000; shares \$1 par; 500,000 shares with dividends of 10% cumulative and 10% bonus, but without interest; power. 241,252 shares issued.

Reserves: 142 hectares, 350 acres, in the Altar district near Puerto, 7 miles from Noria. Property shows several contact deposits of nearly vertical between limestone, quartzite and granite. The main orebody under development is reported by company as of 40' average width, traceable 1,500' face, carrying carbonates to depth of about 100', underlain by chalcocite ore averaging 6 to 8% copper, 4 to 6 oz. silver and \$1.50 gold value.

Development: by shafts of 200' and 520', and a short tunnel, managing and reporting 7,500' of workings. Property idle, 1913, but resumed work in 1918, on the 500' level, opening up a vein said to be 4' wide and carrying ore assaying from 3-15% copper. Plans sinking a 3-compartment shaft and erecting concentrator.

Equipment: includes a 300-h. p. steam plant, with a new hoist, installed 1912, and a 10-drill air compressor. There are 20 buildings, including an engine house, shops, store, office and about 15 dwellings. The smelter has a 100-ton Macdonald hot-blast pyrite furnace and is operating steadily. Management estimated 70,000 tons of ore in the mine.

LA DURA MILL & MINING CO.**MEXICO**

See Mines Co. of America, under Chihuahua.

LA REINA UNION MINING & REDUCTION CO.**MEXICO**

Mine near San Javier, Hermosillo, Sonora, Mexico. Property includes the Mimbres mine, said to show a fissure vein carrying lenses of complex lead-copper-sulphide ore with gold and silver values.

Development: by shaft, cut a vein that assayed from 15 to 30 grams gold and 400 grams silver per ton.

Equipment: includes steam and electric power, and an air compressor. Idle owing to revolution in Mexico.

LA UNION CONSOLIDATED COPPER CO.**MEXICO**

C. B. Bell, Douglas, Ariz., owner.

Property: 660 acres, in Cerro Tordillo section of the Ajo mountains W. of Fronteras, Sonora, Mex., shows a 3' to 20' vein traceable a mile, that carries high-grade copper, gold, silver, zinc ore. Orebody is a contact deposit in lime and porphyry formation, ore occurring in shoots.

Development: by 5,000' of tunnels and shafts to depth of 500'. Shipments of 1,500 tons were made to April, 1914, averaging 15% copper, 13 oz. silver and 0.1 oz. gold. The property was worked in 1882-86, acquired by present owner in 1906, and considerable work done in 1912-13-14.

Company gave up property in 1914, and C. B. Bell plans resuming operations when peace is restored in Mexico.

LUCKY TIGER-COMBINATION GOLD MINING CO.**MEXICO**

Office: 1012 Baltimore Ave., Kansas City, Mo. **Mine office:** Esqueda, Sonora, Mexico.

Officers: J. Z. Miller, Jr., pres.; W. A. Moses, v. p.; O. V. Dodge, sec. H. Vanderslice, treas., with E. D. Fisher, F. D. Whiting, G. M. Smith, W. G. Catron, J. E. Hutt, John Kelley, C. M. Bush, J. T. McCormick and A. E. Mosier, directors. L. R. Budrow, gen mgr.; R. T. Mishler asst. gen. mgr. J. W. Malcolmson, cons. engr.

Inc. March 16, 1903, in Arizona. Cap., 800,000 shares; \$10 par; 715,337 shares issued. Annual meeting, 3d Monday in March. Company owns the entire capital stock of Tigre Mining Co., S. A.

The combined balance sheet for 1916 of the Lucky Tiger Combination Gold Mining Co. and The Tigre Mining Co., S. A., shows total assets \$6,625,591, which includes mining property \$5,615,542; plant, machinery, equipment, \$372,744; inventories, \$126,330; product on hand and in transit, \$255,652; cash, \$169,616; liabilities include capital stock, \$7,153,370; current liabilities, \$161,694. Total receipts for the year's operations were \$1,624,517 including \$1,614,207 from ore sales; total expenditures were \$979,697; depreciation of property, depreciation, plant and equipment, \$461,938; net realization \$645,120.

Dividends: paid since organization of the company:

Year	Number	Amount
1916	77-85	\$515,042.64
1915	69-76	493,582.53
1914	58-68	715,337.00
1913	46-57	450,662.31
1912	40-45	336,208.39
1911	30-39	357,601.10
1910	18-29	429,000.00
1909	6-17	409,500.00
1908	1- 5	71,500.00

Total \$3,778,432.97

Property: the El Tigre mine, 6 claims, 622 acres, at El Tigre, Montezuma district, Sonora, Mex., shows gold-silver-lead-copper ore in fissure veins traversing rhyolite. Ore is a silicious sulphide occurring in vein 25' wide, proven for 4,000' in length, and running N.-S. with average dip of 65°. Developed by 1,000' incline shaft and 5,000' tunnel, with about 13 miles of underground workings. Ore is mined mostly by overhand shrinkage.

Equipment: includes electric power, 25-h. p. electric hoist, 250-ton concentrating mill and cyanide plant. Reported extraction in 1916 was 93.6%, concentrates averaging 2.17 oz. gold, 683 oz. silver, 2.93% copper, 11.4% lead. Experiments with flotation have been satisfactory, and a plant was to have been erected. Decreased cyanide consumption and lower costs are said to result from flotation.

Production: 83,000 tons in 1912; 90,000 tons in 1913; 88,000 tons in 1914. Ore averages 31 oz. silver, 0.01 oz. gold.

Company has been able to continue operations and shipments more or less regularly, notwithstanding disturbed conditions in Mexico during the past years.

MANHATTAN DEVELOPMENT CO. MEXICO
Owns Arnold Mining Co. property near Santa Cruz, Sonora, Mexico.

MANHATTAN EXPLORATION CO. MEXICO
Office: 52 Broadway, New York. **Mine:** at Hermosillo, Sonora, Mex.

Officers: John M. Bishop, pres., Washington, D. C.; A. H. McCarthy, v. p.; T. Addison Bell, sec.-treas.; preceding with Gen. Jas. S. Clarkston and Wm. Tierney, directors.

Inc. Feb. 6, 1909, in Maine. **Cap.**, \$2,000,000; shares, \$100 par; \$1,806,000 outstanding. Company is a close corporation.

Property: 18 titled properties near La Dura in the Yaqui River district, central Sonora. Two of the properties, the Promontorios, silver-lead and the Mesita, copper-silver-lead ore, had just reached the shipping stage when the Mexican revolution stopped all operations, May, 1912. Company expects to resume operations as soon as country is once more safe.

MARIA MINING CO. MEXICO
Office: 516 Providence Bldg., Duluth, Minn.

Officers: Joseph Backus, pres., Virginia, Minn.; Jas. A. Butchart, sec.-treas.; with Thos. F. Brady, Martin Trewhella and Thos. A. Armstrong, directors.

Cap., \$500,000; shares, \$1 par.

Property: the Carmen mine, in Arizpe mining district, Sonora.

Ore: silver, gold, in veins in andesite and rhyolite.

Development: by shaft; greatest depth 350', with 3,000' of underground workings. Has been idle 4 years, owing to the revolution, but resumed work in Feb., 1917. Rich silver ore being extracted in August, but on account of bandits, work was again suspended.

MELCZER MINING CO. MEXICO
See Copete Consolidated Copper Co.

METAL DE COBRE; COMPANIA MINERA MEXICO
Mine near San Antonio de la Huerta, Ures, Sonora, Mex.

Inc. in Mexico as holding company of the Rio Yaqui Copper Co.

MEXICAN EXPLORATION & MINING CO. MEXICO
Controlled by Pacific Smelting & Mining Co.

MEXICAN METALS CO. MEXICO
Office: 35 Congress St., Boston, Mass.

Officers: Geo. E. Keith, pres.; Geo. H. Woodman, v. p.; Sumner M. Teele, sec.; Harold C. Keith, treas.; with Eldon B. Keith, directors.

Inc. Aug. 16, in Arizona. **Cap.**, \$5,000,000; shares \$5 par; assessable; 655,373 issued; \$2.55 paid.

Company succeeded the Arizpe Mines Co. and holds title to property through the Moctezuma-Arizpe Development Co., legalized in Mexico.

Old Colony Trust Co., registrar; Federal Trust Co., transfer agt. Annual meeting, second Monday in September.

Mexican property near Cananea, Sonora, Mex., closed down in autumn of 1914. After geological survey of property made by J. M. Little, checked by A. H. Rogers, Boston, and Franklin W. Smith, of Bisbee, it was decided to sell or abandon such property as directors considered unworthy and to purchase new properties. Fully described Vol. XI, Copper Handbook.

An option has been secured on a property at Cripple Creek, Colo., where development work is under way.

MEXICO MINING, REFINING & EXPLORATION CO. MEXICO

Office: 501 I. W. Hellman Bldg., Los Angeles, Calif.

Officers: Wm. T. Calderwood, pres and gen. mgr.; Dr. Chas. B. Nichols, v. p.; F. C. Lamb, sec.-treas.; preceding with E. B. Lovie, C. A. Neil, L. A. Davis and A. A. Snodgrass, directors. B. A. Ogden, supt.; A. Wainwright, engr.

Inc. 1905, in Arizona. Cap., \$5,000,000; shares \$1 par; non-assessable. Annual meeting, second Monday in April, at Nogales, Ariz.

Property: 260 acres, El Creston de Cobra mine, about 35 miles west of Hermosillo, shows dolomite and garnite and is an antiqua dating from the eighteenth century. The property carries 4 orebodies, of which 2, reported by company as of 30' average width, and traceable 1,400', carry copper ores averaging 4% copper, 8 oz. silver and \$1 gold per ton.

Development: by 8 shafts, deepest 300', and 4 tunnels with 1,000' of workings, estimated by the company to show 100,000 tons of ore.

La Cobriza mine, at Soyopa, is said to show a 16' vein with a 7' pay-streak, carrying copper-silver ore.

Equipment: includes 235-h. p. steam plant, 2 hoists, 6-drill air compressor, and 20-ton mill. Company was planning to erect a 100-ton smelter, but revolution has probably interfered. No recent information secured.

MINA MEXICO MINING CO. MEXICO

Office: 1,025 Peoples Gas Bldg., Chicago, Ill.

Officers: Potter Palmer, Jr., pres.; H. L. Hollis, v. p. and man. dir.; E. F. Bryant, sec.-treas.

Property: at Mina Mexico, district of Sahuaripa, Sonora, Mexico. Has small mill and smelter.

MINERAL DEVELOPMENT CO. MEXICO

See Proprietary Mines Co. of America.

MINNEAPOLIS COPPER CO. MEXICO

Office: 525 Plymouth Bldg., Minneapolis, Minn. Mine address: Cumpas, via Nacozeni, Sonora, Mexico.

Officers: J. W. Christy, pres.; James Thompson, sec.; F. A. Guice, gen. mgr.

Inc. June, 1906, in South Dakota. Cap., \$1,000,000; shares, \$10 par; non-assessable; also inc. in Mexico as Minneapolis Copper Co., S. A., the South Dakota corporation being a holding company. Is operated in the United States under the title of Minneapolis Copper Development Co., the reason for which has not been explained.

Property: 277 hectares, about 30 miles S. E. of Cumpas. Property carries several fissure veins, in andesite, with N. E. strike, of which 4, under development, are of 5' to 8' estimated average width, carrying tetrahedrite, estimated by company to average 10% copper, with traces of lead and zinc, 5 to 40 oz. silver, and \$1 and upwards in gold, with occasional very high assays.

Development: property has been under development continuously with a small force, since the company took it in 1906. The 155' Fryer shaft develops a 4' vein carrying ore said to average about 9% copper and 20 oz. silver per ton. The Archipelago mine, the principal property, has a 250' incline shaft, and the mine as a whole has about 8,000' of workings, mostly in ore.

Equipment: includes a 35-h. p. gasoline hoist and 5 buildings. There is also a 75-ton smelter, built in 1912. Transportation is by wagon-road to Cumpas, freight being carried in two 90-h. p. gaso-electric trucks.

Being operated under lease, 1917, by Samuel E. Greenidge, of Douglas, Arizona.

MOCTEZUMA COPPER CO. MEXICO

Fully described under title of Phelps Dodge Corporation.

NACAZARI CONSOLIDATED COPPER CO. MEXICO

Address: P. O. Box 64, Douglas, Arizona. Mine office: Pilares de Nacozari, Sonora, Mex.

Officers: John G. Alexander, pres.-gen. mgr.; R. R. Humphrey, v. p.; B. R. Russell, sec.; Roy Hiatt, treas.; with Geo. S. Howard, Geo. Motz and Y. Soto, directors. Fred Alexander, mine and mill supt.; A. H. Ger-neth, purch. agt.

Inc. July, 1907, in Arizona. Cap., \$3,000,000; shares, \$5 par; fully paid and non-assessable; issued 535,000; 16,000 shares in treasury, Oct. 1, 1917; 15,000 shares sold for \$2.50 each in 1917. Annual meeting, second Monday in July.

Property: 15 claims, 360 acres, lying in 2 groups, adjoining the Pilares mine of the Moctezuma Copper Co. on the N. and W. and partly on the S. The Galera, or southern group shows andesite and brecciated rhyolite cut by several large veins carrying sulphide ores with gold-silver-copper-lead and zinc values. The Copper King or northern group shows a big red reef, 600' wide, of brecciated, silicious vein matter outcropping, evidently an extension of the Pilares deposit.

The Galera group is opened by a working tunnel, 2,600' long, in April, 1917.

Development: to date, 10,500', including shafts, crosscuts, tunnels.

In 1917, a double-compartment shaft was sunk 400' on the San Pablo claims and drifts were started from No. 2, 3 and 4 stations, opening up stopes of silver-copper-lead ore, 10' to 12' wide, the ore netting about \$100 per ton as shipped to smelter at El Paso.

A 100-ton mill, using fine-grinding machinery, Wilfley tables with National riffles and K. and K. machines for oil flotation, was put in operation in Sept., 1917.

In tuning up mill in Sept., low-grade ore put through mill produced two carloads of concentrate assaying \$100 per ton; two more were expected, Oct. 12.

NORTHERN SIERRA MADRE MINING CO. MEXICO

Address: D. E. Alexander, Humboldt Savings Bank Bldg., San Francisco, Cal. Mine near Soyopa, Sonora, Mex.

Officers: Chas. K. Blender, pres.; Carlo Giovannetti, v. p.; John O'Donnell, sec.; Fred Townsend, treas.; preceding, with D. E. Alexander, Fred Trevarrow and E. C. Curtis, directors. F. R. Luckhardt, gen. mgr.

Inc. Aug. 2, 1901, in California. Cap., \$300,000; shares, \$1 par.

Property: 167 acres, including La Reina de Cobre and Providencia copper mines and El Colosus siver-lead mine, 25 miles west of Suaqui de Batuc. Le Reina shows diabase, shale and limestone, carrying orebodies of oxidized and sulphide ores, with quartz gangue, estimated to average 15.5% copper, 20% lead, a trace of zinc, 73 oz. silver and \$8 gold per ton.

Development: by 633' of workings. Management estimates 4,854 tons of ore in sight, with 3,214 tons blocked out for stoping. Closed down owing to Mexican revolution.

PACIFIC SMELTING & MINING CO. MEXICO

Office: 20 Broad St., New York. Mine and smelter office: Fundicion, Sonora, Mex.

Officers: Melbert B. Cary, pres.; Geo. M. Ryall, v. p.; Nelson S. Haughwout, sec.-treas.; preceding, with Ronald E. Curtis, Howard McWilliams and Charles E. Wetmore, directors. Thornton C. Kirkland, asst. gen. mgr.

Inc. Oct. 6, 1909, in Maine. Cap., \$8,000,000; shares, \$5 par, issued in \$1,737,850 convertible cumulative 7% preferred stock and \$6,262,150 common stock; all issued. United States Corporation Co., New York, registrar. Annual meeting, third Monday in January, at Augusta, Maine. Listed on New York Curb.

General balance sheet: Dec. 31, 1916, shows property and securities, \$8,409,848; furniture, etc., \$200, and cash and accts. receivable, \$161,311, last item showing \$1,032 reduction, the others identical with 1915 statement. **Liabilities:** \$8,000,000 for stock, \$239,609 accts. payable, compared with \$237,972 in 1915, and \$333,750 surplus, compared with \$833,581 in 1915.

Holdings: company controls the Douglas Copper Co. and Mexican Exploration & Mining Co. by ownership of 98% of the capital of each company. These constituent companies hold practically the whole of the capital of 3 other Mexican companies. The subsidiary Mexican corporations are the Anita Mines Co., Yaqui Mining Co. and the following smelting companies: Compania Metalurgica y Refinadora del Pacifico, S. A., owning the Fundicion smelter; the Mexican American Smelting & Refining Co., S. A., owning the Guaymas smelter and the Sinaloa Smelting Co., holding the Mazatlan, or Sinaloa smelter concession.

Anita Copper Mines Co., S. A., owns the Anita Consolidated, Baroyeca, London, Julia and Maria claims, 330 acres, belonging to the Anita mine, 25 miles north of the Fundicion smelter and the station of that name on the Southern Pacific Railroad of Mexico. This mine has been developed to a depth of 900' on the dip of the vein and is said to show ore reserves above the 7th level, amounting to 55,000 tons, that average \$2.58 gold, \$1.17 in silver and 3.99% copper.

Geology: the Anita (or El Cobre mine), has a shear zone of 115' width, with a diorite foot and trachyte, or rhyolite hanging wall. The shear zone, traceable for several thousand feet, with N.-S. strike and dip of about 45° W., carries ore in 5 lenses, or chimneys, the principal one being opened from the surface down to the 8th level, branching into 2 parts at the 6th level. Faulting, cross-faulting and brecciation occurs with displacements up to 200'. The ore is partly metasomatic replacement of diorite, and partly a contact metamorphic deposit. It contains the usual oxide minerals succeeded in depth by chalcopyrite.

Development: consists of a 900' inclined main shaft, No. 1, with 9 levels opened and about 7,415' of workings. There are also 4 other shafts. The management plans further work as soon as enough basic custom ore is available to supply a suitable furnace mixture. Courtenay de Kalb reported that his examination showed about 55,000 tons of ore blocked out, with good indications for development of further orebodies.

The surface equipment consists of 2 cross-compound 2-stage Rand compressors of 3,000-cu. ft. combined capacity; a Risdon second-motion duplex hoist, 14x21"; three 150-h. p. boilers; generator for light and power; rock-crushers, picking tables, shops, assay office, office buildings, warehouses, dwellings, supplies, etc.

El Cobre ranch owned by the company has approximately 10,000 acres of wood and timber land.

The Pirita mine, of the Anita Copper Mines Co., embraces Pirita No. 2 and Pirita No. 3 claims, 81 acres, located 5 to 7 miles from Victoria station on the Southern Pacific Railroad of Mexico. The mines contain a considerable tonnage of pyritic ore having small values in gold, silver and copper, but the deposit has not been extensively developed on account of poor transportation, though in time it will become of value to the company for fluxing purposes.

Yaqui Mining Co., S. A., owns 10 mining properties in Mexico, which are as yet but partly developed. The Rosamond and Aurora mines each have about 800' of development work, exposing a fair tonnage of commercial copper-silver ore. The company also owns a number of slightly-developed prospects and some old mines nearby.

Compania Metalurgica y Refinadora del Pacifico, S. A., owns the Fundicion smelter and other properties. The smelter was built originally to treat the ores of the Anita mine and to do general custom business. The smelting plant has a capacity of 350 tons a day, but was designed and in part equipped for 3 times that amount. The plant has one 42x160' blast furnace, sampling mill, power house, shops, administration buildings, etc.

A railway connects all departments. Electric plant furnishes current for both lighting and power purposes, and all machinery excepting yard locomotives is motor driven. The plant is of modern design and in excellent condition.

The mine is 23 miles from a railway, and ore is hauled to the smelter by Saurer motor trucks. The road is good for 18 miles and bad for 5 miles, frequently muddy, with grades up to 12%.

The L'Aime lime quarry, located 2 miles from the railway near Victoria station, has 75 acres of limestone forming a hill 250' high, 300' wide and approximately 3,000' long. The rock is an excellent smelting flux, averaging but 1.2% silica, with about \$1 in gold; it was because of this gold content, determined by a special Government commission, that the company secured it as mineral land.

The Fundicion smelter was in blast for 9½ days in May, 1908, treating 300-tons charge daily, but owing to tap jacket troubles, about 15% of the value of the tonnage smelted was tied up in cleaning. As a result of this run, 3 carloads of matte, amounting to 73.5 tons, were shipped to the Nichols Copper Co. for refining. The shipment contained, as per report, 27,868 oz. silver, 172.2 oz. gold and 67,993 lbs. of copper and returned a net value of \$26,869.12. Mr. W. B. Budrow, who was the smelter superintendent at the time, and who had been connected in a similar capacity with several of the Guggenheim smelters, referring to the operation of the furnace, stated: "The performance of the furnace during this operation was very satisfactory, both from a metallurgical and economical point of view. The matte produced was clean and averaged over 46% copper, and notwithstanding the fact that it carried high values in both silver and gold, the slag losses in those metals were quite low."

Mexican-American Smelting & Refining Co., S. A., owns the Guaymas smelter with 250 acres, at Batuecas, a suburb of Guaymas, on tide water, lying between the Bay of Guaymas and the Southern Pacific Railroad of Mexico. The plant was originally erected by William C. Greene, founder of the Greene-Cananea Copper Co., and not having been operated for some years will need extensive alterations.

The Sinaloa Smelting & Refining Co., S. A., owns a concession from the Government for a smelter at Mazatlan, or elsewhere in the State, for a period of 20 years from the 27th day of April, 1906, and is particularly exclusive in its terms.

The smelters have been closed down since 1910.

Reported 1917 that Anita mine was working and shipping 50 to 100 tons a week, of high-grade copper-silver ore.

PHELPS, DODGE CORPORATION

See same title under United States mines.

PICACHO MINING CO. (CIA. MINERA DE PICACHO) MEXICO

J. S. Douglas, Cananea, Sonora, and associates, owners.

Property: 35 miles south of Cananea, has a deposit of cupiferous silver ore that has been under development since about 1909 and has been shipping ore to the Copper Queen smelter at Douglas.

PIEDRAS VERDES y ANEXAS; COMPANIA MINERA. MEXICO

Alamos, Sonora, Mex. Angel Almado, pres., at last accounts.

Property: about 15 miles N. W. of Alamos, and 2 miles north of the Rio Mayo, includes the Piedras Verdes, Union and Sonora mines, having a mineralized zone of about 1 mile width, and 4 miles length. Claims show red schists carrying copper carbonate stains at surface, with quartz dikes and numerous dioritic intrusions, the veins outcropping 10 to 40' in width and carrying considerable oxidized ore of good grade, with occasional native copper in masses of considerable size.

Development: by a 350' shaft and a 375' tunnel. Some churn drilling was done by the General Development Co., 1910.

Equipment: includes steam power, and a small matting furnace. Presumably idle.

PLATA-FINA MINING & DEVELOPMENT CO. MEXICO

Office: Pomona, Kansas. Mine office: Alamos, Sonora, Mexico.

Officers: E. G. Swayze, pres.; Dr. L. R. King, v. p.; C. N. Emery, sec.; E. A. May, treas.; T. P. Brinegar, mgr.; above with J. M. Nolan, A. P. Elder and J. W. Churchill, directors.

Inc. March, 1911, in Arizona. Cap., \$500,000, reduced to \$300,000; shares \$2 par; 114,720 shares issued.

Property: Plata-Fina group, 9¼ hectares; Cacharamba group, 8, Otila group, 10 hectares, and 2 new properties, about 100 acres in all, 4½ miles from a railway, in the Alamos district, shows several contact veins between granite and porphyry, in a zone 40' wide. Is said to have 6 oreshoots developed, all about 6' wide and carrying native silver in copper carbonate and chalcocite. Ore blocked out is given as 15,000 tons in the Arapes mine, estimated to be worth \$40 a ton.

Development: by 5 shafts, deepest 115', with about 3,000' of underground workings. Development work is being done in spite of the revolution, about \$8,000 having been spent in 1916. All drilling is done by hand. Shaft will be sunk to 300' depth, 1917.

PROMONTORIO CONSOLIDATED MINING CO. MEXICO

Office: 99 John St., New York. Mine office: Lampazos, Moctezuma district, Sonora, Mex.

Property: 11 groups, 1,410 acres, 3 miles from the forks of the Yaqui river; also a 12,000-acre ranch and the Marguerite and Inez claims, adjoining the mineral lands. Includes the Promontorio mine, 35 miles S. E. of Moctezuma, and about 30 miles from the nearest railway at Tonichi, an antigua, said to have produced the copper from which were cast the bells on the old church at Moctezuma, built 1640. During the American Civil War some bornite from this mine was packed on mules, 40 miles to Guaymas and shipped to Swansea for smelting.

The claim shows diorite, granite and limestone, carrying orebodies in a shear zone between granite and diorite, with high-grade bornite and low-grade disseminated chalcopyrite ore. The low-grade zone is upward of 200' in width, with a granite footwall, also carrying low-grade impregnations of copper.

The Inez mine shows a large gossan, mined for flux, underneath which is cupriferous pyrrhotite, carrying small gold and silver values, and the Inez is also said to have another orebody of promise, carrying auriferous and argentiferous copper ore.

Closed down since 1913.

QUINTERA MINING CO., LTD. MEXICO

London secretary and Office: J. G. Mills, 8 Crosby Square, London, E.C., England. Paris office: 1 rue des Mathurins, Paris, IXe, France. Mine: at Aduana, Alamos, Sonora, Mex. Jacques F. Kulp, chairman; A. Dubois, S. Einhorn and Ernest May, directors.

Inc. May 4, 1888, in Great Britain. Cap., £52,000, increased Nov. 18, 1901, from £40,000; shares £1 par, fully paid; all issued.

Annual meeting in June. Shares listed on the Paris coulisse. Accounts for calendar year 1916, submitted July 5, 1917, showed £840 loss; total deficit, Jan. 1, 1917, £19,956; reserve fund, £28,623. Operations suspended since 1911, owing to Mexican revolutions.

Dividends: 25% in 1900; 22.5% in 1901; 17.5% in 1902; 17.5% in 1903; 7.5% in 1905; 11.25% in 1906, and 5%, or 2s. 3d. in 1907; none since.

Property: 26 claims, 134 hectares, in the Alamos district, Sonora, and in the Fuerte district, State of Sinaloa, Mex., with ranches of about 7,400 acres. The mining property consists of 4 groups, the Quintra and Libertad, Azulaques and Constancia, Minas Nuevas, Cotera and Porvenir, and the Rosario group. Only the Quintera has been worked by the present owners.

Some 40 to 50 years ago a Frenchman owned this and the Rosario, a lead-silver property on Rosario mountain, where the States of Sonora, Sinaloa and Chihuahua touch. He had worked the Rosario extensively, the

ore being a lead carbonate containing much silver, and finally went to Paris, mortgaged both properties to the Egyptian-Paris Bank for \$250,000 and skipped out to South America. He has never been heard from since. After the bank acquired the properties, for many years they sent engineers out each year to examine and report. Finally, about 30 years ago, after several had reported favorably upon the Quintera, work was commenced.

The vein is strong on the surface, 18 to 20' wide, and has granite on the east and dark andesite on the west. It showed low silver values on the surface and 2 to 3% lead. With depth the value of the ore improved and under efficient management, the mine paid \$50,000 to \$100,000 yearly in dividends, notwithstanding that the general mill management was expensive.

The ore is 20 to 30' wide in the deeper levels and assayed 40 to 50 oz. in silver, the lead being replaced by 8 to 9% copper ore as depth increased. This copper ore was sorted out and smelted on the ground using mesquite charcoal at a cost of one-half cent per pound. The mine is on a hill 700' above the mill, and an aerial tram was put in to bring the ore to the mill. A shaft 500' deep was sunk at the north end of the property, from which a drift was driven 1,300' south and a winze sunk, ultimately to a depth of 1,000' below the surface. All ore was hoisted twice and trammed 1,300', when an adit from the mill 2,000 to 2,500' long would have tapped the winze 200' below the long drift, and the ore could have been trammed in cars direct to the mill. Even when the new shaft was sunk from the surface, this was done near the old one, instead of raising from the winze on the 500' level. At 1,500', the vein split. One branch was followed to the east in the granite; it contains no ore of value. A few hundred feet north of the shaft the main vein enters the granite on both sides and becomes barren. At the south end of the property the ore-shoot appears to be dipping into the Promontorio. Property considered valuable, but in consequence of the unsettled state of affairs in Mexico, the property is shut down indefinitely.

RICHFIELD COPPER CO.

MEXICO

Office: 812 Mears Bldg., Scranton, Pa.

Officers: Dr. J. K. Bentley, pres.; Dalbys L. Fickes, sec.; Otto Robinson, treas.; preceding, with Harry Witter, R. H. Gay, Geo. Stark, John Hershberger, Philip Robinson, J. A. Schadt, R. E. Mikesell, W. O. Smith, J. H. Wood and Jacob Huffer, directors.

Inc. 1902, in Arizona, as successor of Richfield Mining Co. **Cap.**, \$5,000,000; shares \$1 par; issued, 4,000,000. **Bonds**, \$250,000, authorized, at 6%; issued, \$230,000. **Scranton Trust Co.**, registrar. **Annual meeting**, 2nd Saturday in October.

Property: 1,300 acres of mineral property, with timber and ranch lands, total holdings 26,512 acres in the Ures district. The Dos Naciones group, 12 miles east of Tuape and 35 miles from a railway, is said to have 7 contact deposits between granite and limestone, of 10' to 60' estimated average width.

Development: includes about 10,000' of underground work, showing oxidized ores and chalcopyrite, reported by present management to average 4 to 15% copper, 7 to 40 oz. silver and \$2 to \$5 gold per ton. A body of good ore was reported at a depth of 350'.

Equipment: includes two 25-h. p. hoists and a 5-drill air compressor, several mine buildings and an 80-ton water-jacket smelter.

Shipments to the American Smelting & Refining Co. and Phelps, Dodge & Co., ran 9 to 10% copper, 10 to 32 oz. silver and \$2 to \$5 gold per ton. Management has been prevented from operating during the last years owing to revolutionary disturbances in Mexico, but plans resuming work when able.

SAN ANTONIO COPPER CO.

MEXICO

Address: Geo. J. Eisele, sec.-treas., Iron Mountain, Mich. **Mine office:** San Antonio de la Huerta, Sonora, Mex.

Officers: Otto C. Davidson, pres.; Dr. J. A. Crowell, v. p.; precedin

with John Uno Sebenius, D. M. Clemson, Hon. Richard C. Flanagan, E. G. Kingsford and W. H. Johnston, directors; John E. McIntyre, supt.

Inc. Sept. 23, 1908, in Arizona. Cap., \$2,500,000; shares \$10 par; issued, \$1,000,000 full paid and \$1,000,000, with \$3.50 paid on the latter. Direct title is held through the San Antonio Copper Co., S. A., inc. April 12, 1908, in Mexico, with all stock owned by this company. Annual meeting, 2nd Monday in April.

Property: 9 groups, about 7,500 acres, with 2,000 acres about 3 miles from San Antonio de la Huerta, near the Yaqui river. The property was worked 1862 in a small way.

Lands show a mineralized zone of 200' to 500' width. Ore includes high-grade oxides and carbonates, with sulphides of good average tenor, there being a considerable quantity of chalcocite, giving assays up to 11% copper.

Development: consists of 20 tunnels with 15,000' total workings, opening 7 separate orebodies in 2 tunnels, with 4,000' of workings in ore. Mr. Dwight E. Woodbridge estimated, March 4, 1910, that the San Antonio had exposed on one plane, 300,000 tons of ore; figured conservatively, averaging 7% copper, with very low values in the precious metals, and that the newer tunnels should increase this tonnage five-fold. Railway connections to within 2.2 miles of the main tunnels were secured, 1910, and will be extended to the tunnel mouth as soon as peace prevails again. Operations suspended on account of revolutionary disturbances since August, 1917. Property considered promising.

SAN XAVIER COPPER CO.

MEXICO

Idle. San Xavier, Sonora, Mex.

Officers: C. C. Rountree, pres.; Wm. Foster, sec.; W. C. Laughlin, mgr. Inc. in Arizona. Cap., \$1,000,000; shares \$1 par and holds direct title to lands through the Cia. Minera de Cerro Verde, S. A., inc. in Mexico.

Property: 1,440 pertenencias, 3,500 acres, 80 miles east of La Colorado in the Hermosillo district, Sonora; also 300 pertenencias lying 24 miles to the southward and about 4 miles north of the Yaqui river.

Letters returned in 1917.

SILVER SEAL MINING CO.

MEXICO

Mine at Pilares de Teras, Sonora, Mex. Fred O. Colsen, lessee at last accounts.

Property: includes El Aguaje mine, 12 miles east of Nacozari, showing a fissure vein in andesite rock cut by granite and carrying narrow pay-streaks of gray copper, chalcocopyrite and galena ore. The mine has yielded ore assaying up to 15% copper and 20 oz. silver per metric ton. Property worked intermittently during recent years.

SOMBRERETILLO MINING CO., S. A.

MEXICO

Was controlled by the Sonora Central Mines Co., now out of business.

SONORA CENTRAL MINES CO.

MEXICO

Fully described Vol. XI, Copper Handbook. Passed away; foreclosure proceedings took place about 1913, but provided no cash for the bondholders, so they took the property. No reorganization of the Sonora Central was made, but a new company was formed, known as the Alamos Dev. Co.; E. M. Board, v. p., 1510 Dayton St., Chicago; Walter Strong, sec.-treas.; 1638 So. Michigan Ave., Chicago, Ill.

SONORA CHIEF MINING CO.

MEXICO

Idle. Office at last accounts: 219 Argyle Bldg., Kansas City, Mo. Mine near Suaqui de Batuc, Sonora, Mex.

Officers: Jas. E. Crosby, pres.; Dr. Moses T. Runnels, v. p. and treas.; R. A. Bruns, sec.; preceding, with C. D. Stoll and I. D. Waggener, directors.

Inc. July 18, 1904, in Arizona. Cap., \$1,500,000; \$1 par.

Property: the Phoenix and Lakeside groups, 464 acres. The flotation was, it is believed, a crooked one. The property has no such showing as reported and described. Such veins as exist are tiny streaks a few inches wide, which in places contained very high-grade ore, chalcocite and perhaps whitneyite. Its location, on the far side of the Yaqui river, is such that even a remarkably good showing would not have been worth development at

the time the company was active. The property is totally devoid of merit. Idle several years.

SONORA COPPER MINING CO.**MEXICO**

Idle. Office at last accounts: 895 So. Clarkson Ave., Denver, Colo.

Officers: Edward J. Wilcox, pres.; H. L. Peebles, v. p.; Fred W. Webber, sec.; C. A. Parker, treas., and L. J. Stark, directors.

Inc. May 17, 1910, in Colorado. Cap., \$10,000; shares \$1 par.

Property: 10 claims, 4 miles from San Felipe, in the Arizpe district, Sonora, and 62 miles from Posa on the S. P. R. R., developed by 820' of underground workings, showing a 12' vein, with some complex silver-lead-zinc ore.

SONORA COPPER SMELTING CO.**MEXICO**

Idle. Last address: 424 Scarritt Bldg., Kansas City, Mo. Mine office: Noria, Sonora, Mex.

Officers: A. M. Conard, pres. and gen. mgr.; J. M. Lowe, v. p.; C. E. Kroh, sec.; W. R. Moore, treas.; preceding with J. G. Burnley, F. E. Reed, E. E. Axline, J. E. Kramer and Chas. L. Irons, directors.

Inc. June 25, 1908, in Arizona. Cap., \$3,000,000; shares \$10 par.

Company supposed to have been organized as successor of the Sonora Copper Co., but apparently owns only a 50% stock interest in that company, and title to the Mexican property is held in the name of the International Copper Ore Corporation, which is controlled, in some manner, by this company, the corporate relations being neither clear nor satisfactory. Annual meeting, 3rd Tuesday in December.

Property: about 500 acres, including the Cobre Grande, 123 acres, 3 miles east of Noria, the principal mine, is not considered worthy of the money spent upon it and the past history of the president is such that the company is regarded with much suspicion.

SONORA DEVELOPMENT CO.**MEXICO**

Office: 601 New Ridge Bldg., Kansas City, Mo. Mine office: Cumpas, Sonora, Mex.

Officers: Charles M. Williams, v. p. and act. pres.; Col. Geo. M. Bowie, v. p.; John W. Amerman, sec.; W. A. Rule, treas.; with A. A. Potter, B. H. Rule, and A. D. Fetterold, directors; Y. Soto, Sonora agent.

Inc. in Arizona. Cap., \$2,500,000. Company absorbed the Goodlander Mining & Milling Co.

Property: 167 hectares, including the Nacozari Copper Queen, Don Genario, La Gran Republica, and Lady Goodlander, copper, silver, lead and zinc; Pittsburg group of 7 properties, silver; La Madrugada and El Nocturno, copper and silver; and Wostenholm, gold and silver. La Gran Republica is leased to James Nolan of Nacozari, shipping ore to Douglas, Ariz. The Nacozari Copper Queen, 65 acres, between Pilares de Nacozari and Bella Union mines of Moctezuma Copper Co., contains some remarkably rich ore.

As conditions appear to be more favorable under Governor Calles, company hopes to resume early in 1918.

SONORA EXPLORATION CO.**MEXICO**

Estación Yzabal, Sonora, Mex.

Property: formerly held by the Florida Copper Co., in the vicinity of the El Tigre mine includes El Temblor, Last Chance, Texas, and other properties, carrying gold and silver-copper ore, developed by shaft.

Equipment: includes steam power and an air compressor. Idle.

SONORA MINING & DEVELOPMENT CO.**MEXICO**

Office: 207 Spitzer Bldg., Toledo, Ohio. Works office: Toledo, Sonora, Mex.

Officers: A. E. Klauser, pres.; H. R. Klauser, v. p. and gen. mgr.; J. G. Meilink, sec.-treas.; and A. V. Baumann, directors.

Inc. 1904, in Arizona. Cap., \$5,000,000; shares \$1 par. Company operated in Mexico under the name of the Yaqui Smelting & Refining Co., S. A., which is incorporated in Mexico; cap., 100,000 pesos. Company is exempt from the payment of property tax for 20 years and also enjoys a 50%

reduction on the state tax for 20 years. International Trust Co., Boston, registrar; Frederick R. Tibbetts, Boston, transfer agent.

Property: about 154 hectares of mineral property, and 1,000 acres miscellaneous lands, including a smelter site and town site. Mine is reached by a branch of the Southern Pacific Railway, and company has a government concession for construction of an aerial tram line of 40 kilometers length. Lands are in San Antonio de la Huerta, San Javier and San Onavos, about 80 miles east of Torres and about 60 miles below Campo Santo Niño. The principal property is the Veta Grande mine, about 10 miles from the smelter, said to show a gossan 40' wide, outcropping for a quarter mile. Property also includes the Almeda, Plomosa, Isabella, Moctezuma, San Francisco, Caballos, Ferruginosa, Independencia and Gerberina mines, carrying mainly gold-silver-copper ores, with some auriferous silver-lead ore.

Equipment: the reduction works include a sampler, smelter and power plant, with necessary adjuncts. The 150-ton smelter has a 36" circular Allis-Chalmers blast furnace, for use interchangeably on lead and copper ores, and a smaller furnace for copper only. The power plant includes two 80-h. p. water-tube boilers, 2 engines, an Erie high-speed engine and a No. 7 Connersville blower, for furnace blast. The lead refinery building has a softening furnace, refining furnace and 2 desilverizing kettles, operating on the Parks process. The silver refining plant includes 2 cupel furnaces, with blast attachments, 1 bullion furnace, 1 muffle furnace, and necessary pots and moulds, with a bullion vault. Idle since 1910.

SONORA-PACIFIC MINING CO.

MEXICO

Noria, Sonora, Mex. Ira E. Bowers, gen. mgr. Inc. 1911, as the successor of the Llano Copper Co.

Property: 10 groups, 526 hectares on Caracahui mountain, 3 miles east of Noria, the nearest rail point, also 5,000 hectares of ranch lands. Lands show limestone cut by intrusions of diorite and porphyry, with a quartz vein of 3' to 50' estimated width, traceable 6,000' on the company's claims, which is reported to show bunches of ore carrying chalcocite, bornite and chalcopyrite, with a little native copper, that will average about 7% copper: 6 to 10 oz. silver and \$2 to \$5 gold per ton, as developed.

Development: consists of the 105' No. 1 shaft, No. 4 shaft of 800', and No. 7 shaft of 600', with tunnels of 50', 200', 577' and 750'. Orebodies developed so far are too small and too few for commercial production.

Equipment: includes a 125-h. p. steam plant, with 2 hoists, and a 6-in. Ingersoll-Rand compressor. Presumably idle. Unfavorably regarded.

SUPERIOR BONANZA MINING CO.

MEXICO

Controlled through stock ownership of 60,000 shares by Greene Cananea Copper Co.

Office: Cheyenne, Wyo. Head office: Cananea, Sonora, Mex.

Officers: George Kingdon, pres.; John Cuddihy, v. p.; C. Sites, v. p. asst. sec.; J. V. Montague, treas.-asst. sec.; J. F. Carmichael, asst. treas.; A. E. Peterman, A. S. Cox, A. C. Cole and W. L. Thomas, directors.

Inc. in Wyoming, Aug. 31, 1907. Cap., \$1,250,000; shares \$10 par: 74,000 issued. Owns the entire capital stock of Bonanza Mining Co., S. A.

TECOLOTE COPPER CO.

MEXICO

See West Coast Smelting & Refining Co.

THARSIS-YORK CO.

MEXICO

Address: Thomas Pryor, 850 Putnam Ave., Brooklyn, N. Y. Mine office: Nacozari, Sonora, Mex.

Officers: Herbert E. Young, v. p.; Thomas L. Pryor, sec.; Willard T. Carleton, treas.; preceding, with R. C. Heath, E. C. Williams, W. R. Sparrow and Wm. J. Maloney, directors.

Inc. April 29, 1909, in Delaware. Cap., \$1,000,000; shares \$5 par: 200,000 paid and non-assessable; issued 145,761. Boston Safe Deposit & Trust Co. registrar and transfer agent, Boston, Mass. Annual meeting, 2nd Wednesday in April.

Property: 12 claims, 1,015 acres, in 6 groups, the Esquina, the main group, adjoining and lying between the Nacozari Consolidated Copper Co.

and the Pilares mine of the Moctezuma Copper Co., with 1 shaft near the boundary of the latter. There are several attractive orebodies on the property, 3 partly developed.

The Esquina claims carry a dike-like mass of red-stained mineralized porphyry, similar to the outcrop of the Pilares orebody and on the same line of fracturing. This outcrop is 600' wide and extends across the claims. Like the Pilares it has a footwall of white rhyolitic breccia, a hanging wall of andesitic breccia, and the lode filling is an altered, sericitized, silicified and mineralized rhyolite, supposedly with copper and iron sulphides below water level.

Development: includes considerable prospect work, with shafts of 168' and 170', latter planned to be sunk to 300' with tunnels of 330', 107', 268' and 485', the mine having about 1,500' of workings. The company was driving a crosscut tunnel to cut the lode at 800' in and to drain the bottom of the 168' shaft and continue across the ore zone. This mineralized belt has thus far shown only bunches of ore, but is expected to develop ore similar to that of the Pilares mine.

Equipment: includes an 80-h. p. electric plant, with a 25-h. p. hoist and a 3-drill air compressor, and the company has the use of the shops of the Moctezuma Copper Co. Was forced to close down in 1914, owing to revolutionary disturbances, and has been idle since then. Property considered promising and development well planned.

TIGRE MINING CO., S. A.

MEXICO

See Lucky Tiger Combination Gold Mining Co.

TRANSVAAL COPPER MINES CO. OF UTAH

MEXICO

Formerly Transvaal Mining Co. of Utah.

Mine and works office: Cumpas, Sonora, Mex.

Officers: Louis J. Hauck, 433 Dayton St., Cincinnati, Ohio, pres.; Theo. M. Foucar, 1st v. p.; Percy Andreae, 2nd v. p.; Alfred Vogeler, sec.-treas., with Louis Hehman, W. C. Geis, Leo G. Cloud, Bernhard Freiberg and J. J. Haas, directors.

Inc. Aug. 4, 1917, in Utah, as a reorganization of the Transvaal Mining Co. of Utah, which was a reconstruction of the Transvaal Copper Co. **Cap.**, \$4,000,000; shares \$5 par. Annual meeting 1st Tuesday after 1st Monday in May.

Property: 3,500 acres of mineral land, including a 50-acre smelter site with 75-acre townsite adjoining; La Piedra Verde ranch of 15,000 acres and an interest in the San Nicolas Tolentino ranch, 26,000 acres, including timber and grazing lands.

Geology: company's holdings cover the heart of a mountainous district showing widespread rock alteration with acid stream waters, bleached and iron-stained areas, and "chimneys" or "pipes" of silicified breccia. The tract shows granitic exposures, part of an underlying batholith, cutting recrystallized volcanic breccias, baked by contact action. In the Transvaal mines, both granite and this cover of fragmental rock are cut by irregular mineralized fractures along which orthoclase, carrying chalcopyrite, fluorite, chlorite, and calcite have been deposited by pneumalytic action. The "pipe" or "chimneys" of brecciated material cemented by quartz, are mostly barren, but in some cases, as at La Verde and Cobre Rico, contain workable copper ores. It is a peculiar type of deposit and resembles the Calumet-Copper Creek deposits of Arizona, the Kamloops mine in British Columbia and the neighboring Washington mine, 4 miles W. of the Cobre Rico property.

Extensive drilling at La Verde, or the Transvaal mine proper, has developed a great tonnage of low-grade primary ore, averaging 1½% copper and estimated by the management at 3,000,000 or more tons, which will doubtless be treated some day by flotation methods. The drills have shown the ore to extend to a depth of 1,100'.

Development: the Cobre Rico mine has 2 shafts, No. 1 of 100' and No. 2 about 140' deep, with several tunnels and about 16,400' of workings, including diamond drilling developing several orebodies in a mass of brecciated rock, locally called trachite. Ore is estimated to average about 2% copper, 1 to

2 oz. silver and a trace of gold. Management estimates 2,500,000 tons available in this mine.

The Transvaal or Verde mine has shafts, 318' and 210' deep, former the main working shaft with about 5,000' of drift and crosscut work including several tunnels. This development has opened up considerable low-grade ore carrying chalcopyrite which can only be treated by concentration. Development near the mine by diamond-drill work has shown the existence of a large body, or bodies, of primary ore, the cores varying from a trace up to 17.85% copper and 46.8 oz. silver for 2' at 1,032' depth. About 10,000' of drill work had been done up to March, 1913, which shows that the orebody is somewhat irregular in shape and spotty in character but of fair average value.

Equipment: at the Verde shaft includes two 80-h. p. boilers, a steam hoist and air compressor. The water supply at this mine is bad, owing to its acidity. Management estimates between three to four million tons of concentrating ore available at this mine.

The Buckeye mine has about 10,000' of tunnel work, on a blanket vein of 6" to 4' thickness, showing ore reported to have given average returns of 12% copper and 8 to 10 oz. silver, with a trace of gold. There are about 5,000 tons of high-grade ore left in the mine and a considerable amount of low-grade ore of no present commercial value. The mine, however, has been thoroughly explored in the bottom, or lower tunnel level and the ore shoot found to have played out.

The San Nicolas mine is a silver property about 8 or 10 miles from the Transvaal. It shows a vein along an igneous contact varying from 1' to 4' in width, carrying silver-lead ore said to change to copper in the lower workings. The mine is reported to have yielded 6,000 tons of 60 oz. silver ore and still has between 2,000 and 3,000 tons of 50-oz. silver ore, but is locally regarded as practically worked out, though the limited amount of development work does not disprove the downward extension of the ore shoot. It is regarded as a promising prospect, especially for lateral development.

The Ultima Chanza mine has a 300' incline shaft and a 100' winze, with about 5,000' of workings, developing a fissure vein of 10" to 42" width. The management estimates 50,000 tons of ore in sight, averaging 10% copper, 5 oz. silver and a trace of gold. This property is a good, but small mine, needing further development. Equipment includes a steam plant and hoist.

The Guadalupe mine carries cupriferous iron ore, used for flux.

The nearest rail station is at Nacozeni, 30 miles north, but the Cananea. Rio Yaqui y Pacifico railway has surveyed a line to within 9 miles of the smelter. The company has built about 35 miles of wagon roads and 25 miles of trails at a cost of \$50,000, with a maintenance charge of about \$5,000 yearly.

The main camp is at La Verde, 25 miles S. W. of Cumpas, where mining operations are centered. There are 20 buildings, including 3 power plants, machine shop, carpenter shop, smithies at the principal mines, 2 laboratories, a boarding house, general store, with a branch store at the smelter, a hospital, and several dwellings.

Smelter: at Cumpas, at an average distance of about 25 miles from the mines, was located at that point because of a good site and ample water supply, both lacking at the mines. Equipment includes a 125-ton 42"x120" El Paso Foundry & Machine Works water-jacket blast furnace, with room for 2 additional furnaces of the same size. There is a reverberatory furnace, variously rated by the company as of 20 to 50 tons daily capacity, and the works have a sampling mill, capable of sampling ore to feed 3 furnaces. The smelter power plant includes three 80-h. p. Babcock & Wilcox boilers, an Allis-Chalmers tandem-compound engine and a Connorsville blower. This smelter was blown in, May 1, 1906, treating ores from the Buckeye and San Nicolás mines and doing a little custom business, producing matte shipped to the Laurel Hill works of the Nichols Copper Co., that was reported by the company as averaging 37%-40% copper, 100-140 oz. silver

and 0.1-0.5 oz. gold per ton. The smelter was blown out, Oct., 1907, and has been idle since.

From May 1, 1906, to Nov. 3, 1907, a period of 18 months, the smelter, in operation about two-thirds of the time owing to scarcity of freighting outfits, smelted 18,550 tons of ore having an average assay tenor of about 10% copper and 8 oz. silver for copper ore, and 2% copper and 60 oz. silver for silver ore, making 3,089 tons of matte, yielding 2,178,855 lbs. fine copper, 407,607 oz. silver and 240 oz. gold.

The extensive development work done on the property since 1909, shows the existence of small veins of rich ore and large deposits of low-grade ore. The property is a valuable one and will be worked on a large scale when given the rail connections now lacking, but absolutely essential to the successful exploitation of the ores.

TRANSSVAAL MINING CO. OF UTAH MEXICO

Reorganized as Transvaal Copper Mines Co. of Utah, which see.

TRENTON-SONORA MINING CO. MEXICO

Mine office: Tarachi, Sonora, Mex.

Property: 4 miles S. of La Calera, includes the San José, Santa Eduviges, El Porvenir and other mines, carrying copper ores, with values mainly in silver. The San José mine is reported to show an 18" paystreak of highly auriferous chalcopyrite.

Development: by a 200' shaft, sunk on the vein, equipped with a hoist. There is a mill and a smelter. Probably idle owing to Mexican revolution.

UNITED MEXICAN MINES MEXICO

Idle. Mine near La Verde via Cumpas, Sonora, Mex. O. L. Neer, mgr., Douglas, Ariz.

Property: 40 miles S. of Nacozari, includes the Veta Grande and Cerro Gordo groups, near the Transvaal mine.

Mines show rhyolite, granite and porphyry, with several orebodies occurring in fissure veins, and as breccia deposits between trachite and granite. Ores are copper sulphides.

VICTOR MINING AND SMELTING CO. MEXICO

Office: 315 Schultz Bldg., Columbus, Ohio. Mine address: Cananea, Sonora, Mex.

Officers: S. D. L. Jackson, pres.; M. F. Cole, v. p.; F. P. Jackson, sec-treas.; preceding, with J. S. MacLean, W. H. Sartain, C. Thornton, Chas. Schindler and C. A. Stillwagen, directors; W. A. Woodlief, fiscal agt.

Inc. May 9, 1905, in Arizona. Cap., \$1,500,000, increased 1907, from \$1,000,000; shares \$10 par; issued, 90,000 shares. Title to property is held through the Guerrero Mining Co., legalized in Mexico. Annual meeting, 2nd Monday in January.

Property: 47 pertenencias, in 2 groups in the Magdalena district, about 12 miles S. W. of Cananea. The property shows fissure veins in granite-porphyry intruding sedimentary rocks. The veins are strong and well defined, very silicious and high in iron content.

Development: by a shallow shaft and 5 short tunnels, with a total of about 1,500' of workings, showing high-grade copper ore with small gold and silver values, in 2 veins of about 4' and 70' width, the wider vein showing evidences of considerable leaching. The mine has no power or equipment. Property closed down in 1914 owing to revolutionary disturbances in Mexico.

Mine was ordered sold at receiver's sale, Sept. 11, 1916, at Nogales, Ariz., but such sale could not be legal in Mexico.

WASHINGTON MINES DEVELOPMENT CO. MEXICO

Office: Douglas, Ariz. Mine office: Washington Mine, via Huepac, Sonora, Mex.

Officers: F. O. Bostwick, pres.; Geo. Cass, v. p.; Albert Sames, sec-treas.

Inc. 1911, in Arizona. Cap., \$1,500,000; shares \$10 par; issued 130,000 shares.

Property: 27 claims, patented, 76 acres, with options on 200 acres additional in the Arizpe district, 60 miles from Nacoziari, the nearest rail point. Claims show several big "pipe" ore deposits composed of brecciated rhyolite in dacite. Ore is reported to average 3.2% copper, 0.35% tungstic acid; 1.5 oz. silver and 25 oz. in gold.

Development: by 3 tunnels and 2 air shafts with a total of about 6,000' of workings said to show 600,000 tons of ore blocked out for stoping. Company plans development at depth by sinking a winze from No. 2 tunnel level, 313' below the outcrop, and expects to add 4 additional levels to the workings with the funds in hand.

Equipment: includes a small steam plant with hoist good for 500' and 50-ton concentrator. A mill was being erected in 1916 to treat tungsten ores.

Property promising, but needs railroad transportation for profitable working. Reported under option 1917 to Henry Hovland of Duluth.

WEST COAST SMELTING & REFINING CO.

MEXICO

Office: C. H. Kittredge, treas., 30 Church St., New York.

Property: at Tecolote, via Carbo, Sonora, Mex.

YAQUI CANYON COPPER CO.

MEXICO

Idle. **Former offices:** 408 Gumbel Bldg., Kansas City, Mo., and Suaqui de Batuc, Ures, Sonora, Mex.

Officers: at last accounts, A. J. Davies, pres.; S. M. Major, v./p.; W. T. Kerr, sec.; Frank B. Foster, treas.

Inc. in Ariz. Cap., \$2,000,000; shares \$1 par.

Property: 60 pertenencias, 148 acres, known as the Todos Santos and Great Republic mines, and a 50-acre smelter site, has contact deposits between limestone and porphyry, two under development, of 10' estimated average width, carry copper and lead ores, former said to assay 7% copper and 50 oz. silver, and latter 15% lead and 30 oz. silver, with a trace of gold. The principal property is an antigua.

Development: by 4 tunnels and 7 or 8 shafts.

Equipment: includes a steam plant, air compressor and a small smelter, with a 10-ton reverberatory furnace. Presumably idle as the region in which the mine is situated is notoriously unsafe since the Mexican revolution began.

YAQUI COPPER CO.

MEXICO

Office: 1 Madison Ave., New York. **Mine office:** Suaqui de Batuc, Ures, Sonora, Mex.

Officers: Wm. Sauntry, pres.; Dr. A. E. Magoris, v. p.; Hon. Geo. E. Green, sec.-treas., at last accounts.

Inc. 1902, in West Virginia. Cap., \$5,000,000; shares \$1 par.

Property: originally claimed to be 6,032 acres of mineral territory, and 119,284 acres of timber and grazing lands, also water rights to 25 miles of the Yaqui river, the mining lands being in the vicinity of Suaqui de Batuc, Campo Santo Nino, in the Sierra Madre, 120 miles from Hermosillo. Property is claimed to show antigua workings, iron ore and indications of coal. In June, 1906, the Montana de Cobre Co. was said to have acquired 1,000 pertenencias formerly held by the Yaqui Copper Co.

Development: begun, 1901, is by 2 shafts and 8 tunnels, and so far as can be learned the mine has shown practically no ore. Improvements include an engine and boiler house, office building and store.

The company was promoted with \$10,000 offices, magnificently furnished, in which visitors were royally entertained and given handsome ore samples. Company's literature was untruthful, its representations gross exaggerations, and its property practically valueless. It caused as much misery and harm as any mining fraud ever perpetrated. See Vol. VIII of Copper Handbook for full description.

Letters returned unanswered in Oct., 1916.

YAQUI MINING CO., S. A.**MEXICO**

Fundicion; Sonora, Mex. Geo. M. Ryall, pres., care Jonathan Club, Los Angeles, Cal. Inc. in Mexico.

Owned by Mexican Exploration & Mining Co., controlled by Pacific Smelting Co. Property is described under latter title.

YAQUI SMELTING & REFINING CO., S. A.**MEXICO**

San Antonio de la Huerta, Ures, Sonora, Mex. Is the Mexican operating company of the Sonora Mining & Development Co., and described under latter title. Fully described Vol. VIII of the Copper Handbook.

ZAMBONA DEVELOPMENT CO.**MEXICO**

Idle. Mine office: Minas Nuevas, Alamos, Sonora, Mex.

Officers: R. R. Coleman, pres. and treas.; Wm. S. Cranz, v. p.; C. W. Hayes, sec., at last accounts. Is supposed to be owned by Pacific Smelting Co.

Property: includes the Zambona, Purisima and San Antonio mines, said to have produced about \$7,000,000 worth of ore, in the past, carrying native silver, argentite and chalcocite, with values largely in silver. Developed to depth of 730', and by a long crosscut tunnel. There remain about 200,000 tons of low-grade disseminated ore on the dumps, available for milling and cyaniding.

Equipment: includes a steam and electric plant, a 30-stamp mill having 4 Huntington mills and 3 tube mills, and a 100-ton cyanide plant. Idle and company probably dead.

STATE OF TEPIC**LA JARA GOLD MINES CO.****MEXICO**

Idle. Office: J. W. Dunham, 501 Fifth Ave., New York.

Officers: W. P. Dunham, pres.; E. G. Thomas, v. p.; J. W. Dunham, sec.-treas.

Inc. in Maine. Cap., \$3,000,000; shares \$1 par; non-assessable; 2,500,000 issued. Is the holding company of La Jara Gold Mines Co. of Mexico. Organization and titles are certified by H. L. McNair, attorney, 120 Broadway, New York.

Property: the old Natividad group of claims, 298 acres, at La Jara, territory of Tepic, Mexico. Examined by C. E. Gillette, E. G. Thomas, U. S. York and I. J. Hall. Claims said to show several large quartz veins in andesite carrying gold-silver ore. Openings are mostly by tunnels. Mine was under development until July, 1916, when conditions in Mexico became impossible and mine was left in charge of a Mexican superintendent. Reported late in October, 1917, that property would be reopened as soon as conditions warranted.

In 1917, company acquired an option on the Jim Crow-Imperial group of patented claims, about 123 acres, in the Steeple Rock district, New Mexico, about 7 miles E. of Duncan, Ariz. Said to have made ore shipments in the past running from \$22 to \$500 a ton in gold and silver.

STATE OF ZACATECAS**EL EDEN; COMPANIA MINERA y BENEFICIADORA****MEXICO**

Idle, owing to revolution. Mine at El Eden, Zacatecas, Mex. Francisco Llamosa, pres. and gen. mgr.; Enrique Gutierrez, sec.; Luis Colina, supt.

Inc. 1905, and reorganized 1907, in Mexico. Cap., 600,000 pesos; shares 100 pesos par.

Property: 102 hectares, is a silver-gold mine with incidental copper.

Development: by 8 shafts, deepest 210', and 2 tunnels aggregating 1,120' in length, with considerable underground workings, developing ores of gold, silver, copper, lead and zinc.

Equipment: includes 40-stamp mill with 2 Krupp tube mills, 6 Wilfley tables and 6 Johnson tables; company planned installing a cyanide plant, to treat a large amount of tailings accumulated, the dump being estimated to average 400 to 500 grams silver and 3 to 5 grams gold per metric ton.

ESMERALDA; NEGOCIACION MINERA. MEXICO

Idle. Property: at Chalchihuites, Sombrerete, Zacatecas, Mex., includes the Anaconda, Esmeralda and La Luz mines, developed by shafts and tunnels, carrying argentiferous and auriferous lead and copper ores.

LEONORA y HUERTA; MINAS. MEXICO

Office: care James M. Daniel, owner and gen. mgr., April 16, Aguascalientes, Mex. Mine near Villanueva, Zacatecas, Mex.

Property: 100 acres, with 500 acres miscellaneous lands, in the Jalapa district, said to show a fissure vein in porphyry, of 10' average width, carrying galena, argentite, melaconite and azurite, with clay gangue, and about 5% copper, 10% lead, 200 oz. silver and 29 milligrams gold per ton. Mine was opened in 1820, and reopened 1883.

Development: by shafts of 300' and 1,000', with about 1 mile of underground workings.

Equipment: includes steam power and a concentrator. Concentrates and smelting ores shipped, 75 miles, by pack train, to the Aguascalientes smelter, when operating. Presumably idle. No returns secured.

MAGISTRAL, S. A.; NEGOCIACION MINERA DEL. MEXICO

Office and mine: Aptdo 22, Zacatecas, Zacatecas, Mex.

Officers: Dudley H. Norris, pres.; Chas. O. Gilbert, mgr. Company, a close corporation, is said to have paid for improvements from net earnings. Owns the Refugio de Magistral and San Roberto mines.

The San Roberto mine, about 300' deep, has iron ore carrying small values in copper, silver and gold, used for fluxing, and also has a little high-grade silver and silver-lead ore.

The Magistral mine carries chalcopyrite and galena, and ore is produced returning about 6% copper and up to 200 grams silver per metric ton.

Development: by a 900' tunnel and 2 shafts, 1 of 400' depth, the second, with 3 compartments, is to be sunk 1,500'.

Equipment: includes a 40-h. p. gasoline and 150-h. p. steam hoist, boiler plant, compressor, etc.

The reduction plant, at Magistral siding, on the Mexican Central line, connected with the mine by a narrow-gauge railway, includes a 50-ton sampling mill and a 200-ton smelter. Slags are highly silicious, and matte is sent for conversion to the Torreon smelter. Works treat about 2,000 tons of ore monthly, including a considerable amount of custom ore. About 150 men employed. No recent returns secured. Property practically idle owing to Mexican conditions.

NATIONAL SMELTING CO. MEXICO

Properties said to be lost to company through the revolution in Mexico and a claim for indemnity has been filed with Dept. of State. Practically dead. See Vol. XI for description.

PROTECTORA y ANEXAS; COMPAÑIA MINERA LA. MEXICO

San Salvador, Mazapil, Zacatecas, Mex. Percy A. Babb, pres. and gen. mgr.; J. L. Miranda, assec.

Inc. 1907, in Mexico. Cap., 100,000 pesos; fully paid.

Property: 68 hectares, including La Protectora y Anexas and San Francisco mines carrying oxide ores, with copper, lead and zinc occurring as re-

placements in limestone. Low-grade ores average 2.5 to 5% and high-grade ores 12 to 19% copper. Mine has a depth of 100 meters with about 1,500 meters of workings.

Equipment: includes a 15-h. p. gasoline hoist. Was working with about 200 men, early 1913, and shipping around 250 tons of high-grade ore monthly. No recent reports received and presumably closed down.

SAN BERNABE y ANEXAS; COMPANIA MINERA. MEXICO

Zacatecas, Zac.; Mex. C. A. Bentley, mgr., at last reports.

Property: 25 hectares, including La Confianza, El Faro and La Fama mines, west of the Malanoche mine, includes the oldest mine in Zacatecas, discovered about A. D. 1546, which was a considerable producer of silver. Property formerly was under option to an English company, but option was dropped after unwatering the old shaft. Ore is copper, associated with some lead, values being mainly in silver. Idle.

SAN BERNARDO MINING CO. MEXICO

Is the Mexican incorporation of the Southern Sonora Development Co., controlled by the Sonora Central Mines Co.

SAN ROBERTO MINING CO. MEXICO

Zacatecas, Zacatecas, Mex. C. A. Bentley, gen. mgr.

The mine, opened to depth of 300', shows copper, lead and zinc ores, occasionally assaying up to 30% copper with good gold and silver values. The mine has given a limited production of excellent ore.

In a letter entitled "C. A. Bentley vs. American Metal Co.," in Mining and Scientific Press of April 7, 1917, Otto Sussman, v. p., of the American Metal Co. contradicts a previous statement concerning the San Roberto Company. C. A. Bentley, acting for the San Roberto Mining Company, made a contract with H. A. Houser, of the Compañia Minera y Compradora de Metales, the latter to purchase 10,000 tons of zinc ore. Houser tried to sell this ore to the Compañia de Minerales y Metales Compañia Minera de Penoles, and the American Metal Co., but they refused it as the ore contained under 25% zinc. Houser had, it is said, no authority to act for these three concerns. Houser's company being financially irresponsible the suit against it was dismissed, apparently as his reward for testifying against the American Metal Co., showing evidence of complicity between Houser and Bentley. Eventually the American Metal Co. was adjudged responsible for the contract, with damages at \$60,000 to cover alleged profits that might have been made under the contract. Evidence showed no connection of the American Metal Co. in the contracts and the case has therefore been appealed.

SANTA ROSA MINING CO., LTD. MEXICO

Subsidiary of the Exploration Co., Ltd.

Office: T. D. Dillans, 24 Lombard St., London, Eng, E. C.

Directors: R. T. Bayliss (chairman), S. A. Cloman, J. E. D. Ryder, J. H. M. Shaw and the Earl of Hardwicke.

Inc. Nov. 24, 1910, in England. Cap., £150,000; shares £1 par; 100,007 issued. Debentures: £35,500.

Property: in the Mazapil district, Zacatecas, Mexico. Since 1913 the mill has not operated, owing to the revolution.

TRES SENORES MINING CO. MEXICO

Mine: at San Pedro Ocampo, Zacatecas, Mex.

Property: includes La Providencia and La Poderosa mines, near San Pedro Ocampo, yielding ores that have given smelter returns of 10% copper, 3,234 grams silver and 120 grams gold per metric ton. Closed down at last report.

AFRICA

AFRICA

CAPE COLONY

CAPE COPPER CO., LTD.

CAPE COLONY

Secretary: P. J. Franks, 9 Queen St. Place, London, E. C., England.
Mine office: O'okiep, Little Namaqualand, Cape Province; James Crozier, gen. supt. **Works office:** Briton Ferry, Glamorganshire, Wales. T. Blair Reynolds, chairman; John Taylor, J. M. V. Money-Kent, Marcel Paisant, John E. Champney, directors; John Taylor & Sons, mgrs.; J. Crozier, supt. Cape Colony mine and Chas. Olden, supt. Rakha Hill mine, P. G. Timms, chief engr.; N. E. Moffatt, traffic mgr.; H. Phillips, smelter supt.; Dr. A. de W. Allan, chief surgeon.

Inc. April 30, 1888, as a reconstruction of Cape Copper Mining Co., Ltd., under the laws of Great Britain, capitalization £950,000, in 75,000 cumulative 6% preferred shares, of which 45,000 are issued and fully paid, and 400,000 ordinary shares, par £2; issued 360,000. Annual accounts are made up to April 30, at the Cape, and to August 31 in London and India, and are submitted in December.

Balance sheet (1916) showed assets of £1,632,160 of which estates, rail-ways, jetties, mines, smelting works and machinery aggregated £895,320; stocks and supplies, £120,293; cash receivable and on hand, £63,056; investments in various government stocks, etc., £116,308; copper and metal in stock, £407,544. Profit and loss was £69,077. Profit and loss account showed mining costs, etc., of £104,745 and total profits from metals, interest, etc., £269,840; balance as carried down, £131,248 with that of 1915, £25,674 gave £156,923 as total balance. Of this £87,846 was paid as taxes and dividends.

Profits have ranged from a net loss of £6,493 17s. 9d. in 1902, owing to interruption of business through the Boer war, this being the only year in which no profit was earned, up to the maximum profit of £379,910 in 1907, with profits of £144,366 in 1908; £90,223 in 1909; £124,659 in 1910; £60,862 in 1911, £80,494 in 1912, £83,500 in 1913, £17,244 in 1914, £33,212 in 1915, £131-248 in 1916, giving a total net profit to Jan. 1, 1917 of £4,144,667, in addition to which the Cape Copper Mining Co., Ltd., paid dividends, 1864-88, of £1,324,375 representing £67 13s per share on original £10 shares, £8 paid in. The present company has paid dividends to Jan. 1, 1917, amounting to £3,036,750 on ordinary shares and £391,725 on preference shares.

On Jan. 1, 1918, 1s. 9.6d. on cum. pfd. shares, and 3s. on ord. shares will be paid.

Property: principal mines of the company are in Little Namaqualand, Cape Colony, lands including about 280 acres of freehold and a few leasehold tracts. The first mines were opened, 1856, by Phillips & King, and were taken over, 1860, by the predecessor of this company. Principal mines 1916, are the O'okiep, Nababeep South, Nababeep North and Narrap mines in Cape Colony; and the Rakha Hills mines in India, with a number of idle mines and prospects, among which is the Terra Nova mine in Newfound-land. Ore contains chalcopyrite, with limited quantities of bornite and chalcocite, intimately associated with pyrite. These irregular deposits of

massive pyritic ore are associated with basic igneous dikes, intrusive in granite and gneiss.

Cape Colony Mines.

The O'okiep mine, long the principal mine, has dwindling ore reserves, estimated, 1916, at only 6,000 long tons, though production has remained practically unchanged for some years and was 13,496 tons net dry weight of 11.22% copper tenor in the fiscal year 1916, containing 151,527 units. It is estimated that there are 120,000 tons of 4% copper ore at the surface. About 514' of drifting was done during 1916.

The NababEEP mine, 5 to 6 miles west of O'okiep, opened 1890, includes the NababEEP South, now the principal producer, and has reserves, estimated, April 30, 1916, at 120,000 tons of 5% ore, production for year ending that date being 70,677 long tons of ore assaying 3.7% copper, containing 261,827 units. Of this production 24,959 tons were from quarrying and open cuts. The returns of the previous year were 68,141 tons of 4.35% copper. The mine is developed by tunnels and a shaft.

The NababEEP North mine extracted 1,326 tons of 4.96% copper, principally from the capping, and containing 6,581 units of copper.

A summary of combined outputs from North and South mines showed an extraction of 72,003 tons, of average assay of 3.72% and containing 263,409 units of copper as compared with 69,798 tons assaying 4.41%, containing 307,909 units of copper for previous year. The average grade of mineral has decreased somewhat in value. Development work for year totaled about 1,560'.

The Narrap mine, about 1 mile east of the O'okiep East, with somewhat similar ore, yielded 4,494 long tons of 5.37% ore in 1916, containing 24,130 units of copper, as compared with 2,692 tons, assaying 4.79% the previous year since the close of the financial year operations have been suspended to effect economies because of the war. This property has an aerial tram, electric hoist and ore crusher. The Narrap South mine, opened to a depth of 120', is without important developments.

The Spektakel mine, 28 miles west of O'okiep, is an idle, old mine, having orebodies both in granite and basic intrusive rocks.

The Carolusberg mine, about 6 miles southeast of O'okiep, opened by tunnel, and the Carolusberg East mine, about 2 miles east of the Carolusberg, are both idle.

Other idle properties include the Flat mine, 4 miles north of NababEEP, which was reopened, 1907; the Kopperberg mine near the Carolusberg, about 5 miles southeast of O'okiep, and the Coetzee mine, which was abandoned and plant removed several years ago.

Electric power has been substituted for steam throughout the principal works, the central power station at the O'okiep mine having 2 suction gas engines, with the old steam plant held in reserve for emergencies.

Reduction works at the mines include smelters at O'okiep and NababEEP, the former closed down 1912, the ore from both mines being treated in the enlarged NababEEP plant, 1913. In 1916, there passed through the furnaces 91,207 tons of ore, slag and flue dust. Production of the smelter is matte of 48 to 50% copper tenor, shipped to the Briton Ferry works for resmelting and refining. For 1916 the average assay of the regulus from the two furnaces was 43.83% copper.

The company owns a 99-mile railway, with 16 miles of sidings, running from O'okiep to Port Nolloth, where there are docks, wharves, cranes, tugs and lighters for the receipt and dispatch of freight. The line is laid with 32, 37 and 50-lb. rails. Freight traffic for fiscal year ending 1916 was 91,250

long tons. The company also owns 4 tugs at Port Nolloth. A tram line connects the principal mines with the smelters. There are about 1,500 men employed at mines, smelters, docks, etc.

In addition to its mines in South Africa, the company has the Terra Nova mine, in Newfoundland, which produced 6,265 tons, assaying 2.41% copper and 37.23% sulphur. No output at present because of high freight rates. Ore reserves estimated at 10,630 tons. Properties in the United States, formerly held under option, were surrendered, 1910, but the company secured title to some claims in Alaska, on which no work is planned until a railway reaches the district.

Rakha Hills Mine—India.

The company has also taken a lease on the Rakha Hills, or Rajaoka property, at Surda, India, and spent £32,058 on its development. This mine shows an extensive belt of cupriferous schist, in blanket formation, with seams of copper ore of 2 to 6% tenor. Development is by several shafts, the main shaft showing 236,401 short tons of 4.12% copper developed and 43,372 tons at 2.93% probable ore; and the No. 4 shaft showing 72,013 tons of 3.74% copper developed and 4,423 tons of 2.51% copper as probable ore. In addition to this there are 36,939 tons of broken ore on surface averaging 3.23% copper, making a total ore reserve of 393,148 tons of about 3.89%. During 1910-12, a number of boreholes were drilled with a total of 9,700', proving the copper belt for nearly 1½ miles. Development work to March, 1916, amounted to 10,829' in Main shaft section and 1,936 in No. 4 shaft, or a total of 12,765, an increase over 1915 of 366' of drifts. In addition to this there has been done 11,260' of winzes, raises, crosscuts, etc. The main shaft is 1,126' deep, the No. 4, 423'; No. 5, 328'; and No. 6, 569'. The new construction plant has been completed and trial runs made. Entire mill was put into operation in Oct., 1916. The smelter plant is progressing rapidly. New equipment, such as transmission lines, steel head frame and equipment at Main shaft, compressor and power plants, etc., have been installed. Property is considered very promising.

Briton Ferry Smelter.

The Briton Ferry smelter, which is the largest in Wales, in addition to treating the company's own ores, does a general custom business, smelting the ores of the Namaqua Copper Co., Ltd., under contract, treating 13,879 long tons of Namaqua ore and 883 tons of Namaqua matte of 54% copper tenor in 1906. The Briton Ferry works are located on the Great Western and Rhondda railways, also having canal connection with Swansea, receiving ores mainly by rail. The works have revolving cylindrical calciners up to 80' in length, heated by gas, and four 70-ton blast furnaces, making matte. Ores are smelted, without calcining, in reverberatories, to a 76% white metal, which is refined by the Nichols direct method, by which some of the white metal is calcined and mixed with uncalcined white metal, the consequent reaction eliminating the remaining sulphur. Tilt Cove sulphide ores are burned in kilns for their sulphur contents, fumes going to an acid plant, which makes 30,000 tons of chamber acid yearly. The works have a double concentric chimney of steel and concrete and a telpherage plant for handling material. In 1906 the Briton Ferry works produced the equivalent of 10,212 long tons of fine copper, of which 733 tons were turned out as bluestone, and output was increased, 1909-10. The works include an electrolytic refinery, constructed 1912.

Production: of the African mines has been as follows: 8,960,000 lbs. fine copper in 1901; 6,061,000 lbs. in 1902; 10,371,200 lbs. in 1903; 12,264,000

lbs. in 1904; 11,256,000 lbs. in 1905; 8,825,600 lbs. in 1906; 9,475,200 lbs. in 1907; 10,035,200 lbs. in 1908; 10,404,800 lbs. in 1909; 9,867,200 lbs. in 1910. Later metal figures are not available, but in 1914-15 the ore output was 81,496 tons, and in 1915-16, 84,173 tons. In July, 1917, 4,246 tons of 3 to 6% ore yielded 360,640 lbs. copper. In August smelting was suspended through coke shortage.

The management has been criticized occasionally for not adopting the latest methods and machinery, but the circumstances of the case have precluded as rapid advances in this direction as would be warranted were the company mining enormous orebodies. The record of the Cape Copper Co., Ltd., as a steady dividend payer, for 40 years past, is perhaps the best answer to such criticisms, founded upon part misconception of the facts. The company issues full monthly reports to stockholders that are models, and could be imitated by other companies to the advantage of the investor.

NAMAQUA COPPER CO., LTD.

CAPE COLONY

Head office: A. W. Outram, sec., 3 Fenchurch St., London, E. C., England. Mine office: James Garland, Concordia, Cape Colony, South Africa. Officers: William Rich, managing director; Thomas V. Anthony, H. von Berg, F. J. King, C. L. H. Loeffler, directors.

Inc. April 23, 1888, in England. Cap., £200,000; shares £2 par; 94,331 issued.

Balance sheet for 1916 showed ore sales amounting to £249,111, of which £78,407 was profit, after writing off depreciation, etc. Dividends absorbed, £61,314. There was carried forward £16,241. Reserve fund was £70,000.

Dividends: since 1888 total 426%, including 25% for 1916.

Property: 680 acres at Concordia, Little Namaqualand, Cape Colony, South Africa, known as the Tweefontein, Wheal Julia, Henderson's and Hester Maria.

Development: in 1916 totaled 1,769'. Exploration in the Tweefontein was rather disappointing; the eastern section is being prospected. Results in the Wheal Julia and Henderson's were also not very encouraging.

Ore reserves: estimated at 51,264 tons (40,000 in Tweefontein), containing 6,630,000 lbs. of copper, or 6.5%, a decrease of 15,467 tons. Tailings in reserve of 3 to 5% tenor, amount to 59,000 tons.

Equipment: mining plant, sorting plant, mill and Elmore flotation plant, briquetting plant, precipitating tanks, smelter and power plant.

Production: in 1916 the smelter reduced 32,958 tons of mixed ore, etc. yielding 3,763,200 lbs. of copper.

GOLD COAST COLONY

ABBONTIAKOON MINES, LTD.

WEST AFRICA

Office: E. Price, sec., 19 St. Swithin's Lane, London, E. C., England. Officers: E. Davis, chairman; W. A. Aikin, Lord Brabourne and the Earl of Verulam, directors. S. H. Ford, supt. engr.; Consolidated Gold Fields of South Africa, cons. engrs.

Inc. Feb. 24, 1909, in England. Cap., £800,000; shares 10s. par; 1,571,601 issued.

Revenue in 1915 totaled £261,024, of which £51,490 was net profit. Adding previous balance there was available £66,889, of which £31,834 was distributed and £35,055 carried forward.

Dividends: in 1914, 20%; in 1915, 5%.

Property: 918 claims (1½ acres each) near Tarkwa, Wassau, Gold Coast Colony, West Africa.

Development: by 3,200' shaft. Reserves are given as 429,381 tons of \$10.20 gold ore.

Equipment: 25 stamps, tube-mills, and cyanide plant of 12,000-ton monthly capacity.

Production: in 1916 was 117,885 tons yielding £231,000. Costs are about \$6.50 per ton.

ABOSSO GOLD MINING CO., LTD.

WEST AFRICA

Office: 460 Salisbury House, London, E. C., England.

Directors: D. H. Bayldon, M. Attenborough, T. F. Dalglish, F. H. Hamilton and Sir J. S. Hay; E. W. Spencer, supt.

Inc. June 18, 1901, in England. **Cap.**, £400,000; shares £1 par; all issued.

Statement for year ending June 30, 1916, showed a profit of £25,024.

A dividend absorbed £20,000. Adding previous balance, there was carried forward £35,646.

Dividends: since 1905 total 65%, 5% being paid in 1916.

Property: in the Wassau district, Gold Coast Colony, West Africa. Ore reserves are estimated at 237,280 tons, worth \$7.80 per ton.

Equipment: complete for mining, also 50 stamps, tube mill, grinding pans and cyanide plant.

Production: during the last financial year was £179,459 from 113,300 tons. Costs were \$6.14 per ton.

ASHANTI GOLDFIELDS CORPORATION, LTD. WEST AFRICA

Office: H. Morgan, sec., 6 Southampton St., Holborn, London, E. C., England.

Directors: Earl of Bessborough (chairman), J. Colman, G. L. Johnston and C. W. Mann. J. S. Watkins, mgr.; W. R. Feldtmann, cons. engr.

Inc. May 25, 1897, in England. **Cap.**, £250,000; shares 4s par; 1,103,057 issued.

Statement for year ended June 30, 1916, shows a profit of £173,281, of which £154,428 was paid in dividends; £89,052 was carried forward. Reserve fund stands at £117,375.

Dividends: since 1900 total 752%, 50% being paid in 1916.

Property: 100 sq. miles at Obuasi, in Gold Coast Colony, West Africa. Mine is the largest producer in the region.

Geology: the Obuasi shoot occurs in disturbed ground, close to the intersection of two fissure planes. The normal fissure filling or vein formation is a brecciated graphitic schist, in places very friable. The main vein is a solid quartz body 1,000' long on some levels, and from 3 to 40' wide. The ore, owing to parallel streaks of graphite, has a banded structure. Some gold is free, the remainder being in pyrite and other sulphides. The Ayeinm shoot, in the same main fissure, is pear-shaped in horizontal section, being 700' long and from 4 to 60' wide. Gold content in both shoots is erratic.

Development: by shafts to 2,000' depth. Mining is rendered difficult by the weakness of the containing formation, the irregular and considerable width of the quartz, the flat pitch of the shoot and the graphitic selvedge on the footwall. Reserves at Sept. 30, 1916, were 436,600 tons, assaying \$24.90 per ton. Ore extraction costs \$2 and development \$1.50 per ton. Methods are described by H. I. Johnston in the Mining Magazine of Sept., 1917.

Equipment: complete for mining, with 50 stamps, 7 ball mills, Edwards' roasting furnaces, fine grinding and cyanide plant of 15,000 tons monthly capacity.

Production: in 1916, 136,994 tons yielded £475,958 at a cost of 44s 7d (£10.70) per ton, including development and depreciation. Total output to date amounts to several millions.

KONGO

TANGANYIKA CONCESSIONS, LTD.

KONGO

Office: Friars House, New Broad St., London, E. C., Eng. **Mine offices:** Kambove, Katanga, Belgian Congo, and Kansanshi, Northwestern Rhodesia.

Officers: Tyndale White, chairman; Robt. Williams, managing director; G. C. Hutchinson, Lord Arthur Butler, T. P. Heyvaert, Thos. Honey, Sheffield Neave, and C. F. Rowsell, directors; L. Scotland, sec.; Robt. Williams & Co. mgrs. and engrs.

Inc. Jan. 20, 1899, in Great Britain. **Cap.**, £1,000,000. Original capitalization was £100,000, successively increased Dec. 1901, to £184,000, in 1902 to £194,000, in 1903 to £264,600, in April, 1905, to £450,000, in July, 1905, to £525,000, and in Nov., 1906, to present amount; shares £1 par; issued 980,098 to Dec. 31, 1916. Debentures £2,600,000 authorized, at 5%, in denominations of £8; outstanding 2,176,624 at Dec. 31, 1916. Col. Sir Howard Melliss, and Hon. Arthur Stanley, are trustees for the debenture holders. The debentures are redeemable at par Jan. 1, 1917, but owing to the war the Court granted until after it was over to pay interest, but coupons No. 16 to 19 have been paid.

The property of the company, Dec. 31, 1916, consisted of a 39.3% share interest in the Compagnie Union Minière du Haut-Katanga, amounting to 50,000 shares of £100 par and 48,000 dividend shares; 75% of the issued stock of the Rhodesia-Katanga Junction Railway & Mineral Co., Ltd., amounting to 500,750 ordinary £1 shares, 44,500 B 1s. shares, the Kansanshi copper mine having been sold to this company; 1,600 shares of £250 par in the Compagnie du Chemin de Fer du Katanga; £2,700,000 stock of Companhia do Caminho de Ferro de Benguela; 2,297 shares of £4 each of the Intertropical Anglo-Belgian Trading Co.; and £5,000 of the 3% debentures of the Rhodesia Railways, Ltd.

The Tanganyika Concessions, Ltd., has an arrangement with the Zambesia Exploring Co., Ltd., by which the latter is ready to finance the former until the company is independent. The Zambesia Co. has practically the same officers as the Tanganyika, and floated the latter, the former having a capitalization of £870,000, shares £1 par, with 686,963 shares issued, fully paid, and an authorized debenture issue of £250,000, secured by 100,000 shares of Tanganyika and £200,000 5% debentures of Benguela Railway Co. The Zambesia Exploring Co., Ltd., paid a 100% dividend Feb. 7, 1896, and for the year ending June 30, 1912, showed a profit of £13,468. The accounts for the year ending Sept. 30, 1912, submitted May, 1913, show a loss of £136,116, compared with loss of £226,787, for 15 months ending on like date 1911, both amounts being deducted for share premium account.

This company was formed to acquire from the British South Africa Co. a 2,000 sq. mile concession in Northern Rhodesia for a terminal and town site of the Cape to Cairo railway at the S. end of Lake Tanganyika; a 2-year exclusive right to prospect and locate for minerals in an area of 2,000 sq. miles N. of the Zambesi, and to locate 1,000 claims in British South African territory. For these concessions, the company gave £80,000 in fully paid shares, besides which the B. S. A. Co. retains a 35% interest in all mines. Having made important discoveries and located various mines in the borderland of the Belgian Congo, the Tanganyika sought and obtained another mineral concession, covering 60,000 sq. miles of the Belgian Congo region, known as the Katanga, and adjacent to the Rhodesian properties of the company. The

Special Committee of Katanga reserved 60% of the net profits, and received £30,000 in fully paid shares. An extension of this concession and an interest in the Benguella railway later increased to 90%, was acquired in July, 1902, for £10,000 in fully paid shares.

The mineral discoveries in the Belgian Congo cover a copper belt 200 miles long with over 100 known copper deposits; also a tin belt, 100 miles long, with workable deposits, also gold and iron mines and diamondiferous areas.

The Tanganyika Co. has sold its holdings to subsidiary companies controlled by it and thus becomes a parent holding company only. In the Belgian Congo, 72 large mining concessions were located, the company engineers estimating in 1908, that 5 of these claims showed 9,500,000 tons of 6.3 to 14% copper ore, most of which could be extracted by open cut; while on another group, the company estimated 1,500,000 tons of 13% copper tenor.

The copper interests of the Tanganyika Concessions, Ltd., consist of present almost exclusively of its holdings mentioned above in the Union Minière du Haut Katanga, (which see), and the Rhodesia-Katanga Junction Railway & Mineral Co., Ltd. (Kansanshi), and the Benguella Railway. The copper deposits and mines owned by the Union Minière were discovered by prospectors employed by Tanganyika Co., under terms of the concession from the Comité Spécial du Katanga. These deposits are scattered through a practically uninterrupted belt of country extending from the Rhodesian border in the S. E. corner of the Katanga region to the W. bank of the Lualaba river, a distance of 180 miles in a N. W. and W. direction. This copper belt is a region of rounded hills and steep sided valleys, 4,000 to 5,000' above sea level, the copper areas being bare, due to copper salts. The copper ores occur in sandstones and in schists, slates and limestone, the beds running W.-N. W. and dipping steeply. The ores are oxidized, malachite being the most abundant mineral associated with chrysocolla and azurite, while melaconite is found mixed with wad. The orebodies are lenses that vary from small deposits up to mammoth ones such as Kambove No. 2, said to be 3,000' long, 240 to 400' wide and to hold 10,000,000 tons of 15% copper ore to a depth of 100'.

The Star of the Congo mine, in the Belgian Congo, was the first to be reached by the railway extension from Broken Hill in Rhodesia and the first to be developed and worked. Development work at this mine comprises 20 shafts, a total of 1,250', about 3,000' of crosscutting and a main haulage tunnel open at each end, driven 1,500' through the deposit, at a depth of 80 to 90', or just above water level. This tunnel is equipped with rope haulage and a double track for ore trucks.

The deposit is being mined by opencuts, the ore after breaking, being milled down through winzes to the crosscuts below and hauled out through the main tunnel to the surface. The rich ore goes direct to the smelter, but the bulk is washed, sorted, and concentrated before it is sent to the furnace.

The Lubumbashi smelting works are 8 miles from the mine on the main railway line. The plant contains 5 water-jacket blast furnaces, smelting about 2,500 tons of copper ore monthly. Two more were ready by Aug., 1917.

Coke is now being regularly supplied at the rate of 1,500 tons a month from the Wankies coal mines in Rhodesia, a distance of 725 miles on the main railway. This coke costs about £6 per ton delivered at the smelter, the colliery's entire output being bought by the Union Minière up to the end of 1913. A battery of 22 coke ovens has been built at Lubumbashi works, which, at the end of 1913, will produce 1,200 tons of coke a month, costing about £4 a ton. The Wankies coal mines have contracted to supply the Union Minière with washed coal for 5 years at £8 6s. to £7 6s. a ton, with 2,000 tons

minimum and up to 5,000 tons a month. A second battery of 22 coke ovens is to be erected when the first is finished.

The Kambove mine is the largest and most important copper mine owned by the Union Minière. It is 100 miles N. W. of the Star of the Congo and is now reached by the railway and can ship its ores to the Lubumbashi smelter. A 2-compartment haulage tunnel has been driven from the surface through the deposit for 1,500', half through payable ore. The tunnel is equipped with rope haulage and a double track. There are 10 shafts from 100 to 50' deep to the level of this tunnel and 5 bore holes put down to about 100' below tunnel level with about 1,600' of crosscutting. Ore will be quarried and milled through the shafts, and hauled out through the tunnel. Management estimates 3,000,000 tons of 13.4% copper ore in sight above the tunnel level and a similar quantity of probable ore in the 100' below. The Kambove is situated 1,720 miles from the seaport of Beira, by rail, and is reported to be able to produce 500 tons of ore daily in 1913.

The Luiswichi and Luusha mines, 30 miles from the Star, have been developed recently and results being satisfactory, they will be equipped and worked, supplying ore to the Lubumbashi smelter.

On all the other deposits forming the copper belt varying amounts of prospecting and development work have formed the basis of estimates, some of which are as high as 300,000,000 tons of copper ore in sight over the whole copper belt.

The Union Minière company estimates 40,000,000 tons of 8% ore above water level in all the Katanga mines.

The Bukama tin belt of the Union Minière is an area in the Katanga containing tin deposits on which development work was commenced in 1913. The belt is near Bukama, on the navigable Lualaba-Congo route from the West Coast, and 210 miles from Kambove, with which place it is being connected by rail, and should be working its valuable ores by the end of 1914.

The Kansanshi mine, transferred in 1909 to the company's subsidiary, the Rhodesia-Katanga Junction Railway & Mineral Co., Ltd., lies at an elevation of 5,000', about 12 miles S. of the Congo-Zambesia divide, which forms the boundary between Rhodesia and the Belgian Congo. This property shows extensive remains of ancient opencut workings, there being trenches and pits for a distance of 6,000', which form 6 chains or lines of workings, in which the pits vary from 1 to 30' in width, 5 to 30' in depth and 300 to 1,300' in length.

The Kansanshi copper deposits consist of beds, 1 to 10' thick, of sandstone impregnated with copper and resting on limestone and schist. The sandstone is micaceous and fissile in places and more or less charged with malachite particles and flakes, the upper beds carrying malachite and chrysocola, with occasional occurrences of azurite and melaconite, and some cuprite, with silicious gangue, and some manganese dioxide in the superficial portions. The gangue carries a little limonite, usually ochrous. Surface ores are said by John R. Farrell to show no evidence of having resulted from alteration of sulphides in place, the facts leading him to the opinion that the malachite was deposited from hot solutions, coursing in fissures. The ore is highly silicious.

The main ore bed, known as D reef, averages 8 to 10' thick, with 5 to 10' of sandstone impregnated with malachite on each wall of the vein; the ore as mined is said to average 18.7% copper with \$2 gold per long ton. Sulphide ores, with bornite and chalcopyrite associated with pyrite, show in the deeper workings, but the depth of the oxidized zone has not as yet been determined.

Development: includes 5 shafts, sunk in old open cuts, on beds 1 to 16

thick. The main shaft, 300' depth, is on D reef, which averages 8 to 10' wide and has been opened for a distance of 1,000', on the 85' level, and a second level, at 134'. The E reef, of 2 to 8' width, and another reef of about 4' width, have been opened for nearly 500' on the 85' level. An 8' vein with limestone walls is reported to average 10.5% copper on the 200' level.

The Kansanshi mine produced up to May, 1913, 2,500 tons, or 5,600,000 lbs. of copper, smelted in a small blast furnace made at the mine and using charcoal as fuel. Transport of this cost about £6 per ton from Kansanshi to Baya, on the railroad.

The mine is being developed and a concentrating plant as well as extensive pumping machinery were installed in 1913. The property is 80 miles from the main railway and both ore and supplies are transported by traction engines.

The company's success in opening up a vast territory in Central Africa, building railways and developing great mining interests, has been largely due to its energetic managing director, whose unbounded optimism has carried the company over difficulties that would have swamped a more conservative management. The company has, however, paid a good price for these services, the contract, 1905-11, securing Mr. Williams 10% of the net profits of the company's assets representing profits. The financial part of the company's affairs have also been much criticized on the ground of excessive royalties exacted, amounting to 60% of the net output of the Belgian properties, while only 65% interest is owned by the company in the Rhodesian properties it has spent so much money in developing.

The company's subsidiaries are now producing at the rate of over 60,-000,000 lbs. of copper yearly, at a reported cost of £28 per metric ton, at the works, or about 6.2c per lb., but it will be many years yet before the world will be flooded with the copper produced in Central Africa, as was feared when the company was first formed. While the early statements issued greatly exaggerated the present conditions, and the results of 13 years' work and the expenditure of \$33,000,000 have not yet brought the company to a dividend-paying stage, it has demonstrated the worth of the properties. Great credit must be given Mr. Williams for his energy and perseverance in bringing this great enterprise to its present condition. The company has heretofore given out little real information, especially about its financial affairs, but the tide having turned and the enterprise being now fairly under way, fuller reports will doubtless be given. The company still has the problem of treatment of the great silicious copper deposits to solve and the Benguella railroad to build, but these problems are not unsurmountable if money is available. Owing to the war, work on the railroad was suspended at kilometer 520 in 1915.

The remarkable development that has taken place in the Katanga copper country can be realized more fully perhaps when it is remembered that the European population at the Star and Elisabethville numbered 2 in 1907 and now number nearly 2,000, according to official returns from the Belgian Colonial office.

UNION MINIERE DU HAUT KATANGA

KONGO

Office: 3 Rue de La Chancellerie, Brussels, Belgium. Works at Elisabethville, Katanga, Belgian Congo.

Officers: Jean Jadot, chairman; Robt. Williams, vice-chairman; Baron de Moor, managing director; H. Buttgenbach; E. Francqui, J. Cornet, Lord Arthur Butler, Tyndale White, Sheffield Neave and C. F. Rowsell, directors; Geo. Velge, sec.

Inc. Oct. 28, 1906, in Congo Free State. Cap., £400,000; shares £4 par; increased May 10, 1912, to £500,000 by issue of 25,000 new shares, fully paid.

There are also 125,000 dividend shares without par value. **Debentures:** £800,000 authorized, at 4½%; issued £600,000. Company is controlled, through half ownership each by Tanganyika Concessions, Ltd. and Société Générale de Belgique. Annual meeting, second Monday in July.

Property: company has a mining concession covering a copper belt of about 200 miles long, containing upwards of 100 copper outcrops; and a tin belt nearly 100 miles long. Both concessions are situated in the southern part of Katanga, north of Rhodesia, a rolling country with a healthy climate. Company also owns valuable water power rights and other mineral rights.

Development: at the end of 1917 five mines will be in operation, namely, the Star, Kambove, Luushia, Likasi and Chituru. Most of the smelting ore will be supplied by the Kambove at the rate of 25,000 tons per month. This mine will be worked as an open cut by steam shovels.

The probable quantity of ore above water level in all the Katanga mines has been estimated at 40,000,000 tons, averaging 8% copper.

Geology: the formation consists of beds of sandstone carrying malachite in the laminations and also impregnated with that mineral. These sandstones overlie and underlie quartzite containing nodules of malachite in irregular quantities, but sufficient to make this rock pay ore in a great many cases.

Equipment: includes 7 blast-furnaces of an average charge capacity of 300 tons.

Production: from 1911 to 1915, the copper output has been 35,800 metric tons; in 1916, 22,165 tons; and estimated for 1917 is 30,000 tons or 66,120,000 lbs. The ore smelted contains about 15% copper and the black copper produced carries 96% metal. Costs at the works amount to about £28 per metric ton, or say 6.2c per lb. The June, 1917, copper output was 5,246,948 lbs.; and for 10 months, 55,549,120 lbs.

The company's consulting engineer, Archer E. Wheeler, has been for over two years studying the treatment of the lower grade 7% silicious ores and a plant to utilize the water power and produce 50,000 tons of electrolytic copper per annum is now under consideration.

PORTUGUESE EAST AFRICA

MOZAMBIQUE CO. (COMPANHIA DE MOCAMBIQUE).

PORTUGUESE EAST AFRICA

S. H. Sharpe, act. sec., Thames House, Queen St. Place, London, E. C. England. **Head Office:** 10 Largo da Biblioteca Publica, Lisbon, Portugal.

Inc. March 8, 1888, given royal charter Feb. 11, 1891, and reconstituted May 5, 1892. **Cap.**, £1,500,000; shares £1 par; issued and paid, £1,322,222. Paid a 5% dividend in 1911.

Company practically owns and exercises governmental functions over the whole of the land, mines and produce of 60,000 square miles in the central and richest part of Portuguese East Africa, adjoining Rhodesia. The Manica goldfield, or mining district, covers the main mineralized portions of the territory and lies within a radius of 16 miles about Macequece, the district being part of the Umtali field of Rhodesia. It shows a belt of schists bounded east and south by granite with irregular intrusions of diorite largely altered to serpentine and traversed longitudinally by ledges of ferruginous quartzite paralleling the gold quartz reef. Copper ore occurs and is worked by the S. African Copper Trust in the Edmundian mine. (See descriptions under the title.)

The company offers prospectors a 12-months' license for £1, with the right to locate (peg off) 10 claims of 100 meters square, which must be registered and within 12 months thereafter opened by 66' of development work on

group of 10 or less claims, or 6' 7" on each claim, or in lieu thereof pay 10s. (\$2.40) per claim for an inspection certificate good for 12 months. Claim rents, like those of the Transvaal and Rhodesia start the second year at 10s. (\$2.40) per claim and increase 50% each succeeding year. Royalties amount to 10% of the net profits, except for gold, for which a graduated scale from 1 to 4% is provided for production less than 800 oz. per month, and 10% for over that amount.

RHODESIA

ANTELOPE GOLD MINE (RHODESIA), LTD.

RHODESIA

Office: 8 Old Jewry, London, E. C.

Directors: J. C. Prinsep (chairman), F. Johnson, J. R. Mason, H. W. Morrison and H. L. Sapte. H. A. Piper, cons. engr.

Inc. Nov. 25, 1908, in England. Cap., £400,000; shares 5s. par; 1,398,128 issued. Profit in 1915 was £19,877. Investments at cost are valued at £106,990.

Property: 170 claims, 1½ acres each, 60 miles S. of Bulawayo, Rhodesia. Reserves were estimated in Sept., 1916, at 110,987 tons, assaying \$10.10 per ton.

Development: by vertical and incline shaft 1,400' deep. Equipment: complete for mining, also 150-ton plant using 2 Krupp ball mills, 4 Edwards' furnaces, tube mill, 12 pans, and 2 filter presses.

Production: in 1916, gold worth £91,710 was extracted from 45,927 tons. Costs were \$8.60 per ton.

BRITISH SOUTH AFRICA CO., THE

RHODESIA

Head Office: 2 London Wall Bldgs., London E. C., Eng. A. P. Millar, asst. sec. Administrator of Southern Rhodesia: Sir D. Chaplin, Salisbury.

Administrator of Northern Rhodesia: L. A. Wallace, Livingstone. Res. mining eng.: A. H. Ackerman, Bulawayo.

Board of Directors: Rt. Hon. Sir E. Jameson, Bart., C. B., pres.; R. Maguire, Esq.; Hon. Sir L. Michell, C. V. O.; Sir H. Birchenough, K. M. C. G.; Marquess of Winchester; Otto Beit, Esq.; H. W. Fox, Esq., M. P.; Baron E. B. d'Erlanger; D. O. Malcolm, Esq.; Br.-Gen. E. Baring, C. V. O.; Duke of Aberdeen.

Inc. Oct. 29, 1889. In Oct., 1911, the British South Africa Company's Mines Development Co., Ltd., was formed in order to acquire, explore and develop properties in Rhodesia and other parts of So. Africa. Present authorized capital is £9,000,000 in 9,000,000 shares of £1 each, having been increased at intervals from £1,100,000 in 1890; 8,937,324 shares are issued and fully paid. Bonds, £1,250,000 5% mortgage debentures.

Lands: about 400,000 sq. miles. The company acquired: (a) from the Central Search Association, Ltd., the Rudd-Rhodes Concession, consisting of the mining rights over the territory of the King of Matabeleland; the Central Search Association being entitled to one-moiety of the net receipts, which right was subsequently merged in the United Concessions Co., Ltd., and capitalized in 1894 by the issue of 1,000,000 fully-paid shares of the company; (b) mining rights over the territory of the chiefs Khama and Gungunhana; (c) administrative power over the whole British sphere north of the Zambesi and west of Nyasaland; (d) rights of the African Lakes Co. (acquired in 1894); (e) and also through the Victoria Falls Power Co., in which this company holds a large interest, the right to develop electrical energy at Victoria Falls.

The company adopted the name "Rhodesia" to describe all the territories under the company's administration; the portion south of the Zambesi being described as Southern Rhodesia. Company controls Bwana M'Kubwa and several other important South African copper properties by ownership of a

large stock interest. Company is a gigantic corporation and is the owner of the mineral rights throughout the territory.

BWANA M'KUBWA COPPER MINING CO., LTD. RHODESIA

Office: T. Donald, 365 Salisbury House, London, E. C.

Directors: R. Littlejohn (chairman), E. H. Dunning, T. Huntington, A. Stewart, H. L. Stokes and C. H. Villiers.

Inc. March 16, 1910, in England. Cap., £600,000; shares 10s. par; 925,053 issued.

Property: 450 claims, 1½ acres each, containing the Bwana M'Kubwa mine, also other adjacent properties, 1,450 miles by rail from Beira, Portuguese East Africa, in Northern Rhodesia. Reserves are estimated at 23,000 tons of 10% copper ore, 3,000,000 tons of 4.5% and 1,200,000 tons of low-grade material. The war has interfered with work considerably. A 100-ton concentrator is working and a 100-ton leaching plant is to be erected.

CAM & MOTOR GOLD MINING CO., LTD. RHODESIA

Office: Palmerston House, London, E. C., Eng.

Officers: J. Weil, chairman; F. A. Govett, G. R. Lewis, I. Lewis, and S. Weil, directors. Robert Allen, gen. mgr.

Inc. Sept. 3, 1910, in England. Cap., £617,500; shares £1 par. **Debentures:** £50,000 in 1914, redeemable at par Dec. 23, 1919. Accounts for year ended June 30, 1916, shows a profit of £8,562.

Property: 286 claims, 1½ acres each, in the Hartley district of Southern Rhodesia. Ore reserves estimated at 577,281 tons, averaging \$9.76 per ton.

Equipment: complete with mill treating 15,000 tons per month.

Production: in 1916, was 162,922 tons yielding £219,374. Costs are \$6.25 per ton.

Is a good gold mine, but as the ore contains antimony and arsenic, treatment has been difficult.

FALCON MINES, LTD. RHODESIA

Office: Gold Fields Rhodesian Development Co., 8 Old Jewry, London, E. C., Eng.

Directors: Lieut. Col. F. Johnson, Chairman; J. Prinsep, vice-chairman, B. Vieira, W. F. Andrews, Maj. H. L. Sante, H. T. Brett, gen. mgr. Gold Field Rhodesian Development Co., cons. engr.

Inc. Feb. 26, 1910. Cap., £600,000; shares £1 par; 400,000 shares issued and fully paid. Cap. originally £400,000, increased Aug., 1912, to provide for bond redemption. Bonds £300,000 authorized, 6%, £217,341 outstanding.

Accounts, June 30, 1916, showed operating expenses £335,138; operating profit, £195,688; loans, £119,975; receipts from ore sales, £530,826.

Property: acquired from the Falcon (Rhodesia) Development Co., Ltd., by Rhodesia Cons., Ltd. In Jan., 1911, the Athens mine was acquired. The mining property comprises 380 claims, 578 acres, farm lands near the Falcon mine. 500 acres adjoining the mine and 19 acres for machinery and water sites.

The orebodies are large, increasing from 17' in width on the 3rd. level to 50' on the 9th. level. Values also increase from 2.45% copper and \$3.68 gold per ton on the 3rd to 2½% copper and 6 dwt. gold on the 9th level. The shaft is being sunk to the 11th level, 1917. Report for year ending June 30, 1916, shows ore reserves, 742,228 tons sulphide ore and 119,838 tons oxidized ore.

Equipment: crushing plant, equipped with 3 jaw breakers and 4 trommels, separating the fine and coarse ores; sorted ore of 5½% copper content and 9% of total output is sent to furnaces. The mill, installed in 1915, has 36 Nissen stamps, tube mills, Dorr thickeners, vanners and a 9-compartment Mineral Separation flotation plant.

The smelter equipment includes 12 hemispherical blast roasting pots, two blast furnaces, each of 300 ton daily capacity, two 12,500 cu. ft. turbo blowers,

electric crane and 12 converters of 15 ton copper capacity. Copper is cast into bars of 360 lbs. containing 10 oz. gold and 20 oz. silver. The plan of treatment is similar to that of the standard plants in the United States. About 20,000 tons of ore treated per month.

See article "Ore Treatment at Falcon Mine," by H. R. Adams, *So. African Mng. Journ.*, Dec. 30, 1916, p. 421.

Production: during fiscal year, ending June 30, 1916, 160,837 tons of sulphide ore, and 57,955 tons of oxidized ore was treated, yielding 3,477 tons of blister copper, which contained 3,411 tons copper, 38,569 oz. gold and 73,862 oz. silver. The working cost amounted to 30s.7d. per ton and the price received for blister copper was 48s. 6d.

GLOBE AND PHOENIX GOLD MINING CO., LTD. RHODESIA

Office: T. Priest, sec., 35 Old Jewry, London, E. C.

Directors: Earl Russell (chairman), J. D. Hope, J. E. Howard, F. A. Macquisten and H. Miller. T. Haddon, gen. mgr.

Inc. Oct. 18, 1895, in England. Cap., £200,000; shares 5s. par; all issued.

Profit in 1915 was £181,492, £80,000 being paid in dividends. Reserves are: general, £76,312; gold, £26,175; and litigation, £102,000. The last mentioned was for the long suit with Amalgamated Properties of Rhodesia, which company sued the Globe & Phoenix for wrongful extraction of ore, but lost. The action cost £100,000. The 1916 profit was £250,000.

Dividends: total 1017%, 80% being paid in 1916.

Property: the largest gold producer in Rhodesia, 140 miles N. of Bulawayo.

Development: by incline shafts, 3,149' deep. Reserves early in 1915 were 189,200 tons, assaying \$29.40 per ton.

Equipment: complete, with 40-stamp mill, roasting and cyaniding plant.

Production: in 1916 was 102,473 oz. gold from 77,464 tons.

LONELY REEF GOLD MINING CO., LTD. RHODESIA

Office: A. D. Owen, 34 Bishopsgate, London, E. C.

Officers: C. F. Rowsell, chairman; W. F. Andrewes, G. R. Lewis, H. D. Lewis, I. Lewis and G. Pauling, directors. C. B. Kingston, gen. mgr.; S. H. Bought, mine mgr.

Inc. Jan. 13, 1910, in Rhodesia. Cap., £325,000; shares £1 par; 271,007 issued.

Balance sheet for 1915 showed a profit of £60,973, with £18,922 forward from 1914, a total of £79,985. Dividends absorbed, £35,231. Balance forward to 1916 was £20,059.

Dividends: 10% in 1911; 30% in 1912; 30% in 1913; 20% in 1914; 15% in 1915; 20% in 1916.

Property: 234 claims, 1½ acres each, 40 miles N. of Bulawayo, Bubi district, Rhodesia.

Development: 1,500' incline shaft.

Ore reserves: estimated at 136,774 tons, worth \$18.10 per ton.

Equipment: 20 stamps, 3 tube-mills, and cyanide plant.

Production: in 1916 was £174,857 from 59,240 tons, giving a profit of £70,314. Costs are about \$8 per ton.

RHODESIA CHROME MINES, LTD. RHODESIA

Office: T. Donald, sec., 365 Salisbury House, London, E. C.

Directors: E. Davis, F. R. Harris, A. W. Jarvis, F. E. Lander, T. J. Seal and H. L. Stokes.

Inc. June 27, 1908. Cap., £60,000; shares £1 par; 59,457 issued.

Dividends: 10% in 1911, 20% in 1912, 20% each in 1913 and 1914.

Property: 885 acres, in the Gwelo and Selukwe districts, Southern Rhodesia.

Production of chromic-iron ore:

Year	Tons	Value
1912.....	69,260	£154,600
1913.....	63,383	141,481
1914.....	48,207	107,612
1915.....	60,581	175,792

RHODESIA COPPER & GENERAL EXPLORATION & FINANCE CO., LTD.**RHODESIA****Office:** T. Donald, 365 Salisbury House, London, E. C.**Directors:** E. Davis (chairman), E. H. Dunning, J. E. H. Lomas; H. L. Stokes, P. C. Tarbutt and C. H. Villiers.**Inc.** March 5, 1909, in England. **Cap.**, £352,793, in 1,398,046 shares of 4s. 6d. and 101,954 of 7s. 6d. par, of which 1,173,405 of the former are issued. On May 31, 1916, there were cash assets amounting to £33,712.**Dividends:** were 5% in 1910-'11; 3% in 1913-'14; 3% in 1915-'16.**Property:** 640 sq. miles near the Kafue river, 59,000 acres of farm lands. 560 mining claims, 1½ acres each, also ½ interest in 120 and 1/3 interest in 150 claims, all in Northern Rhodesia. On some of the claims fair quantities of copper ore have been opened. To develop some of the claims the Rhodesia Broken Hill Development, Kafue Copper Development and Bwana M'Kubwa Copper companies have been organized.**SHAMVA MINES, LTD.****RHODESIA****Offices:** 8 Old Jewry, London, E. C.; and Bulawayo, Rhodesia.**Officers:** E. S. Birkenruth, chairman; W. F. Forbes, L. Hoskyns, C. F. Roswell, and H. L. Sapte, directors in England; J. G. McDonald and G. Mitchell in Rhodesia. C. W. Terry, mine mgr.**Inc.** April 5, 1916, in England. **Cap.**, £600,000; shares £1 par, all issued.**Accounts:** for 1915 showed a profit of £235,913, of which £165,000 was paid in dividends. There was carried forward £64,324.**Dividends:** 27½% in 1915, 30% in 1916.**Property:** 243 claims, 1½ acres each, in Abercorn district, Rhodesia.**Development:** by tunnels. Reserves are estimated at 1,719,920 tons, averaging \$5.20 per ton.**Equipment:** includes 3 Gates crushers, 56 Nissen stamps, 9 tube-mills, and cyanide plant.**Production:** in 1916, mill treated 582,980 tons for £448,723, of which £183,481 was profit. Costs are \$2 per ton.**ZAMBESIA EXPLORING CO., LTD.****RHODESIA****Office:** L. Scotland, sec., Friars House, New Broad St., London, E. C. Eng.**Directors:** Tyndale White, chairman; Robert Williams, managing director; other directors, S. Neave, Godfrey C. Hutchinson, C. F. Rowsell Lord A. Butler and T. Honey; R. Williams & Co., mgrs. and engrs.**Inc.** March 26, 1891. **Cap.**, £20,000, increased 1892, 1893, 1897, 1898, 1900, 1903, 1905, 1909 and 1911, to present figure of £870,000; shares £1 par, issued, 686,963, fully paid. **Debentures:** £250,000, at 5½%, callable at 106% on or before Feb. 28, 1918, or six months after termination of war, whichever is the later date.

A dividend of 100% was paid Feb. 7, 1896. Company floated the Tanganyika Concessions, Ltd., which see.

Property: consists of about 38,348 acres farm lands; 19 town sites; a one-third interest in 30 mining claims; an 85% interest in 20 mining claims; a one-half interest in 10 mining claims; 174,644 shares in the Tanganyika Concessions, Ltd.; £1,073,100 Benguella Railway bonds. 11,000

Union Miniere du Haut Katanga shares; £10,000 Rhodesia Railways bonds. £15,704 Tanganyika Concessions, Ltd., bonds, and £1,425 debts. of the Rhodesia Railways.

Balance sheet for 1915, presented Oct., 1916, shows assets of £1,362,-851, including £1,188,103 shares and debentures of other companies. Cash on hand amounted to £4,270. Current liabilities included £3,428 for creditors. Loans from bankers, etc., were £178,727.

SOUTHWEST AFRICA

SOUTHWEST AFRICA CO., LTD.

Secretary and offices: C. Launspach, 1 London Wall Bldg., London, E. C., Eng.

Directors: E. Davis, chairman; C. E. Atkinson, F. G. J. Eckstein, Johan Askevold, at Grootfontein, African mgr.

Inc. Aug. 18, 1892, in England. Cap., £300,000, increased successively to £400,000, £500,000, £1,000,000, and finally, in 1902, to £2,000,000; shares £1 par; issued, £1,750,000.

Dividends: were 5% in 1908; 7½% in 1909; 5% in 1910; 7½% in 1911; 5% in 1912 and 1913. During 1915 the income totaled, £41,285, including £26,358 dividends on investments, which were valued at £1,341,391 at the end of the year. These consists mainly of British and foreign Government bonds. A profit of £11,967 was made.

Property: comprises about 20,000 sq. miles, in which company has mining rights and 3,500 sq. miles of freehold land, in Damaraland; a one-half interest in mining rights to 23,000 sq. miles, in Ovamboland; a large share interest in the Kaoko Land & Mining Co., owning 37,000 sq. miles freehold land; a two-thirds interest in the South African Co., Ltd., owning about 66,000 sq. miles of mining rights, in Angola, Portuguese S. W. Africa, nearly one-half interest in the Hanseatics Mining Co., owning mining rights covering about 15,000 sq. miles; a large share interest in the Otavi Mines & Railway Co., small interests in the Southwest African Mining Syndicate, the Otavi Exploring Syndicate, Ltd., and the Angola Exploring Syndicate, Ltd., and about £1,800,000 in cash, farm mortgages, and choice securities.

As the British forces now occupy this territory little is being done until after the war. The Otavi mines company produced 120,000 lbs. of copper in 1913-14.

TRANSVALL

CENTRAL MNG. & INVESTMENT CORP'N, LTD.

Office: L. Bluen, 1 London Wall Bldg., London, E. C.

Inc. May 9, 1905, in England. Cap., £3,400,000; shares £8 par; all issued.

Profit in 1915 was £325,028. Dividends: total £4 2s per share.

This is a holding concern, interested in the Bantjes, City Deep, City and Suburban, Crown Mines, Daggafontein, Durban Roodepoort Deep, Ferreira Deep, Geduld Prop., Geldenhuis Deep, Modder B., Modder Deep, New Heriot, New Modder, Nourse Mines, Robinson Deep, Robinson Gold, Rose Deep, Village Deep, Village Main Reef, Rand Mines, and East Rand Proprietary companies, all large gold producers on the Rand.

CONSOLIDATED GOLD FIELDS OF SOUTH AFRICA

TRANSVAAL

Offices: H. C. Porter, sec., 8 Old Jewry, London, E. C., England; E. C. Goodhart, mgr., 12 Rue des Pyramides, Paris, France; 233 Broadway, New York.

Directors: Lord Harris, chairman; E. Birkenruth, Lord Brabourne, C. Christopherson, E. Frewen, Leigh Hoskyns, R. Maguire, J. C. Prinsep and H. L. Sapte. **Johannesburg staff:** D. Christopherson, mgr.; F. L. Brown and C. Hely-Hutchinson, asst. mgrs. **Engineering staff:** C. D. Leslie, supt. engr.; H. A. Piper, W. A. Caldecott, J. W. Craig, A. C. Holtby, A. E. Pettit and G. H. Thurston. **Staff in America:** Alfred de Ropp, agent, and H. H. Webb, cons. engr. J. G. McDonald, agent in Rhodesia.

Inc. Aug. 2, 1892, in England. **Cap.**, £2,000,000; shares £1 par; and £2,500,000 in 1,250,000 6% first-cumulative preference shares and 1,250,000 6% second-cumulative preference shares; total capital £4,500,000. Debentures outstanding total £100,000.

Company is a holding concern, having investments valued at £4,092,613, in many important mines and other industries. Some of these, described under their respective titles, are: Abbontiakoon Mines, Cam & Motor Gold Mining Co., Crown Mines, Falcon Mines, Gold Fields American Development Co., Government Gold Mining Areas (Modderfontein Consolidated, Lonely Reef Gold Mining Co., Robinson Deep, Shamva Mines, and Summer Deep. Company also has considerable real estate in the Transvaal, Rhodesia, and London.

Balance sheet for year ended June 30, 1916, shows £461,379 received from dividends, etc., of which £440,141 was profit. Dividends absorbed £300,000. There was carried forward £81,740, after allowing for depreciation in shares £232,265 and £6,224 for taxes. The balance from 1915 was £80,088, and £100,000 was taken from reserve.

Dividends: on first preference shares is paid Jan. 1 and July 1; on second preference, April 1 and Oct. 1; on ordinary, since the Boer War, 25% in 1901-02; nil in 1902-03; 12½% in 1903-04; 15% in 1904-05; nil in 1905-06; 12½% in 1906-07; 20% in 1907-08; 35% in 1908-09; 30% in 1910-11; 17½% in 1911-12; 10% in 1912-13; 5% in 1913-14; 7½% in 1914-15; 7½% in 1915-16.

CONSOLIDATED LANGLAAGTE MINES, LTD.

TRANSVAAL

Offices: 10-11 Austin Friars, London, E. C., England, and Cons. Investment Co., Ltd., Consolidated Bldg., Johannesburg, S. A. **Mine office:** Langlaagte.

Directors: J. Munro (chairman), E. Danckwerts, J. Friedlander, G. Imroth, C. Marx, J. H. Ryan and S. B. Joel. **London committee:** W. Bailey, W. J. Benson and T. Honey. W. L. White, cons. engr.; A. E. Payne, mine mgr.

Inc. Sept., 1902, Transvaal. **Cap.**, -£950,000; shares £1 par; all issued and fully paid. £300,000 in 5½% debentures authorized; outstanding, £150,000. Company was formed to acquire the New Croesus Gold Mining Co., Ltd., and the Langlaagte Star Gold Mining Co., Ltd.

Statement for year ended Dec. 31, 1916, showed a profit of £279,821 plus £75,196 balance forward from 1915. Dividends amounted to £213,737; taxes totaled £32,041; £98,627 was carried forward.

Dividends for 1913, 10%; 1914, 20%; 1915, 25%; 1916, 22½%.

Property: 343 claims and 210 deep level claims on farm Langlaagte No. 13, 4 miles west of Johannesburg. Also 30 claims under lease for erecting plants and 3 water rights

Development: on the southern end of the property, the East and West shafts have been sunk 4,057 and 3,507' (incline depth), to work the deep levels. New openings in 1916, totaled 17,604'. Drifting on the reef exposed mill ore. There were 119 drills operated. The flow of water is 430,000 gals. daily.

Ore reserves: are estimated at 2,174,536 tons, valued at \$6.20 per ton, over a stoping width of 49"; against 2,248,656 tons of \$6.50 ore a year ago.

Equipment: includes 100-stamp mill with 1,900 lb. stamps, 10 tube mills and cyanide plant with capacity of 53,000 tons monthly.

Production:

Year	Tons	Gold, Oz.	Cost per Ton
1916.....	627,050	184,938	\$3.88
1915.....	636,500	184,839	3.50

CONSOLIDATED MAIN REEF MINES AND ESTATE, LTD.

TRANSVAAL

Office: Downes, Munns & Co., secretaries, 286 Salisbury House, London, E. C., England, and H. G. L. Panchand,, Cullinan Bldg., Johannesburg, S. A.

Directors: W. H. Dawe, chairman; C. S. Goldman, A. A. Auret, H. J. King, W. H. B. Frank, F. R. Lynch, A. G. Gill, E. J. Renaud, J. H. Ryan, and E. A. Wallers; D. Wilkinson, cons. engr., Johannesburg; J. E. Healy, gen. mgr.; A. J. Jones, asst. gen. mgr.

Inc. July, 1896, in the Transvaal to acquire the properties of the Main Reef Gold Mining Co., Ltd.; and the Cons. Anglo-Tharsis Gold Mining Co., Ltd. **Cap.**, 950,000 shares of £1 par value. 924,364 shares issued and fully paid.

Balance sheet: of June 30, 1916, showed total assets as £1,269,156, including £1,094,130 for property and investments; cash account £64,880; gold consignment £18,814. Profit for year was £162,931, making with sundry revenue and balance brought forward a total of £242,459.

Dividends: Nos. 15 and 16 amounted to £115,545. Balance carried forward £77,854. Gold account was £501,281 produced against which is charged £322,213, mining expense, etc.; £16,137 for other charges, leaving a balance of £102,931.

Property: 800 claims and an estate of 7.66 square miles, six miles west of Johannesburg. There are three shafts, the Western, 4,059', the Main, 3,882', and the Central, 2,800'.

Development: for 1916 totaled 17,802' of which 759' was for shafts; winzes and raises, 5,408'; and the remaining by crosscuts and drifts; 11,420' were accomplished on the reef divided as follows: main reef leader, 9,407', of which 5,972' was payable reef; south reef 2,013', of which 1,203' was payable reef which developed 214,940 tons of 8.16 dwts. value. Stopping width about 4'. A total of 387,557 tons were mined.

Equipment: includes 120-stamp mill, 3 tube-mills and cyanide plant and necessary surface equipment. £41,671 was expended in improvements during the year.

Production: during the year, 342,895 tons were milled and cyanided, yielding £501,281 as compared with 294,766 tons, yielding £442,649 the previous year.

Ore reserves: for 1916 are given as 850,770 tons.

CROWN MINES, LTD.

TRANSVAAL

Offices: A. Moir, 1 London Wall Bldgs., London, E. C. England, and The Corner House, Johannesburg, Transvaal.

Directors: S. Evans, chairman, H. C. Boyd, D. Christopherson, W. H. Dawe, C. Meintjes, E. J. Renaud, F. G. C. E. Robellaz, H. A. Rogers, R. W. Schumacher, and E. A. Wallers. R. C. Warriner, cons. eng.; A. J. Brett, gen. mgr.; W. J. Pitchford and T. Simpson, joint mine mgrs.; and S. H. Pearce, reduction officer.

Inc. March 31, 1892, in England. **Cap.**, £1,000,000; shares 10s. par; 1,880,-212 issued.

Debentures: £1,000,000, 5% first mortgage authorized, £744,300 issued.

Profit in 1915 was £1,099,196, of which £611,069 was paid in dividends. Cash assets totaled £173,952.

Dividends: totaled 727% from 1898 to 1910; 120% in 1910; 110% in 1911, 1912 and 1913; 85% in 1914; 65% in 1915; 50% in 1916.

Property: 2,222 claims, 1½ acres each, in the Rand, Transvaal.

Development: by 13 shafts. Ore is hoisted through No. 5 and 7, which are connected by two main haulage levels.

Ore reserves: estimated at 9,938,000 tons, averaging \$6.25 gold per ton.

Equipment: immense mining and reduction plants, including 835 stamps, 26 tube-mills, sand and slime plants, capable of treating 240,000 tons per month.

Production: in 1916 was 2,666,000 tons, yielding gold worth £2,887,777, of which £815,620 was profit. Costs total, \$4 per ton.

EAST RAND PROPRIETARY MINES, LTD.

TRANSVAAL

Head office: Farrar Bldg., Johannesburg, Transvaal.

Directors: E. A. Wallers, chairman, J. P. Farrar, J. Friedlander, A. G. Gill, J. H. Jourdan, F. Raleigh, E. J. Renaud, F. G. C. E. Robellaz and H. R. Skinner. E. C. J. Meyer, gen. mgr.; W. T. Anderson, supt. engr.

Inc. May 6, 1893, in the Transvaal. **Cap.**, £2,514,000; shares £1 par; 2,445,897 issued.

Debentures: £1,500,000 authorized; £999,430 outstanding.

Company controls large interests in the Angelo, Cason, Cinderella, Driefontein Cons., New Blue Sky and New Comet companies, operating on the Rand.

During 1915 a net profit of £514,940 was made. Dividends absorbed £275,163; taxes and war levy, £66,198; debentures purchased, £108,760; carried forward £193,354.

Dividends: since 1903 total 350%; but from 1913 to 1916 they have dwindled from 25 to 5%.

Property: 4,515 claims, 1½ acres each, on the Rand, Transvaal.

Development: by numerous shafts and extensive workings. Reserves early in 1916 were estimated at 4,800,000 tons of \$6.40 and 9,800,000 tons of \$4.40 ore.

Equipment: full complement for mining; and 820 stamps, 25 tube-mills and cyanide plants.

Production: in 1916, 1,936,326 tons yielded £2,365,107. During the second quarter of 1917, 462,500 tons gave an average of \$5.15 per ton.

In August a profit of only £100 was made and in September a loss of £3,606, due to the native labor situation on the Rand.

In 1914 the directors considered that 20 years' profitable work was ahead of the company. Like several other great consolidations on the Rand, predicted estimates have not been realized for long; however, this is one of the world's greatest producers.

FERREIRA DEEP, LTD.

TRANSVAAL

Offices: The Corner House, Transvaal, S. A., and 1 London Wall Bldgs., London, E. C., England.

Directors: H. C. Boyd, chairman; S. B. Joel, F. Heim, T. J. Milner, H. A. Rogers, R. W. Schumacher, L. Wagner and E. A. Wallers. P. Cazalet, cons. engr.

Inc. 1898, in Transvaal. **Cap.**, £1,000,000; shares £1 par; 980,000 issued. Accounts for year ended Sept. 30, 1916, showed: net profit, £452,699; cash balance, £117,461, after payment of £379,750 in dividends.

Property: 207 mining claims at Witwatersrand, formerly owned by the Barnato Cons. Mines, Ltd., the Rand Mines, Ltd. and the Ferreira Gold Mng. Co., Ltd., each of these companies receiving a stock interest in the Ferreira Deep, Ltd., in payment for mining claims.

Ore reserves: estimated, Sept. 30, 1916, at 1,632,600 tons, averaging 83 dwts. gold.

Equipment: complete power and mining plants, with 60-stamp mill, 10 with 280 stamps, 7 tubes and cyanide unit.

Production: in 1916 amounted to 643,460 tons, yielding £1,130,227. Cost per ton was 20s. 11d. per ton, leaving an operating profit of 14s. 3d. per ton, or a total of £458,695.

GENERAL MINING & FINANCE CORPORATON, LTD.

TRANSVAAL

Head office: H. W. Dalton, sec., General Mining Bldg., Johannesburg, Transvaal.

Directors (in Transvaal): Sir G. Albu, chairman; L. Albu, J. Freudenthal and M. Luebeck, A. French, mgr.; R. Pill, tech. advisor; E. Farrar, mechanical engr.; H. W. Clayden, electrical engr.; A. Heymann, cons. chemist.

Inc. Dec. 30, 1895, in the Transvaal. Cap., £1,875,000; shares £1 par; all issued.

Company has large interests in the Aurora West United, Cinderella Cons., Meyer & Charlton, New Goch, New Steyn, Rand Collieries, Roodepoort United, Sacke Estates, Van Ryn and West Rand Cons. mines, all producers.

Profits in 1916 were £35,616, an increase of £20,509.

Dividends: have been irregular, amounting to 67% since 1902.

GOVERNMENT GOLD MINING AREAS

(MODDERFONTEIN) CONSOLIDATED, LTD. TRANSVAAL

Offices: 10 and 11, Austin Friars, London, E. C., England, and Consolidated Bldg., Johannesburg, Transvaal.

Officers: S. B. Joel, chairman; D. Christopherson, G. Imroth, C. Marx, J. Munro, directors; G. Beatty, mgr.; W. L. White, cons. eng.

Inc. Feb. 26, 1910, in England. Cap., £1,400,000; shares £1 par; all issued. Profit in 1915 was £160,612, of which £111,509 was carried forward.

Property: 2,633 claims, 1½ acres each, on the Rand, Transvaal.

Development: four 7-compartment shafts, 2,588', 2,433', 3,893', and 3,821' deep, two 3,100' apart and two 4,000' apart. Main "reef" was cut in N.-W. shaft in 1912 at depth of 2,395', where it was 31" wide, and worth \$7.15 per ton. The dip is 15° S. W. In N.-E. shaft reef was cut at 2,273', being 21" wide, worth \$7.70; at 3,579' in the S. E. shaft it was 57" wide, worth \$16.50; and in the S.-W. shaft at 3,608', 30" wide, worth \$3.80 per ton.

Ore reserves: estimated at 3,665,000 tons, averaging \$6.90 per ton.

Equipment: complete, with 200 (2,000 lbs. each) stamps, 10 tube-mills, and cyanide plants.

Production: in 1916 was £1,008,643 from 744,000 tons, giving a profit of £272,676. Costs are about \$4.80 per ton.

KNIGHTS DEEP, LTD.

TRANSVAAL

Office: J. T. Bedborough, 8 Old Jewry, London, E. C.

Directors: D. Christopherson (chairman), F. L. Brown, W. H. Dawe, C. H. Hutchinson and W. S. Smits.

Inc. Sept. 14, 1895, in the Transvaal. Cap., £743,528; shares £1 par; all issued.

For year ended July 31, 1916, the profit was £173,232, less £111,529 for dividends.

Dividends: total 260% to Feb., 1917.

Property: 506 claims, 1½ acres each, on the Rand, Transvaal.

Development: by vertical shafts. Reserves were 2,614,000 tons of 4.40 ore at the end of the last financial year.

Equipment: complete, with 400 stamps, 11 tube mills and cyanide plants.

Production: in 1915-16, £994,969 from 1,307,300 tons of ore.

MESSINA (TRANSVAAL) DEVELOPMENT CO., LTD.**TRANSVAAL**

Head office: 1 London Wall Bldg., London, E. C., England. **Mine office:** Messina, Zoutpansberg, Transvaal, South Africa.

Officers: C. F. H. Leslie, chairman; J. A. Agnew, R. J. Frecheville and J. P. Grenfell, directors; R. J. Frecheville, A. F. Kuehn and T. J. Hoover, technical committee; A. B. Emery, gen. mgr.

Inc. Jan. 30, 1905, in England. **Cap.**, £250,000; shares 5s par; 727,154 issued. Capital increased from £110,000 to £200,000 in 1908, and to present amount in 1911. **Bonds:** £250,000 issued April, 1912, at 95%, redeemable at 105% by drawing or purchase in open market at or under that price. Interest guaranteed to Jan. 1, 1917, by Camp Bird, Ltd. (of Colorado).

Balance sheet for year ended June 30, 1916, showed income from copper sales, £559,202, with £255,433 profit. Dividends absorbed £72,715; income and profit tax in Africa, £42,600, and excess profits duty reserve in England, £140,000.

Dividends: in 1915-16 were equal to 40%.

Property: about 22,000 acres; also coal and lime claims in the Zoutpansberg district of the Transvaal. Ore contains chalcocite, bornite and some chalcopyrite occurring in granite.

Development: by shafts, 1,033' and 1,742' deep.

Ore reserves: at middle of 1916 were estimated at 298,061 tons of 4.74% copper ore to No. 11 level.

Equipment: sufficient for several hundred tons daily output, including 250-ton mill and 2 reverberatory furnaces.

Production: in 1915-16 was 111,909 tons of ore milled with copper output of 12,840,000 pounds.

NEW MODDERFONTEIN GOLD MINING CO., LTD. TRANSVAAL

Head office: Corner House, Johannesburg, Transvaal. **London office:** A. Moir, 1 London Wall Bldg., London, England.

Officers: E. A. Wallers, chairman; R. W. Schumacher, W. H. Dawe, C. S. Goldman, S. C. Black, J. G. Currey, W. T. Graham, directors; Rand Mines, Ltd., secretaries; E. M. Sharp, mgr.; H. S. Martin, cons. engr.

Inc. June 1, 1895, in Transvaal. **Cap.**, £1,400,000; shares £4 par; all issued and paid up.

Accounts for year ended June 30, 1916, disclose a profit of £766,235, of which £455,000 was paid in dividends. Net cash assets totaled £398,126.

Dividends: 70% from 1906 to 1911; 25% in 1912; 30% in 1913; 30% in 1914; 31¼% in 1915; 32½% in 1916; 32½% in 1917.

Property: 173 claims, 1½ acres each; also prospectors claims, water rights, etc., on the Rand. Mine considered one of the greatest in the world, considering past production, present profits and future possibilities.

Development: by shafts to 2,258'. Ore reserves estimated at 8,013,357 tons, assaying \$8.40 gold per ton.

Equipment: includes 180 stamps, 7 tube mills and vacuum cyanide plant, capable of treating 54,000 tons per month.

Production: in last financial year, £1,296,043 from 635,000 tons, giving a profit of £749,117. Costs total \$4.14 per ton.

RAND MINES, LTD.**TRANSVAAL**

Office: A. Moir, 1 London Wall Bldgs., London, E. C., England.

Directors: E. A. Wallers (chairman), F. G. J. Eckstein, W. Mosenthal, Sir L. Phillips, E. J. Renaud, F. G. C. E. Robellaz, R. W. Schumacher. E. T. Mellor, cons. geologist.

Inc. Feb 22, 1913, in the Transvaal. **Cap.**, £550,000; shares 5s par. 2,125,995 issued.

Revenue in 1915, from dividends in other companies, was £868,539, of which £850,398 was distributed.

Dividends: 2,690% since 1898, 150% being paid in 1916.

Company is mainly a holding concern, but owns 1,252 claims with other interests and derives its income from the following producers, with their 1916 yields:

Mine	Tons	Gold Yield	Profit
Bantjes Consolidated.....	279,400	£296,543	£4,422*
City Deep.....	725,700	1,437,329	704,249
Crown Mines.....	2,266,000	2,887,777	815,620
Durban Roodepoort Deep.....	319,800	414,532	52,051
East Rand Proprietary.....	1,936,326	2,365,107	497,165
Ferreira Deep.....	643,600	1,130,227	458,695
Geduld Proprietary.....	330,763	504,514	167,258
Geldenhuis Deep.....	696,300	886,728	170,110
Jupiter.....	269,900	298,292	53,032
Modderfontein B.....	498,700	1,075,740	630,047
Modderfontein Deep.....	454,000	858,247	490,624
New Modderfontein.....	635,000	1,296,043	749,117
Nourse.....	663,640	775,362	114,203
Robinson Gold.....	691,300	845,029	367,136
Rose Deep.....	784,500	900,147	278,303
Village Deep.....	626,900	925,752	266,739
Village Main Reef.....	333,885	480,978	160,576
Wolhuter Gold.....	423,500	531,382	161,223

* Loss.

At the end of 1916, twelve of these mines had reserves totaling 39,975-187 tons, varying from \$5.30 to \$9.20 per ton.

RANDFONTEIN CENTRAL GOLD MINING CO., LTD.

TRANSSVAAL

Office: W. H. Crawford, Box 2, Randfontein, Transvaal.

Directors: G. Imroth, S. B. Joel, J. Munro, J. C. K. Pollock, W. H. Robinson and N. J. Scholtz. D. H. Thacker, gen. mgr.; W. A. A. Hahn, chief surveyor.

Inc. March 26, 1907, in the Transvaal. Cap., £4,500,000; shares £1 par; 4,343,700 issued. Debentures: £3,000,000 6% authorized, of which £2,734,900 are outstanding.

Revenue for 1916 was £2,835,892, of which £834,555 was operating profit. Debenture interest and redemption, taxes, development, etc., reduced this to £402,570.

Property: 2,296 claims, 1½ acres each, on the Rand, Transvaal.

Development: by 12 main shafts along the 7 miles of reef. New openings in 1916 totaled 112,026', including 2,151' of shaft sinking and 482,246 cu. ft. of bins, dumps and stations.

Reserves consist of 4,944,302 tons of \$7.80; 3,486,917 tons of \$4.60, and 3,268,654 tons of \$2.80 ore, a total of 11,699,873 tons. The last mentioned is unprofitable.

Equipment: extensive and modern, including mill of 1,000 stamps, 26 tube mills and cyanide plants.

Production: in 1916 was 680,983 oz. gold from 2,209,622 tons of ore, at a cost of \$4.24 per ton.

ROBINSON DEEP, LTD.

TRANSSVAAL

Offices: J. T. Bedborough, 8 Old Jewry, London, E. C.; and Consolidated Bldg., Johannesburg.

Officers: D. Christopherson, chairman; H. C. Boyd, F. L. Brown, C. Hely-Hutchinson, F. Raleigh, W. S. Smits and E. A. Wallers.

Inc. Dec. 31, 1915, in the Transvaal to acquire assets of Robinson Deep Gold Mining Co., Ltd. **Cap.**, £925,000, in 500,000 cumulative preference A shares of 1s each and 900,000 B shares of £1 each. All A shares and 681,807 B shares are issued credited as fully paid.

Dividends: 8s in 1916.

Property: 557 claims, 1½ acres each, on the Rand, Transvaal.

Development: by 2 shafts, and a new 7-compartment 4,500' shaft being sunk. Reserves are given as 1,849,000 tons, worth \$6.10 per ton, and 237,000 tons partly developed, assaying \$6.30 per ton.

Equipment: includes 300 stamps, 10 tube mills and cyanide plants.

Production: 632,000 tons in 1916 yielded £934,522, of which £306,688 was profit. Costs are about \$4.60 per ton.

ROOIBERG MINERALS DEVELOPMENT CO., LTD. TRANSVAAL

Office: J. H. Clark, 208 Salisbury House, London, E. C.

Directors: Wm. Dalrymple, chairman; W. H. Dawe, W. J. Gau, Wm. McCallum, John Munro, E. H. Read and J. Roy. E. R. Schoch, mgr.; E. J. Way, cons. engr.

Inc. May 19, 1908, in the Transvaal. **Cap.**, £180,000; shares £1 par; all issued.

Statement for year ended June 30, 1916, shows that out of a revenue of £117,252, £25,397 was profit. Dividends paid totaled £18,000.

Dividends: has paid total 104½% since 1910.

Property: tin claims in the Rustenburg district, Transvaal.

Development: by main shaft 243' deep. New openings in 1916 were 11,896', costing \$7.46 per ton; also 11,355' of surface prospecting. Reserves are estimated at 28,659 tons of 3.1% metallic tin.

Equipment: 10 stamps, tube mill and concentrators.

Production:

	Ore Treated, Tons	Tin, Per Cent Metal	Extraction, Per Cent	Metal Pro- duced, Tons	Cost per Ton
1915-16.....	36,460	3.02	77.95	707	\$12.10
1914-15.....	37,263	2.82	78.27	731	10.24
1913-14.....	40,643	3.18	78.81	887	11.46
1912-13.....	35,917	3.56	72.85	832	12.92

For the first half of 1917 there was treated 19,859 tons of ore, yielding 470 tons of 67% metallic tin concentrate and a profit of £17,755.

On a small capital this company is doing well and tin is likely to maintain a good price for many years to come.

SIMMER DEEP, LTD.

TRANSVAAL

Offices: J. T. Bedborough, 8 Old Jewry, London, E. C.; and Consolidated Gold Fields of South Africa, Johannesburg.

Officers: D. Christopherson, chairman; F. L. Brown, C. Hely-Hutchinson, E. J. Renaud and W. S. Smits; C. D. Leslie, supt. engr.; H. S. MacGregor, mine mgr.

Inc. Nov. 30, 1906, in the Transvaal. **Cap.**, £1,750,000; shares £1 par; 1,650,000 issued. **Debentures:** £755,000 5½% first mortgage, of which £740,000 issued.

Accounts for 1915 show a loss of £2,356 after paying £45,952 debenture interest and £9,848 sundries. Total reserve is £493,622.

Property: 1,035 deep-level claims, 1½ acres each, on the Rand, developed by 4 shafts, one being 3,161' deep on incline.

Reserves are estimated at 1,492,000 tons of \$4.50 ore, and 255,000 tons of partly developed ore worth \$4.47 per ton.

Equipment: includes two hundred and twenty 1,670-lb. stamps, 9 tube mills and cyanide plants.

Production: the 1916 output was £682,067 from 762,700 tons, giving £63,706 net. Costs are \$3.85 per ton.

This is one of the Rand's low-grade mines.

SIMMER & JACK PROPRIETARY MINES, LTD. TRANSVAAL

Office: J. T. Bedborough, 8 Old Jewry, London, E. C., England.

Directors: D. Christopherson (chairman), W. S. Smits, F. L. Brown, C. H. Barclay, C. Hely-Hutchinson. C. D. Leslie, supt. engr.; O. P. Powell, mgr.

Inc. 1887, in the Transvaal. **Cap.**, £3,000,000; shares £1 par; all issued.

Profit for the year ended June 30, 1916, was £275,857, of which £262,500 was paid in dividends. There was £92,234 carried forward.

Dividends: since 1889 total 370%.

Property: 624 claims, 1½ acres each, on the Rand, Transvaal.

Development: reserves are estimated at 1,935,000 tons of \$5.20 ore, a decrease of 220,000 tons. There is also 215,000 tons of \$4.40 partly developed ore. Waste sorted out is 3%.

Equipment: complete, with 320 stamps, 7 tube mills and cyanide plants.

Production: in 1916 was 210,970 oz. gold from 797,900 tons, at a cost of \$3.46 per ton.

VILLAGE MAIN REEF GOLD MINING CO., LTD. TRANSVAAL

Office: J. Bradshaw, sec., 8 Old Jewry, London, E. C., England.

Directors: M. A. Bramston (chairman), Pierre Buisson, F. J. Dormer, B. C. Hinman, H. F. Marriott, T. J. Milner and C. S. C. Wafkins; H. C. Hilton, mgr.; H. S. Martin, cons. engr.

Inc. Nov. 28, 1890, in England. **Cap.**, £472,000; shares £1 par; all issued. Company has an interest in the Village Deep.

Accounts for 1916 show a revenue of £505,974, of which £480,979 was from gold. The profit was £106,508, after paying £322,661 for operations and £76,805 for taxes, etc. Dividends amounted to £113,000. The previous balance was £245,611; that carried forward to 1917 was £197,866.

Dividends: since 1898, total 825%, including 25% in 1916, equal to £3,785,143.

Property: 172 claims, 1½ acres each, on the Rand, Transvaal.

Development: during 1916, 473' of new work was done, 45% being in "reef." Reserves total 750,204 tons of \$6.60 ore.

Equipment: complete with 160 stamps, 6 tube mills and cyanide plants. At the sorting plant 14.3% is discarded, assaying 64c per ton.

Production: in 1916 was 333,885 tons of \$7.50 ore, yielding 115,749 oz. gold. Total extraction was 92.4% at a cost of 19s 2d (\$4.60) per ton.

The life of this mine is about 3 years, although it may develop more profitable ore.

ASIA

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ASIA CHINA

WAH CHANG MINING & SMELTING CO., LTD. CHINA

Head office: Changsha, China. **Other offices:** 51 Kiangse Road, Shanghai, China; Woolworth Bldg., New York; H. M. Newhall & Co., Newhall Bldg., San Francisco, and H. E. M. Bourke, 21 Great Winchester Street, London, E. C., Eng.

Officers: Y. H. Wang, pres.; H. Y. Liang, v. p. and chief engr.; K. C. Li, v. p. and New York mgr.; M. C. Wang, v. p.; N. F. Chu, v. p. and treas.; S. L. Tang, supt. and asst. treas.; K. K. Chang, sec.; T. W. Tseng, asst. sec.; D. C. Chow, Shanghai mgr.

Auditors: Y. G. Chow, M. H. Li and C. F. Tsai.

Directors: H. L. Shuan (chairman), H. Q. Liang, Q. Yang, C. T. Chow, D. W. Tang, P. Q. Yuen, H. K. Liang, L. C. Tsow and F. C. Chow.

Mr. Shuan (chairman) was ex-Premier of China during the time of President Yuan Shi Kai. He is wealthy, and owns a large porcelain factory and extensive lands in the Hunan province. Mr. Chu (v. p.) is a partner in the firm of Chu, Yin Koo Tang, the largest tea merchants in China, controlling practically the major part of the tea business in the north, east and west provinces.

Mr. Chow controls about 120 salt firms, extending over practically the whole of China, and enjoys a high reputation all over the country. He is the largest shareholder in the company. Mr. Tang is the brother of the Civil Governor of Hunan province, and is a large land-owner.

Mr. Yuen is the son of the former Viceroy of Canton, and is a large land-owner in Kiangse province.

History: The Wah Chang company was formed in 1898, under the name of Kiu-Tung Antimony Mining Co., which was the first antimony mining company in China. In 1908 it was reorganized, and obtained a patent for its antimony smelting process from the Chinese Government. In addition to this the company obtained a monopoly of the smelting of antimony in the province of Hunan, to extend over a period of 10 years as from 1908. It has since been extended for a period of 25 years. Under this monopoly, no company has the right to erect works in the province, unless the consent of the Wah Chang company is obtained. The patent granted extends over the whole of China, No figures are available, but we are assured that the finances of the company are very strong.

The main office is situated at Changsha, next to the antimony works, which extend over a large area, and includes in addition, a lead plant, warehouses, etc.

Property: the company owns the following:

Antimony mines: (1) the Yi-Yang mines, a good property with modern mining equipment. A light 25-mile railway will shortly be built to connect the mine with the river; (2) the An-Hua mines; and (3) the Lu-Lin mines.

Tin mines: the An-Yuen and Poo-Sha tin mines.

Tungsten mines: the Yao Kan Sian and Ton An tungsten mines.

Each mine is controlled by a subsidiary of the Wah Chang company.

Lead mines: the Tien For Tai lead mines.

Products: the principal product is the WCC antimony, with a guaranteed minimum purity of 99% Sb, but assaying 99.6% and over. Company also markets Chinese needle antimony, white oxide of antimony and antimony ore; tungsten concentrates, which assay 70% WO₃ and over; and lead and tin ores.

The antimony and the tungsten products are shipped all over the world. The lead product is entirely disposed of in China for domestic purposes, while the tin ore is obtained only in small quantities.

At the antimony works the Herrenschmidt process is used. This was described by K. C. Li in a paper prepared for the American Institute of Metals and reprinted in the E. & M. Journal of Oct. 20, 1917. The ore mined is low-grade. In 1915 and 1916 there was extracted from accumulated residue over 9,000 tons (20,160,000 lb.) of metal. The works treat custom ore.

This company is the largest antimony producer in the world and supplied 62% of American imports in 1916.

FEDERATED MALAY STATES

PAHANG CONSOLIDATED CO., LTD.

Office: A. Giffard, ser., Blomfield House, London Wall, London, E. C., Eng.

Directors: J. E. Champey, chairman; E. H. Finch, H. W. Thompson and H. Frisby, Jr. J. T. Marriner, mgr.

Inc. 1906. **Cap.,** £500,000 in 500,000 pfd. shares; £1 par and 1,600,000 common shares; 5s par.

Annual report for year ending July 31, 1916, shows £98,925 net profit, as compared with £103,963 in 1915.

Dividends: paid amounted to £68,155, being 12% on 100,000 pfd. and 15% on 374,370 common shares outstanding.

Property: consists of mining rights over 200 square miles in State of Malay. The main producers are the Willinks mine developed by 982' shaft and the Nicholson mine developed to depth of 1,348'. A number of new properties are under development and management estimates ore reserves at 350,000 tons, July, 1916.

Equipment: includes 50-stamp concentrating mill. Recent production, 1914-15, 160,000 tons, yielding 2,538 tons of tin concentrate; 1915-16, 162,200 tons, yielding 2,535 tons of tin concentrate.

INDIA

BALAGHAT GOLD MINING CO., LTD.

INDIA

Office: W. L. Bayley, 6 Queen St., London, E. C., Eng.

Directors: Lord Ribblesdale (chairman), Lord Glenconner, Sir D. Robertson, J. Taylor and R. Taylor. John Taylor & Sons, gen. mgrs.; W. Pritchard, supt.

Inc. Dec. 7, 1896. **Cap.,** £308,000, in 95,400 pfd. and 212,600 ord. shares of £1 par; all issued.

Dividends: total 132½% on pfd. shares from 1900 to 1907.

Property: 1,565 acres in the Kolar goldfield, State of Mysore, India. Has been a larger producer, but recent profits are small. Reserves in 1916 were estimated at 26,133 tons.

Production: in 1916, 28,476 tons of ore and 57,438 tons of tailing, yielded 17,725 oz. gold, worth \$360,000.

BURMA CORPORATION, LTD.

INDIA

Office: D. Anderson, 1 London Wall Bldgs., London, E. C., Eng. This company controls the Burma Mines, Ltd., which see.

BURMA MINES, LTD.

INDIA

Office: D. Anderson, 1 London Wall Bldgs., London, E. C., Eng.

Directors: Sir T. R. Wynee (chairman), R. G. Brown, J. M. Fells, A. F. Kuehn and C. S. Magennis. T. E. Mitchell, mgr.; Bewick, Moreing & Co., gen. mgrs.

Inc. March 6, 1906, in England. **Cap.**, £200,000; shares 4s par; 512,046 issued, of which 25,538 are fully paid, the remainder 2s paid. Debentures, £35,000 4%. In 1915 there was a loss of £17,427, out of an income of £323,570.

Property: 2,496 acres, including ancient mines at Bawdwin, Upper Burma, India.

Development: by 7,250' tunnel, vertical shaft and extensive workings. Reserves in 1916 were estimated at 3,240,000 tons, assaying 27% lead, 21% zinc and 25 oz. silver per ton.

Equipment: 60 miles of 24" gauge railway, 3 blast furnaces, 1,000-ton mill and other plant capable of handling 300,000 tons of ore yearly. Additions to the smelter and mill are underway.

Production: 18,975,000 lb. lead in 1914 and 30,289,000 lb. in 1915. This will be a large producer in 1918, everything being in its favor.

CHAMPION REEF GOLD MINING CO. OF INDIA, LTD.

INDIA

Office: F. H. Williams, 5 Queen St. Place, London, E. C., Eng.

Directors: J. Taylor, chairman; Lord Ribblesdale, v. c.; Lord Glenconner, Sir J. F. F. Horner, Sir J. D. Rees and E. Taylor. H. J. Gifford, mgr.; John Taylor & Sons, mgrs.

Inc. June 3, 1889, in England. **Cap.**, £260,000; shares 2s. 6d. par; all issued. Profit for the year ended Sept. 30, 1916, was £172,400, of which £140,000 was paid in dividends. The reserve fund amounts to £85,000.

Dividends: since 1893 total 1,923%, 40% being paid in 1915-16.

Property: 1,095 acres in the Kolar field, State of Mysore, India. This has been developed to a depth of over 3,000' by shafts and extensive workings. The lode is narrow, about 36", but persistent. Reserves are 375,991 tons, a decrease compared with 1915. Air-blasts are troublesome underground.

Equipment: complete modern mining plant, with 140-stamp, tube-mills, and cyanide plants. Native labor is employed.

Production: in 1915-16 was £497,329 gold from 194,311 tons of ore and 285,492 tons of tailing.

This is one of the world's great gold producers.

MYSORE GOLD MINING CO.

INDIA

Office: W. F. Garland, 5 Queen St. Place, London, E. C., Eng.

Directors: W. B. McTaggart, chairman; Lord Ribblesdale, v. c.; Lord Glenconner, M. F. Napier, Sir J. D. Rees, J. Taylor and R. Taylor. R. H. P. Bullen, supt.; John Taylor & Sons, mgrs.

Inc. July, 1880, in England. **Cap.**, £305,000; shares 10s. par; all issued. During 1915 the revenue was £880,168, of which £473,448 was profit, less £335,500 for dividends. The reserve fund is £150,000.

Dividends: total 3,100% to end of 1916.

Property: 3,051 acres at Kolar, State of Mysore, India.

Development: by shafts over 4,000' deep and extensive workings on a narrow lode. Reserves are placed at 1,044,000 tons.

Equipment: complete, with 210 stamps, tube-mills and cyanide plants.
Production:

	Ore (Tons)	Gold Yield (Oz.)
1916.....	307,023	198,258
1915.....	305,000	207,981

NUNDYDROOG COMPANY, LTD.

INDIA

Office: W. L. Bayley, 5 Queen St. Place, London, E. C., England.

Directors: W. B. McTaggart, chairman; P. C. C. Francis, V. H. Smith, J. Taylor and R. Taylor. C. H. Richards, supt.; John Taylor & Sons, mgrs. Inc. April 20, 1893, in England. **Cap.,** £283,000; shares 10s. par; all issued. Profit in 1915 was £143,896, of which £99,050 was distributed. £50,000 held as reserve fund.

Dividends: since 1888 total 900%.

Property: 1,497 acres at Kolar, State of Mysore, India

Development: by 5 main shafts, 3,251', 3,588', 3,612' and 3,704' deep, the fifth being 18' diam. and under construction.

Reserves are estimated at 210,500 tons.

Equipment: complete with 80 stamps and cyanide plant.

Production:

	Ore (Tons)	Gold Yield (Oz.)
1916.....	98,000	80,401
1915.....	94,000	82,822

OOREGUM GOLD MINING CO., LTD.

INDIA

Office: F. H. Williams, sec., 5 Queen St. Place, London, E. C., England.

Directors: M. Low, chairman; Sir D. Robertson, Sir J. D. Rees, E. Taylor and J. Taylor. H. M. Cooke, supt.; John Taylor & Sons, mgr.

Inc. Oct. 25, 1880, in England. **Cap.,** £410,000; in 240,000 pfd. and 500,000 ord. 10s. shares.

Profit in 1915 was £174,831, of which £138,270 was paid in dividends.

Dividends: on previous capital 87s. on pfd. and 63s. 9d. on ord. shares and on present capital 55s. 3d. on pfd. and 40s. 3d. on ord. shares.

Property: 931 acres at Kolar, State of Mysore, India.

Development: by vertical shafts, a 4,000' circular shaft being sunk. Reserves amounted to 367,625 tons in 1915.

Equipment: complete with 120-stamp mill and cyanide plant.

Production:

	Ore (Tons)	Gold Yield (Oz.)
1916.....	155,317	90,619
1915.....	153,266	86,643

Costs were \$6 per ton in 1915.

This company completes the important group in the Kolar field. It is supplied with hydro-electric power, generated 91 miles away and sold to the Mysore Government. In case of breakdown an auxiliary steam plant is available at the mines.

JAPAN**FUJITA COMPANY (GOMEI KWAISHA FUJITAGUMI)** JAPAN

Office: 20 Dojima-Kitamachi Osaka, Japan. **Branch offices:** 6 Yamanashi-cho, Kyobashi-ku, Tokio; 27 2-Chome, Nanzancho, Seoul, Korea; 100 Hokumonkogai, Daitotei, Taipei, Formosa.

Officers: Baron Heitaro Fujita, pres.; Tokujiro Fujita, v. p.; Hikasa Fujita, directors; Nakasuke Saka, gen. mgr.; Yotaro Takagi, Seiichi Saka

Kurataro Suzuki, Otojiro Sasano, Kennosuke Tsujimoto, mgrs.; Seiichi Yamashita, min. and smel. supt.

Company was formed at Osaka in 1869 by the late Baron Denzaburo Fujita, father of the present president.

Cap., increased later to present figure of 6,000,000 yen, though the capital actually in operation amounts to more than 50,000,000 yen.

The company is also extensively engaged in forestry (Nam Heng rubber estate in Kota Tinggi, Johore State, Malay Peninsula, 6,000 acres; Hokkaido forest in northern island of Japan, 180,000 acres; Yawataya sawmill in Osaka, Nagakisawa sawmill near Kosaka mine, etc.), and agriculture (reclamation work at Kojima bay, near Okayama, Japan).

Mining is the most important branch, first begun in 1880. When metallic mining was started in Japan, the Fujita Company was among the first to take an active interest in it, and the company led the way in adopting the latest appliances then used in Europe and America. The total number of mining claims and that of the mines possessed by the company, in Japan, Korea, and Formosa, are 163 and 37, respectively. Some of them are being exploited, while 25 are being successfully worked. The total value of the mineral products of the company for 1916 amounted to 10,500,000 yen, including:

Gold, ounces	27,000
Silver, ounces	1,169,000
Copper, pounds	22,640,000
Lead, pounds	764,000
Zinc, pounds	672,000
Other ores, tons	7,063,000

Of silver, the company produces about 30% of the total yield of Japan; of copper, about 17%; and gold, 13%. The company employs 12,872 mine workmen, of whom 3,993 were underground and 8,167 on surface.

Kosaka Mine: situated at Kosaka-machi, Kazunogun, Rikuchu, in the extreme northern part of Hondu, the main island of Japan. The mine is about 10 miles from the Government railway. It was worked until 1897 as a silver mine, passing in 1881 to the present ownership. The Kosaka employed 6,500 hands in 1916.

Geology: country rock is brecciated porphyry tuff, ranging from a fine conglomerate to a coarse grit, of tertiary age, with a covering of volcanic ash and with intrusions of liparite and andesite. The orebodies constitute a fine example of metasomatic replacement occurring along the contact zone between the tuff or liparite and andesite, and is surrounded by the clay with dissemination of pyrite, but are shading imperceptibly into the liparite. There are 5 of these orebodies, of immense size, ranging from 20 to 270' thick, and proved for a length of a half-mile, while drills have shown the formation to continue to a depth of 1,700'. The area of deposit so far explored is 2,000' long, 800' wide; and 500' deep. There are three kinds of ores: a complex sulphide, pyrite both compact and loose, and silicious. They carry much barite.

Ore: all ores are more or less argentiferous, and the product is divided into 3 grades. The first grade is the complex sulphide, averaging 2.43% copper, 2.28% lead, 9.80% zinc, and 15.64% iron, with 7 oz. silver per ton, and from a trace to \$2 gold per ton, the gangue carrying 40 to 45% barium sulphate. The pyrite ore, the second grade, averages 2.34% copper, 0.17% lead, 3.15% zinc, and 26.83% iron. The silicious ore, the third, averages 1.27% copper, 0.26% lead, 1.48% zinc, and 19.4% iron.

Development: the Kosaka is mined through turnels. The slicing and filling system is used, but underground mining was practically abandoned in

1908 for open-cut workings, similar to those of the Utah Copper Co. From 1,000 to 1,800 cu. yd. of overburden is removed daily, the entire overburden being estimated at about 4,000,000 cu. yd. Stripping is partly by hand labor and partly with drills, and with electric trolleys to remove waste.

The open pit is of funnel shape, about 1,000'x2,000' in size, with the sides terraced. Owing to extraction of ore by tunnel and open-out workings only about 500 h. p. is required at the mine.

Equipment: includes two 8-drill Leyner air compressors and one 12-drill compressor, and an electric pump on the 500' level.

The smelter, $1\frac{1}{4}$ miles from the mine, with electric rail connection, is of about 1,000 ton daily capacity. There are 6 pot roasters, 3 Brück-Kretschel briquetting machines, and several stamps used for briquetting fine ores. The percentage of fines is 35% of the raw ore. There are 10 open top water jacket blast furnaces, 7 of which are 24' long, and 4' wide at tuyere level; the others are smaller. One 15' furnace is used for matte concentration. Semi-pyritic smelting is employed, coke charged from the furnace top is about 1.5%, and powdered coal inserted through the tuyeres about 3% of the crude ore. The blast pressure is about 1 lb. About 25% limestone and 10% slag and matte to raw ore are used as fluxes. The average of all ores is only 2.5% copper, with small gold and silver contents. The grade of the first matte is 35%, and the second, 45%.

The converter plant has 2 stands, with 8 shells. There are 2 Brown-Boverie-Rateau blowers, a complete lining department, and 140-ton electric crane. Blister copper from the converter is refined electrolytically, the product being 99.95% copper. The slime from the electrolytic tanks is treated in two cupel furnaces. The monthly capacity of the electrolytic plant is 1,200 tons.

The electrolytic zinc refinery at the Kosaka mine was installed in 1915. There are 4 Herreshoff calcining furnaces, which were used before the matte calcining, one muffle furnace, and 5 Ding's magnetic separators. The daily production of electrolytic spelter is about one ton.

Power is all electric, the Kosaka installations aggregated 3,550 k.w. a.c. and also 220 k.w. d.c. for the mine, smelter, shops, and rail lines. It is generated by 4 water plants on the river Oyu, near the mine, also by a locomobile steam plant.

The Kosaka mine operates an electric trolley, with 9 miles of main line and branch lines, equipped with 35 locomotives and 400 three-ton ore cars. The lines reach all principal points at the mine, smelter, and shops, and connect with the Kosaka railway at the Kosaka depot. The Kosaka railway, which is 15 miles between Kosaka and Odate, connects with the Government railway at Odate.

Production: the annual output of the Kosaka has been as follows: 11,853 long tons of copper, 335 tons of lead, 1,017,200 oz. of silver, 26,667 oz. of gold, and 282 tons of zinc.

The Tokito dressing plant is 2 miles from the smelter, with aerial tram connection. Mixed ores from the branch mines of the Kosaka mine are dressed, the capacity being 100 tons per day.

Hanaoka Mine: in Kita-akita-gun, Akita Prefecture, Japan, owned by the Fujita Co. since 1915.

Ore: the deposit is massive and worked by filling methods. The ore contains chiefly copper and iron pyrites, galena, zinc blende, and gypsum. After hand picking, it is transported to the Kosaka smelter, 18 miles away.

Production: in 1916 was 62,335 tons, which contained 0.00006% gold, 0.008% silver, and 2.08% copper.

Omori Mine: situated in a mountainous region in the province of Iwami (Omori-machi, Nima-gun, Shimane-ken), in the northwest of

Hondo, near the coast of the Japan Sea. This mine is said to have been discovered some 600 years ago, and reopened in 1525. The mine once was highly productive, but was closed in 1872 by an earthquake and reopened in 1884 by the present company, which, after spending considerable capital, equipped the mine with a modern plant.

Geology: the district is composed of Tertiary tuffs and sandstone, interspersed with a great mass of andesite containing ore. There are five veins which have been produced by the fillings of the fissures with mineral solutions. The dip of veins varies from 80° to 70° N., with from 10" to 3' width. Ore exists in bands in the veins, its average width being 7", but it sometimes swells to 6'. Some of the veins are 2,000' long, composed principally of chalcopyrite, galena and zinc blende, containing gold and silver. Five of the veins—Sato, Honnakase, Nakase, Sanjio and Umanose—are now being worked. The ore contains 0.0014% gold, 0.056% silver, 7.75% copper and 0.8% lead.

Development: the veins are worked by stoping, and material is removed by adits and shafts. The ore, after being cobbled and picked, is mechanically dressed by breakers, rolls, trommels, jiggers, etc. The dressed ore, with the requisite quantity of limestone and coke, is smelted raw in an ordinary circular jacketed furnace. The matte formed from this semi-pyrite smelting is once more smelted, forming blister copper (98%Cu), containing 2.3% gold, 77.0% silver, and lead. This last operation is carried out according to the Japanese Mabuki process.

Production: the output was 1,041,933 lbs. of blister copper in 1914; 1,120,306 lbs. in 1915, and 1,002,590 lbs. in 1916. All blister copper from this mine is shipped to the Kosaka electrolytic refinery.

Ōarasawa Mine: about 17 miles W. of Kurosawajiri station on the Government railway, to which a tramway has been constructed from the mine, is situated at Yuda-mura, Waga-gun, Iwateken (east district of Akita-ken, where is also the Kosaka mine). It was opened 33 years ago, passing in 1910 to the present ownership.

Geology: Country rocks are granite, tuff, and liparite of Tertiary age. Traversing these rocks, especially tuff, many veins in various widths from 6" to 6' occur, running nearly parallel in the strike of N. 35 to 60° E. and dipping N. W. at 60 to 70°. A few veins dip at the same angle as the former, but in the opposite direction. The gangue is principally quartz, and the veins carry mainly chalcopyrite and iron pyrite, also some oxides of copper.

At five miles W. from the Ōarasawa mine is the Unekura mine. This is a branch of the Ōarasawa at present. The district consists mainly of liparite and tuff of Tertiary age, and fissure veins are found in liparite and tuff. These can be classified into two general groups; the strike of one is N. 25° E., the other N. 85° E. The minerals contained in the ore are chalcopyrite and a little iron pyrite; the gangue is quartz.

Development: the veins of Ōarasawa and Unekura are worked by overhand stoping, and the material is removed by adits and shafts. The ore mined is mechanically dressed to 7.5% grade.

Production: is about 151,000 long tons of dressed ore yearly, plus 1,000 tons of purchased ore. The blast furnace process is generally similar to that at the Omori. Annual production of blister copper (anode) contains 98% copper, 0.0005% gold, 0.05% silver, is 1,650 long tons, which is transported to Kosaka refinery. About 1,000 men are employed, including branch mines.

Matsuoka Mine: situated at Yamada-mura, Okachi-gun, Akita-Ken, and three miles W. from Yuzawa station on the Government railway, to which a light railway has been laid from the mine. The mine was worked

in the eighteenth century by Shinen Sato, a famous economist, miner and metallurgist, to whom modern mining in Japan is greatly indebted. Since the end of 1906 the present company has operated the property.

Geology: country rocks are liparite and tuff of Tertiary age. Ore deposits consist of a network of veins in the upper part, but only a few veins in the lower part. The ore consists of chalcopyrite, galena, and zinc blende, gold, and silver; and assays 0.003% Au, 0.0085% Ag, and 0.95 % Cu. This is dressed to 0.006% Au, 0.015% Ag, and 2.3% Cu, and is transported by railway to Kosaka. Production was 15,000 tons of dressed ore in 1916.

Obiye Mine: near Okayama, Japan, was discovered a few hundred years ago, and was bought by the Fujita Co. at the end of 1913. It employs 500 men.

Geology: a paleozoic slate is intruded by an irregular "boss" of quartz porphyry, varying from 10' to 50' wide. Veins of chalcopyrite exist in the slate, enclosed by the quartz porphyry in such a manner that mining is carried on separately for each division, namely: Toba, Kurosaki, Kanusai, Saruhiki, Kinsei, Katsuragi, and Asahara, etc. The ores mined are hand picked into over 3.5% ore and 1.38% ore. Hand packing is done by women, whose wages are 27 sen (13 cents) per day.

Production: Up to the end of 1908 smelting was carried on at this mine, but is now done in Inu island, 13 miles E. of the mine (see Inujima smeltery). The annual production was about 500,000 long tons of dressed copper ore containing 8.2% Cu and 0.003% Ag.

Zuiho Mine: Soon after Formosa came into the possession of Japan the Fujita Co. opened a gold mine in Zuiho, in 1895. The mine is 8 miles East of Keelung, in the northern end of the Island of Formosa, near the coast.

Geology: The mine and its vicinity consist of Tertiary formation, and site alternating with a bed of sedimentary rocks. In the former there are several thin streaks of coal embedded between layers of sandstone and bituminous shale. On the contact zone between the Tertiary and andesite are the gold veins, which are common here to both rocks. The ore is silicious, and contains a small quantity of pyrite and other sulphides. Some of the ore, being rather clayey is difficult to classify.

Production: since 1914 the mine has been under sub-contract of Ye-Yün-nien. In 1916, with an average of 291 employees, production was 64,024 tons of ore, yielding 4,791 oz. gold (including alluvial gold), and 185 oz. silver.

Inushima Copper Smelter: These works are situated on island Inu at the mouth of Kojima bay of the Inland sea of Seto, that is 2.5 miles in circumference. This plant is one of the large copper smelters in Japan. Ore from the company's own mines—Obiye, Nachi, Seto, Omidani, Minaki, and several mines in Korea, etc.—cupriferous pyrite from Chugoko district and the Provinces of Kii and Awa, are also brought here by junks.

Semi-pyrite smelting is employed. The first matte from the blast furnace contains 11 to 12% Cu, so that it is to be smelted again into a second matte of about 30% Cu, which is converted by the Mabuki furnaces of 20 stands into a blister copper containing 98% Cu, 0.0095% Au, and 0.2687% Ag. The smelting capacity is about 7,000 tons of ore, and 280 tons of blister copper per month. About half the blister copper is transported to the Kosaka refinery as anode. Production in 1916 was 3,330 tons of blister. About 400 men are employed at present.

Hirota Steel and Ferro-Alloy Works: Situated near Aizu, in Fukushima Prefecture. Owing to the war, Japan has suffered from the lack of some materials imported from foreign countries in ordinary times, and all ferro-alloys are among them. The company taking advantage of this opportunity, started

to produce these alloys and special steels. The works are operated by hydro-electric power, and are now producing ferro-silicon, ferro-manganese, ferro-chromium, ferro-tungsten, ferro-molybdenum, ferro-titanium, ferro-vanadium, silico-speigel of every description, and special kinds of high-speed steel, etc.

Most of the products are used in Japan by the navy and army arsenals, also by various engineering works, while some alloys are exported to Russia and other foreign countries.

Beside the above, the following mines are important producers:

Name	Annual Output		Average Content			
	Long Tons	Ore	Copper, Per Cent	Silver, Per Cent	Zinc, Per Cent	Lead, Per Cent
Kobyaku.....	18,000	Copper	4.2	0.0013		
Omidani.....	12,000	Silver	....	0.065		
Minaki.....	3,200	Copper	3.4	0.00005		
Kawamata.....	9,000	"	2.3			
Kamikawa.....	2,000	"	5.72	0.00115		
Hisaki.....	1,400	"	2.5			
Seto.....	1,000	"	4.5	0.015		
Shikaku.....	2,700	"	1.0			
Yanahara.....	45,000	Pyrite	48%S			
Akitsu.....	3,500	Zinc	2.5	....	33.3	
Tokito.....	2,500	"	2	....	20	
Edate.....	1,500	Zinc and Lead	2	....	23	10
Nachi.....	1,900	Copper	6.5			

FUJITA MINING & SMELTING CO., LTD. JAPAN

Inc. in Japan, with capital of Y30,000,000 (\$15,000,000) to operate from Oct. 1, 1917, the mining and smelting department of the Fujita Company (Gomei Kwaisha Fujitagume), which see.

FURUKAWA GOMEI KAISHA (FURUKAWA & CO.) JAPAN

Directors: Baron Toranosuke Furukawa, pres.; Rokusaburo Kondo, chief director; Masayuki Otagawa, Koji Inoue, Bunjiro Konda.

In 1875 the late Ichibei Furukawa established the Furukawa Copper Firm in Tokyo. He was very energetic, and devoted himself to developing and equipping the mines he had prospected. In 1903 the late Junkichi Furukawa, the son of the founder, succeeded his father and became president of the firm. In the same year the concern was reorganized into a company under the Japanese law. On his death, in 1906, Toranosuke Furukawa, his brother, succeeded him, and since then he has been president of the company.

The company has 11 offices, 4 copper works, and 25 mines, whose total area of concession is about 70,000 acres; 1,200 officials and 25,000 men are employed; the annual production is 35,000 tons of copper, 20,000 tons of copper wire and plate, 220,000 tons of copper ore, 1,200,000 tons of coal, and quantities of bullion, pig lead, silver ore, zinc ore, etc.

Head office: Yaesucho, Kojimachi-ku, Tokyo, Japan.

Branches: *Address:*

- Osaka Branch Office..... Ajikawa kamidori, Kita-ku, Osaka.
- Moji Branch Office..... Hamamachi Moji.
- Wakamatsu Branch Office.... Kaigan dori, Wakamatsu, Fukuoka-ken.
- Fukuoka Branch Office..... Hakata Kaigan dori, Fukuoka.
- Keijo Branch Office Nandaimon-dori, Ni-chome, Keijo, Chosen.
- Shanghai Branch Office..... Peking Road, British Concession, Shanghai, China.
- Hankow Branch Office..... French Concession, Hankow, China.

Tairen Branch Office..... Yamagata-dori, Tairen, Manchuria.
 Hongkong, in China; Branch
 Office Des Vouex Road, Central Hongkong.
 London Branch Office..... Bishopsgate St., London, E. C.
 120 Broadway New York.

Principal Mines:

Ashio Copper Mines..... Ashio Kamitsuga-gori, Tochigi-ken.
 Ani Copper Mines..... Ani, Kita-akita-gori, Akitaken.
 Nagamatsu Copper Mines.... Shiraiwa, Nishimurayama-gori, Yamagata-ken
 Mizusawa Copper Mines..... Iwakimura, Waga-gori, Iwateken.
 Otori Copper Mines Ozumimura, Higashi-tagawa-gori, Yamagataken.
 Kawaiyama Copper Mines.... Ikumo-mura, Abu-gori, Yamaguchi-ken.
 Kune Copper Mines..... Sakuma-mura, Iwata-gori, Shizuoka-ken.
 Furokura Copper Mines..... Oyu-mura, Kazuno-gori, Akitaken.
 Kijo Gold Mines..... Todo, Kijo-gun, Heianhoku-do, Chosen.
 Innai Silver Mines..... Innai, Ogachi-gori, Akitaken.
 Daira Lead Mines..... Fujikoto-mura, Yamamoto-gori, Akitaken.
 Shakanoo, Shiogashira and
 Daini-Shakanoo Collieries... Otani-mura, Kano-gori, Fukuoka-ken.
 Shinshakanoo Collieries Nishiawa-mura, Kurate-gori, Fukuoka-ken.
 Shimoyamada Collieries..... Kumada-mura, Kaho-gori, Fukuoka-ken.
 Yoshima Collieries Yoshima-mura, Ishiki-gori, Fukushima-ken.

Works:

Mizushima Smelter..... Mizushima Is., near Tamashima, Kojimageri.
 Okayama-ken.
 Amagasaki Refinery Amagasaki, near Osaka.
 Nikko Copper Works..... Nikko, Tochigi-ken.
 Honjo Copper Works..... Yanagiwara-cho, Honjo-ku, Tokyo.

Ashio Mines

These mines are in Ashio, Kamitsuga-gori, in Tochigi-ken, about 100 miles from Tokyo, connected by the Imperial Government Railroad and the Ashio Railroad. They are 11 miles W. of famous Nikko. Area of the concession is 4,000 acres.

Geology: the district consists mainly of paleozoic sediments and Tertiary liparite (rhyolite). The liparite forms a volcanic neck erupted through the paleozoic sedimentary rocks and is 2 miles in diameter. The ore deposit of Ashio occur in veins, most of which traverse the liparite. The strike or course of the veins is either N. 60° E. or N. 80° W. The veins of the first-named direction are called the 60° lodes, or the Yokomabu series, and the others the 100° lodes, or the Shinsei series. The mines have more than 200 veins, of which 40 of the Yokomabu series and 60 of the Shinsei series are now being worked. The most important veins of the first series are named as follows: Yokomabu, Kosei, Jimbo and Deai. The second series embraces the Shinsei, Eisei and Tengu. They intersect each other and form rhombic nets of veins. The lodes are generally 1 to 16' thick, 400 to 6,000' long, and generally have steep dips. The chief minerals are chalcopryrite and pyrite, with accessory amounts of zinc blende, arsenopyrite, galena and pyrrhotite. Bornite, chalcocite, cuprite, malachite, pisanite and sometimes azurite and native copper are found in the oxidized zone. The gangue minerals are found in small amount: clay and chlorite are common, quartz is also common, and calcite is found at deep workings. Native bismuth, bismuthinite, wolframite, fluorite, crystallized vivianite, ludlamite and apatite are rarely found.

Development: the mines have three main adits, namely: the Ariki, Kotaki and Isudo, which are three miles apart.

The *A r i k i* adit is driven mainly along the strike of Yokomabu vein and is 10' high, 10' wide and about 8,000' long. It is an important level for transportation and drainage. The *K o t a k i* adit, whose portal is to the N.W. of the mine, is driven chiefly along the course of the Kosei and Tengu veins, and is connected with the Ariki tunnel. Both the Kotaki and Ariki tunnels are used as trunk haulage ways for underground transportation. The 6 levels below and the 12 levels above are within the reach of the Tsudo adit.

T s u d o adit: this adit is S. of the mine, on the bank of the Watarase river, 475' lower than the Ariki. This level was begun in 1885, and driven northward for 12,000'. More than 50 veins were cut in the tunnel, most of them still being profitably worked. The Tsudo tunnel is the main drainage and transportation way of the mine. It is 11' high and 13' wide. There are 12 mine levels below it, the lowest one 1,500' beneath the tunnel.

H o n k u c h i s h a f t: which is 6'x9', is a half mile from the portal of the Honkuchi tunnel, connects with the 10th level and extends down to the Ariki tunnel level. It is equipped with electric hoists.

Y o k o m a b u No. 1, or first shaft, which is 6'x11' in the clear, is sunk on the Yokomabu vein at a point 4,600' from the portal of the Ariki adit, connecting at 457' below with the Tsudo level. There are 7 levels and many working faces that are now being profitably operated.

Y o k o m a b u No. 2, or second shaft, which is 6'x18', is sunk on the same Yokomabu vein, at a place 2,500' from the Ariki adit. It taps the Tsudo adit at a depth of 410' and goes 100' below it. The shaft has 7 levels between the Ariki and Tsudo tunnels, and 6 levels below the Tsudo adit.

Y o k o m a b u No. 3, or third shaft, 5'x12', is 1,900' from No. 1 Yokomabu and passes through Tsudo level at 466' below Ariki level, and reaches to the depth of 1,300', and more sinking is going on. A hoist is fitted up at the mouth of this shaft for the workings below Tsudo level. The *K o l a k i* shaft, 6'x14', is near the Kosei vein, 2,100' from the Kolaki adit, and it reaches Tsudo level at depth of 448'. No. 1 *K o s e i* shaft, 6'x18', near the Kosei vein, is along No. 23 vein, 2,600' W. from the Tsudo adit. It is 900' deep, and further sinking is in progress in 1917. There are 8 levels connecting with this shaft for the working of the Kosei, Kosei-maehi, Tengu, etc., veins. No. 2 Kosei shaft, 6'x18' and 660' deep, is 2,000' W. from No. 1, on the Kosei vein. There are several levels connecting with the shaft, which open up the eastern part of the vein. The *K o s e i - m a e h i* shaft, 6'x23', and sunk on the Kosei-maehi vein, is 1,500' deep below the Tsudo adit, but further sinking is in progress.

The vertical depth of the underground working places from the highest outcrop to the lowest level is as follows: Outcrop on Bizendate peak to Tsudo adit, 2,200'; below Tsudo adit, 1,500'; a total of 3,700'.

The aggregate length of drifts amounts to about 1,000,000', or 190 miles.

Overhand stoping is generally used, but also square set work. Each stope is 6' high, and more than 2½' wide, varying according to the thickness of the vein.

Waste Water from the precipitating tank for cement copper and the slimy water from the dressing plants are treated with milk-of-lime, after passing through slime setting ponds.

The smoke from all the furnaces is treated by Cottrell treaters. Ashio being in a very mountainous region, aerial tramways are widely used for transportation of timber, etc.

The total length is 25 miles. The Tanamura system is adopted in all lines.

Power is chiefly supplied from the Hosoo hydro-electric power plant (12 miles from Ashio) which was built in 1905, developing 10,000 h. p. The plant's capacity is now being doubled.

Production: this has increased gradually during the past 10 years as follows: 6,315 long tons in 1907; 7,191 in 1908; 7,526 in 1909; 7,453 in 1910; 7,932 in 1911; 8,470 in 1912; 10,428 in 1913; 12,204 in 1914; 11,624 in 1915; 14,816 (33,187,840 lbs.) in 1916.

Cost of Ashio copper is probably a little less than 10c per lb. finished.

Ani Copper Mines

(Annual production, 1,500 tons of copper.)

The Ani Copper Mines are at Ani, Kitaakita-gōri, on the western side of the Moriyoshi Mountain, in Akita-ken. The concession is over 4,600 acres, and is over 5 miles long.

Geology: rocks include tertiary tuff, tuffaceous shale, liparite, and andesite. Veins traverse the whole formation, there being two sets of veins, one running N. S. and the other E. W. The dip is generally steep, though a few of the N. S. lodes have a dip less than 40°. The E. W. lodes are cut by the N. S. lodes, which are sometimes brecciated veins, and occasionally have a clay filling. The E. W. lodes are numerous, though not thick nor long; while the N. S. lodes are big, though few in number.

The principal metallic minerals are chalcopyrite, associated with pyrite, some galena and zinc blende. The gangue or vein stuff is mainly quartz, but sometimes calcite and barite are found. The oxidized zone is deep, and contains bornite, chalcocite, native copper, etc.

Holes are drilled both by hand and machine drill. The drills used include the Ashio drill, Water-Leyner, Ingersoll-Sergeant, Sullivan, Flottmann, Little Wonder, and others. Air for drills is supplied by 3 air compressing plants at the Hanzon, Kotaki, and Tsūdō mines, each one equipped with 2 sets of Ingersoll-Rand compressors and synchronous motors, the former two being of 320 h. p. and the third 500 h. p.

For timbering, only rough, round logs are used. There are several forms of timbering used including legs and caps, saddle back, and polygonal sets. It is interesting to note that large excavated spaces such as the hoisting and pumping stations and chambers, each 40' wide, 25' high, are timbered with big logs.

Transportation: underground of ores, waste and supplies is by electric locomotives and electric hoists; the former in the Ariki-Kotaki adit, Tsudo adit and No. 4 and 8 levels below the Tsudo. The total length of electrically equipped trackage is 10 miles. All shafts are equipped with electric hoists. Total electric power used is 1,200 h. p.

The Ariki and the Kotaki levels drain the water coming from above and the remainder by the Tsudo adit. There are many kinds of pumps including the Sulzer and Escher-Wyss turbine types. Total electric power used for pumping is 1,300 h. p.

All the machinery of the mines is driven by electricity, transmitted at 22,000 volts from the Hosoo hydro-electric power plant to five substations where it is transformed down to 2,200 volts, again stepped down to 200 volts at underground substations.

Ore dressing: the mines have three concentration mills at Honzan near the portal of the Ariki, Kotaki and Tsudo tunnels. Crude ore is sorted into two grades underground, one averages 12% copper, the other 0.8%. The daily output of crude ore for the three mills, is 250 long tons of 1st and 1,500 tons of 2nd grade. The former is selected mostly by hand the latter is treated by jigs, tables and flotation. Concentrates from the three mills amount to 300 tons of 12.5% grade daily.

Cement copper: is recovered from old workings and weathered rubble. The daily production is 2½ tons of 66% copper, which is sent direct to the smelter.

Smelter: this is at Honzan, the eastern part of Ashio. The lumps are

finer from the concentrating mills being silicious, some basic ores and limestone is supplied from other places. About 105,000 tons of 12.5% product is treated annually, indicating a production of 13,000 tons of copper.

The lumps are charged raw to the blast furnace, the fines are reduced in reverberatory furnaces after roasting in 5 McDougall furnaces. The matte is bessemerized as usual.

There are four blast furnaces, 160"x42" at the tuyere level; the height from the center of the tuyeres to feed floor is 8½'. Blast is supplied by a Root No. 8 blower, also by turbo-blowers. Matte averages 40% copper. Slag assays silica, 39%; iron, 25%; lime, 19%; alumina, 9%, and copper, 9.2%.

The reverberatory furnace is 19'x110'. Waste heat is utilized by steam boilers. Matte is ladled into converters by an electric traveling crane.

There are 7 converters of the barrel type, 72" diam. and 100" in length. The tuyeres have Dyblie ball valves. Blast for the converters is produced by two turbo-compressors. Lining for converters is a decomposed rhyolite porphyry (liparite).

The converters produce more than 100,000 lbs. of blister copper daily. Blister is cast into 70 lb. ingots or anode plates, and carried to the Nikkō Copper Works by rail.

Analysis of the blister copper is as follows: copper, 99.077%; gold, 0.0003%; silver, 0.1065%; arsenic, 0.029%; bismuth, 0.006%; iron, 0.052%; sulphur, 0.028%, and selenium and tellurium, 0.038%.

Mining: there are many levels and shafts, including the Manaita, 10' wide, 7' high, and 8,000' long, the most important transportation and drainage level. Below this there are four levels at present. The Kanbun is 7' high, 4' wide, and 4,500' long. There are ten other levels above the Kanbun tunnel with intervals of 60' to 80', the lower five now being used. The Kosawa main shaft, 4'x14', is one of the blind shafts, which is sunk down to Maehi vein in Manaita level, and is 400' deep. It is equipped with hoists and pumps. The Chōmatsu crosscut opens nearly all of the chief veins in this mine. It is 7' high, 10' wide, and 1,000' long and is the most important transportation level. There are seven levels above and six below it.

The Sosuido level is the third below the Chōmatsu, and is 4' wide, 6' high, and 1,700' long. It is used for drainage only. The Kayakusa, 4'x14', is one of the blind shafts sunk to the Shinsei vein on the Chōmatsu level, and is 800' deep at present. The Koganehira level is the lowest for transportation and drainage, and is 7' high, 4' wide, and 1,500' long. The Motosawa level is 50' above the former, and is 6' high, 4' wide, and 3,000' long. There are 10 levels above the Koganehira, connected by winzes. The Amaike tunnel is cut through at the foot of the mountain range between the Kayakusa and Sammai valleys. It is the lowest level in the mine, and is 7' high, 8' wide and 9,000' long, with double tracks. During the driving the chief veins in Kosawa and Sammai were found. The Suidōkō adit is driven first as a crosscut; then, after proceeding along the Shōgorōhi vein, it cuts several other veins. It is 7' high, 8' wide and 6,600' long, and is the most important transportation and drainage level. There are 10 levels above it connected by winzes.

Treatment: the main concentration mill is at the Kosawa mine, and contains Hancock jigs, tables, and flotation plant. The 1% crude ore feed is concentrated to 10% Cu.

Ores: the dressed ore treated contains 40% silica and 10% copper. About 16,000 tons of ore are treated annually, yielding 1,500 tons of copper.

The fines and sands are briquetted or roasted in pots. The briquets, roasted ores, and raw material are reduced in 2 blast furnaces with limestone. Matte is blown to blister copper by the Japanese Mabuki hearth (7).

Blister copper, containing 98% copper and 0.11% silver, is sent to the Nikkō Copper Works and electrolytically refined.

Power is chiefly supplied from the Hitachihina hydro-electric power

station, which generates 1,000 h. p. There are also two small auxiliary plants. Another plant for supplying 2,000 h. p. is under construction.

Nagamatsu Copper Mines

(Annual production, 1,000 tons of copper.)

These extend over Shiraiwa-machi, Nishimurayama-gōri, and Okuramura, Mogami-gōri, in Yamagata-ken, and are situated on the south of Mt. Gassan. The area of the concession is 1,300 acres.

Geology: the district consists of Tertiary, shale, tuff, and sandstone, with extensive intrusives of liparite and andesite. The ore deposit forms clay veins which traverse all the rocks and consists chiefly of chalcopyrite and pyrite; zinc blende and galena are frequently found; quartz and baryte are found occasionally.

Mining: there are many levels, of which the Ogiri and Chūgiri are the most important. The former is 5,000' long. The latter is 380' above the former, and is 4' wide, 6' high, and 2,500' long.

Treatment: dressing is done by hand and by mechanical means. Crude 1% copper ore is concentrated to 8.5% grade. The dressed ore averages 8.5% copper and is easily smelted. The fine concentrates are roasted in pots; raw lumps and roasted products are smelted into matte in blast furnaces. Matte is blown into blister at Mabuki. The blister contains 97% copper and 0.18% silver, and is sent to Nikkō Copper Works for refining.

Power: a hydro-electric power plant of 200 h. p. is at work.

Mizusawa Copper Mines

(Annual production, 500 tons of copper.)

These are in the village of Iwasaki-mura, Waga-gōri, in Iwate-ken. The area of concession is about 1,882 acres.

Geology: this district is composed of granite, tertiary tuff, and liparite. The important lodes are the Machi, Okuhi, and Uwabanhi. They run mainly in the granite, with a N. 60° E. strike.

Principal minerals are chalcopyrite and pyrite; but occasionally galena and zinc blende are found in small quantities. The gangue is quartz, but is not abundant. Calcite is found in druses.

Mining: Tsūdō adit level, 300' long, is the lowest level and is used for transportation and drainage. No. 6, 1,400' long, is the main transportatic level.

Treatment: is mechanical concentration. All machinery is driven by electricity.

The crude ore contains 1.2% copper, and concentrates 7.4%.

Smelting: the dressed ores are silicious, containing 7.4% copper. They are classified into lump ore, small ore, fines and slime. The last three are roasted in pots, the roasted fines and fine dust are briqueted. The raw lump briquets and roasted materials are smelted in the blast furnace, and the resulting matte is blown to blister copper by the Japanese Matte process. The blast furnace is rectangular and water-jacketed, 33" x 66" at the tuyeres, and 10' 6" high; the diameter of the 8 tuyeres is 2½".

Otori Copper Mines

(Annual production, 500 tons of copper.)

These are in the village of Oizumi-mura, Higashitagawa-gōri, in Yamagata-ken. The area of the concession is 296 acres.

Geology: the ore deposit forms veins which traverse tertiary andesitic tuff and liparite. The Hompi is the main lode, and strikes E. W. and dips 80° N. It is 1' to 6' wide, and 2,500' long. Minerals are chalcopyrite and pyrite, and the gangue is quartz and rhodochrosite, both in small quantity.

Mining: Tsūdō adit is 1,600' long. The Ogiri level is 420' above it and is 1,200' long.

Treatment: concentration is mechanical. Crude ore carries 3.6% and the concentrates 8% copper.

Kawaiyama Mines

(Annual production, 500 tons of copper.)

These are situated in Ikumo-mura, Abu-gōri, in Yamaguchi-ken, 20 miles N. W. of Yamaguchi. The area of the concession is about 400 acres.

Geology: the deposit is a contact metamorphic one, which is found on both sides of quartz-porphry dyke erupted through paleozoic limestone. It is 1' to 30' thick, and consists of a mosaic of granite, hedenbergite, quartz, chalcopyrite, and occasionally zinc blende and galena.

Mining: there are five levels, of which the 4th is the longest, being 2,500' long. A shaft is 350' deep.

Treatment: the crude ore is sorted by hand. The quantity of dressed ore is 85% of the original run of mine.

Smelting: is done by blast furnaces and Mabuki hearths. The fineness of the blister is 95% copper, and 0.6 to 0.7% silver.

Kune Copper Mines

(Annual production, 170,000 tons of copper ore.)

These are in the village of Sakuma-mura, Iwata-gōri in Shizuoka-ken, and are situated on the eastern bank of the River Tenryū. The area of the concession is 3,000 acres. The mines have no concentrating mill and no reduction works, the pyritic ores being sold.

Geology: the formation is a graphitic schist and chlorite schist of the Algonkian system. The ore deposit consists of epigenetic beds of pyritic ores (copper 3-8%), which strike N. 35° E., and dip 30° to 60° N. W. The deposit contains six orebodies, the Okuhi orebody being the largest; it is 45' to 100' wide and 1,500' long on the strike, and 1,500' deep. The ore consists of pyrite and chalcopyrite with some pyrrhotite and compact granular texture. Quartz is sometimes found, and occasionally magnetite occurs in separate layers.

Mining: there are 14 levels, of which two are important. The Ogiri, 1,500' long, is a crosscut, and is the most important transportation level. The Tsudō adit, the lowest drainage level, is 400' below the former, and is a crosscut, for drainage and transportation. It is 9' wide, 8' high, and 3,000' long at present. A shaft, with cages, 500' below the Tsudō adit, is working at present; another shaft with skips is under construction.

Overhead stoping is followed. According to the thickness of the bed, the stoping is done in two ways: (1) stoping in the direction of the strike, which is employed in the working places, where the bed varies 4' to 8' thick; and (2) stoping in the horizontal direction at right angles to the strike, which is used generally in the thicker part of the bed.

The mines produce both basic pyritic copper ore, and silicious ore, and there is also a small output of cement copper. Annual production of pyritic ore amounts to 170,000 tons, averaging 4% copper.

Transportation: the ores from the sorting house are carried by a rope-way to bins built on the bank of the River Tenryū, and then are loaded on boats and carried to the Tenryū station of the Imperial Government Railway.

Power: 2,500 h. p. is generated by water at Toyone, 5 miles N. W. of the mines.

Furokura Copper Mines

(Annual production, 50,000 tons of copper ore.)

These are in the village of Oyu-mura, Kazuno-gōri, in Akitaken. The area of the concession is 2,322 acres.

Geology: the rocks in which the orebodies occur comprise tertiary tuff, shale, and andesite, cut by quartz veins that traverse all of the rocks. The Hompi vein is the master lode. It strikes N. 30° to 40° E., and dips steeply N. W. or S. E. The thickness varies from 1' to 12', and the known length is 5,000'. In the middle part of the Hompi vein, there is a branch called the Shijunenhi vein, whose strike is N. 60° W., and dip 60° S. The chief

minerals are chalcopyrite and pyrite, and the vein stuff is quartz. Micaceous hematite occurs with the quartz, and sometimes calcite is found in the druse.

Mining: the Ogiri tunnel is driven along the strike of the Hompi vein; it is 5' wide, 7' high, and 5,000' long, and is the most important transportation and drainage level. The Kyūshichi tunnel, 260' above the former, is also driven on the Hompi vein for a distance of 5,000'. The Hosoji tunnel is 530' above the lowest or Ogiri level. All levels are connected by shafts and winzes. Stopping is practiced. Excavation is by hand drilling and by Leyner rock drill and Ingersoll stopers.

Treatment: high-grade ore is mostly screened and picked, and the low-grade ore is concentrated mechanically. The dressed ores treated are silicious, containing 5.5% copper. They are divided into lumps, grains, and sands, and are sent to the smelter of the Kosaka mines owned by Fujita & Co.

Power: gas engines of 600 h. p. are used, and a hydro-electric power plant of 1,300 h. p. is under construction.

The ores and all supplies are transported by aerial tram between the mines and the Kosaka property.

Kijo Gold Mine

(Annual production, 2,000 tons of lead containing gold.)

This mine is in Tōdō, Kijō-gun, Heianhoku-dō, in Chōsen (Korea). It is 27 miles N. E. from Sensen station of Chosen railway. All supplies are transported on horseback from the station. The concession covers 20,000 acres.

Geology: quartz veins are in gneiss, and number over 15, varying from 1' to 20'. The principal minerals are native gold and galena, with some zinc blende and a little argentite. Iron pyrite, arsenopyrite, and chalcopyrite occur as accessory minerals.

Mining: exploitation of the deposits began in 1912, and the work soon disclosed numerous commercial gold veins and gold-lead veins. Work is proceeding on a large scale.

Smelting: the mines have a small concentrating mill and blast furnaces for experimental work. Lead ingots, containing much gold, are produced, and sent to the Amagasaki refinery.

Innai Silver Mines

(Annual production 400,000 ounces of silver.)

These are in the town of Innai, Ogachi-gōri, in Akita-ken, and are within 3 miles of Innai station of the Imperial Government Railways. The area of the concession is over 2,613 acres.

Geology: the district consists of tertiary tuff, tuffaceous shale, and tuffaceous sandstone, as well as liparite and andesite, the latter two intruding the tertiary. The deposit consists of quartz veins that traverse all rocks.

Mining: the portal of the Sosuidō adit is near the concentrating mill; it is first a crosscut, and then a drift along the Hompi vein, the champion lode of the mines. It is 7,800' long, and is used for drainage and transportation.

No. 1 Yamaichi shaft, 4'x13', is 1,370' deep and develops the Hompi vein. It is equipped with an electric hoist. No. 2 Yamaichi is on the E. end of the Hompi vein, connects with the Sosuidō adit level at a depth of 300', but it has no connection with other levels.

Ore treatment: Crude ore is crushed by gravity stamps and concentrated on Wilfley tables. Concentrates and old tailings are treated by cyanidation. The former contains 1.09% (355 oz.) silver, and the latter 0.02% (6.5 oz.) silver. The cyanide plant was completed and about Aug. 1917, is expected to produce 400,000 oz. of silver annually.

Daira Lead Mines

(Annual production, 600 tons of lead, 5,000 tons of zinc ore.)

These are in the village of Fujikoto, in Yamaoto-gōri, Akita-ken. The mine is 17 miles from the Futatsui station of the Ou line of the Imperial Government Railway.

Geology: the rocks include Tertiary tuff, andesite, and liparite. The quartz vein carries mainly argentiferous galena, and zinc blende.

Mining: the deposit is reached by a tunnel driven along the vein.

Treatment: dressing is done by hand, mechanical crushing, screening, jigging, and flotation, and finally by an electro-magnetic separation. The lead ore is smelted here, and the zinc ore sold. The former is roasted in pots with limestone, and is reduced by charcoal in Mabuki hearths, and made into base bullion.

Power: a hydro-electric power plant of 400 h. p. is being erected.

A light railway connecting the mines and Futatsui station of the Government Railway is under construction.

Coal Mines

Following are the collieries and their outputs:

Name	Coal	Tons per Annum
Shiogashira, Shakanoo, Daini-Shakanovo.....	Bituminous	380,000
Shimoyamada	Anthracite	160,000
Hinshakanoo		60,000
Oshima		500,000

Mizushima Smelter

This is a customs smelter, situated in the islet Mizushima, 5 miles S. E. of the Havour Tamashima, near Okayama City. It includes pot roasters, blast furnaces, and Mabuki hearths. The blister copper is sent to Nikkō Copper Works.

Production is 3,500 tons of copper per annum.

Amagasaki Refinery

This refinery is in the town of Amagasaki, near Osaka. Copper is refined in reverberatory furnaces. Lead ingots and silver bullion are also produced.

Annual production is 5,000 tons of refined copper, 2,000 tons of lead, and 10,000 oz. of silver bullion.

Nikkō Copper Works

The Nikkō works are at Kiyotaki, near Nikkō, and make electrolytic copper, copper wire, alloy wire, copper plates, etc.

Copper from Ashio and other mines is refined here. The plant consists of a tank house for the series system, and one for the multiple system, blue color plant, refining furnaces, and slime house.

The wire plant has rolling mills for rods and plates, wire drawing presses, and brass foundry.

A hydro-electric power plant at Hosoo develops 10,000 h. p.

Annual production is 30,000 tons of electrolytic copper and copper wire; 10,000 oz. of bullion, etc.

Honjo Copper Works

These are at Yanagiwara-chō, Honjō-ku, Tōkyō. Copper and brass castings are produced by the mills, which are driven by electric power.

Annual production is 500 tons of copper and brass sheet.

KUHARA MINING CO., LTD.

JAPAN

Head office: Osaka, Japan; **London office:** I. Sato, 60 Mark Lane, E. C.; **New York office:** K. Hishida, 26 Cortlandt St.

Officers: F. Kuhara, pres.; Y. Ayukawa, and I. Saito, directors.

Inc. 1912, in Japan. **Cap.,** 30,000,000 yen (\$15,000,000).

Report for half-year ended May 31, 1916, shows a credit balance of 2,927,974 yen after paying dividend. Reserve fund was 11,497,395 yen. The dividend for this period was 30%.

Property: originally owned by Kuhara Mining Office, includes copper, gold and silver mines, such as the Hitachi in Japan, and Kapson in Korea; also refineries at Saganoseki and Iyejuna.

Production: 2,500 to 3,000 tons of electrolytic copper, 9,000 to 10,000 oz. gold, 120,000 to 150,000 oz. silver, 75 to 100 tons copper sulphate, and 200 to 300 tons of zinc, per annum.

MITSUBISHI GOSHI-KAISHA

JAPAN

Head office: Yaesucho Itchome, Kojimachi-ku, Tokyo, Japan. Branch offices and agencies: Osaka, Kobe, Kyoto, Nagasaki, Moji, Karatsu, Otaru, Nagoya, Ejiri, Yokohama, Tsuruga, Kure, Hakodate, Daihoku, and Muroran in Japan; Shanghai, Hankow, Peking, Tientsin, Dairen and Hongkong, in China; Singapore, in Strait Settlements; Manila, in the Philippines; London, England; New York, in America; and Vladivostock, in Siberia.

Officers: Baron Koyata Iwasaki, pres.; Seijiro Sho, gen. mgr. gen. affairs dept.; Shinji Harada, gen. mgr. metal mg. dept.; Kusuyata Kimura, gen. mgr. coal mg. dept.; Sadaye Eguchi, gen. mgr. trading dept.; Shoichi Kirishima, gen. mgr. estate dept.; Manzo Kushida, gen. mgr. banking dept.; Taisuke Shiota, gen. mgr. shipbuilding and engineering dept.; Teizaburo Hori, gen. mgr. iron foundry dept.

Established, 1893. **Cap.,** 15,000,000 yen.

The Mitsubishi is the foremost private enterprise in Japan, and a worthy memorial to its founder, the late Yataro Iwasaki. Its interests are varied, but are chiefly in mining, shipbuilding, and banking. The company is an important producer of gold, silver, copper, tin, tungsten ore, and coal, possessing 22 metal mines and 11 coal mines, which in 1916 yielded 1,430 kg. (45,760 oz.) gold, 27,605 kg. (883,360 oz.) silver, 30,619,497 lbs. copper, and 2,982,000 metric tons of coal.

Mitsubishi copper is marketed as electrolytic ingots branded with three diamonds, to insure identification, as it is considered to be unsurpassed in purity and electric conductivity. The larger part of the output is sold in the London market through the London branch.

Osarusawa Mines: about 14,534 acres, in Kazuno district, Akita prefecture, Japan. Shokichi Namura, mgr.; H. Abe, asst. mgr. The mines are ancient, having been opened in the 8th century, but were worked for gold only until about 1650, when copper ores were developed.

Geology: ore carries chalcocite, chalcopyrite, bornite, and a little native copper, associated with pyrite, and small quantities of sphalerite, galena, and hematite. Occasionally native gold is found mixed with copper ore, and in a quartz fahlband, gold occurring mainly in the upper workings. Ores occur in a complicated system of interlacing fissure veins varying from less than 1' to over 10' thickness. Their dip is 15°, 45°, 75°; also opposite directions. The average width is 3', and the copper content is 4%; most of ore is also high in iron pyrite. The veins, which are persistent in strike, and workable to an average depth of 500', traverse tertiary sand and tuffs, with intrusive augite-andesite and liparite.

Development: is by 8 working shafts and 12 main tunnels, with a total length of 17 miles of workings.

Equipment: includes electrical installations aggregating 1,140 horsepower. Working forces average 2,400 persons. The reduction plant has two water-jacket blast furnaces, with a 250-h. p. electric plant, turning out matte copper of 98% tenor, sent to the Osaka electric refinery.

During 1200 years of operation, these mines have produced immense quantities of copper, gold and silver. Recent production is as follows:

Year.	Gold ozs.	Silver ozs.	Copper lbs.
1913	320	32,740	4,647,486
1914	390	31,010	4,824,936
1915	550	29,950	4,161,426
1916	640	33,920	5,046,122

Ore production is 16,700 tons per month.

Arakawa Mine: about 2,100 acres, at Arakawa-mura, Sempoku district, Akita prefecture, Japan. Tokutaro Segawa, mgr. The mine is connected with Sakai station on the railway by a 7-mile tram.

Geology: country rocks are tertiary volcanic sediments and crystalline rock, including augite-andesite, liparite, and propylite, carrying 10 parallel veins in propylite, with strike approximately N. E. and S. W., and workable for 1,000' to 4,000' along their course. Ore consists of chalcopyrite and quartz with a little pyrite, galena, and blende. Oxide ores, mixed with sulphides, averaging about 2% copper, extend to 500' below the surface.

Development: by 5 shafts, 300' to 600' deep, and numerous tunnels. The deepest working is at 800' in the lower tunnel.

Equipment: includes 5 power houses, with aggregate of 4,000 h. p. About 1,400 persons are employed.

Production: is 5,000 tons of ore per month. Including the Hisaichi mine, the yield has been as follows:

Year.	Gold ozs.	Silver ozs.	Copper lbs.
1913	80	32,230	3,990,595
1914	50	34,520	3,755,182
1915	30	36,400	2,914,216
1916	75	28,000	2,391,087

Hisaichi Mine: about 926 acres at Nakagawa village, 5 miles S. E. of the Arakawa, with which it is geologically similar. There are 7 veins, the largest, known as Ugaisawa, of about 24' average width, carrying about 8' of payable ore, and occasionally branching into several smaller veins. The other workable veins range from 5' to 7' width. The ore averages 3% copper as chalcopyrite, with oxide ores, hematite, and lead and zinc sulphides, also a little gold and silver. There is a 500' shaft.

Equipment: includes water and electric power installations. Employees average 1,200.

Production: 2,000 tons of ore monthly, which is partly smelted locally.

Tsunatori Mine: a branch of the Arakawa, has an area of 1,240 acres, at Yokokawame-mura, Waga district, Iwate prefecture, Japan. Employees number 400. Output is 1,200 tons of ore monthly.

Production: since 1915, when the mine came into possession of this company, is as follows:

Year.	Gold ozs.	Silver ozs.	Copper lbs.
1915	110	230	25,010
1916	2,750	7,280	807,062

Omodani Mine: area 1,992 acres, at Kamianama-mura, Ono district, Kuroi prefecture, Japan, 50 miles S. of the railway at Fukui, and 27 miles from Ono-machi.

This property, opened A. D. 1,350, has numerous small veins, none of which exceed 3' in width, impregnating sandstones and altered quartz porphyry. The ores carry bornite, chalcopyrite, sphalerite, and galena, all argentiferous, also some native silver. Four larger veins, up to 10' in width, showing low-grade ore, are also worked. Ores average about 6% copper and 72 oz. silver per ton.

Development: by a shaft with 5 levels, the longest 12,110', and all aggregating 58,380' in length, with 23,750' of track. Hydro-electric power is used. The working force is around 670 men.

Production: is 3,878 tons of ore per month. For the past 4 years the yield was:

Year.	Gold ozs.	Silver ozs.	Copper lbs.
1913	320	79,640	650,185
1914	600	103,960	915,116
1915	1,100	129,310	987,742
1916	800	116,600	1,115,646

Ikuno Mine: area 12,786 acres, at Ikuno Machi, Hyogo prefecture, Japan. Kinjiro Shimamura, mgr. The principal mines of this group are the Tasei, Kanagase, Akenobe and Kasei. There are 4 smaller ones.

Geology: the Tasei has a 14' main vein with numerous branches in quartz porphyry, altered andesite tertiary tuffs. The ores carry native gold and silver, together with chalcopryrite, galena, zinc-blende, and pyrite. This vein is notable for its silver content, and has been the mainstay of the mine for centuries, giving it the name of "Silver Mine of Ikuno."

Kanagase Mine: near the Tasei, has many veins in quartz trachyte, three of them being workable. The property is traversed by several andesite dikes, with fault dislocation of the veins along the dikes. The chief copper vein is 8' to 10', runs N. S., dips 60 to 80° E., and is 10,000' long. The ore carries native copper, bornite, chalcopryrite, and tetrahedrite. Two other veins now being worked are 3' to 9' thick, nearly vertical, minable for 2,000', and contain argentite, sphalerite, galena, ruby silver, and stibnite besides copper sulphides.

The Akenobe mine has numerous copper and tin-bearing veins in Paleozoic slate, scattered along the Akenobe river. Eleven veins are worked, varying from 3' to 4' wide. Ores carry chalcopryrite, bornite, cassiterite, wolframite, and blende also.

The Kasei mine shows hornblende gneiss, cut by rhyolite and porphyry dikes with fissure veins carrying silver sulphides associated with chalcopryrite and native silver.

Equipment: includes steam, water, and electric power plant.

Production: copper is shipped in slabs carrying 96.83% copper, 0.002% gold, and 0.4742% silver. Output for the past 4 years was as follows:

Year.	Gold ozs.	Silver ozs.	Copper lbs.	Tin lbs.
1913	3,200	258,900	3,870,311	41,000
1914	2,600	240,200	4,479,880	164,000
1915	2,110	223,200	5,219,481	684,000
1916	2,140	249,000	5,486,119	553,000

Kanayama mine, a dependant of the Ikuno, has 903 acres on the Island of Shikoku, across the Inland Sea, in the Kita district, an hour's run by steamer from Nagahama.

Workings show interbedded lens of cupriferous pyrite 6" to 10' thick in Archean schists. The bed is flat, workable for 3,000', and yields 1,000 tons of ore monthly, averaging 3.3% copper and 40% sulphur. This is sent to Ikuno. Output of sulphur was 5,640 tons in 1915, and 8,497 tons in 1916.

Yoshioka Mine: area 2,155,173 acres, at Fukiyamachi, a small town in Kawakami district, Okayama prefecture, 33 miles from Tatami, on the railway. Fusajiro Fukeda, mgr.

Geology: slates, sandstones, and phyllites are cut by porphyry and quartz porphyry. The ore deposit is divided into two, one part in the sedimentary beds, increasing in richness with depth; the other an impregnation in metamorphic slates in an igneous contact zone. The former shows veins of erratic width, in the form of a stockwerk. Ore is chiefly chalcopryrite, with some pyrite, arsenopyrite, pyrrhotite, galena, and blende with quartz gangue, and averages 3 to 8% copper.

Development: the mine has a 360' shaft, with 9 levels, and a 375' shaft. Total openings amount to 28 miles. Employees average 2,700.

Production: 7,000 tons of ore monthly. The output for the past 4 years was as follows:

Year.	Gold ozs.	Silver ozs.	Copper lbs.
1913	130	61,250	1,519,989
1914	130	61,790	1,741,342
1915	130	64,500	1,608,555
1916	120	63,200	1,607,312

Makimine Mine: area 1,370 acres, in 4 lots, at Kitakata village, Higashi-Usuki district, Miyazaki prefecture, Japan. It is far away from railway lines, but in a well traveled region. It is accessible by steamer up the Gokase river to Tomi.

Geology: country rock is slate with interbedded sandstone, and a capping of lava from the Aso volcano. These rocks are cut by veins of small size, carrying lenticular ore shoots of pyrite, averaging 5% copper, the ore shading into pyrite and lievrite. There are 11 main veins, whose ore-bodies are from 10' to 20' wide, though averaging but 1' to 7', and are 30' to 300' long.

Development: is by tunnels at 50' to 60' intervals, with inclined winzes of 310' and 1,000', and a vertical 240' winze. Workings aggregate 23,300'.

Equipment: is hydro-electric. About 780 persons are employed.

Production: for past 4 years was as follows:

Year.	Gold ozs.	Silver ozs.	Copper lbs.
913	615	6,430	1,515,903
914	618	7,740	2,103,181
915	627	8,100	2,415,395
916	630	8,350	2,121,223

Takara Mine: area 1,659 acres, is at Takaramura, Yamanashi prefecture, convenient situation to rail traffic.

Geology: formation of the country consists of Paleozoic slate and quartzite, intruded by diorite. The ore deposit occurs in the former, taking massive structure and striking from E. to W., with a dip ranging N. 70° to 80° S. The ore produced is pyrite, which carries some copper.

Production: 18,000 tons of ore per year, which is marketed for sulphuric acid manufacture and the solution used in leaching. There are 150 people employed.

Okuyama Mine: area 2,000 acres, is at Minamikami Mura, Kamo district, Iizuoka prefecture. Ores occur as chalcopyrite. Working force averages 0, producing 7,000 tons of ore per year.

Osaka Metallurgical Works: are at Shinkawasaki-machi, Kita-ku, Osaka, joining the Imperial Mint. The works cover 12 acres and employ about 1,000 people. It includes 15 reverberatory furnaces, turning out anodes of 97 to 99% purity for conversion into electrolytic copper, cathodes assaying 89% copper, 0.0037% silver, 0.014% lead, 0.01% arsenic, and a trace of phur. Gold and silver slime yielded by electrolytic separation are washed and dried preparatory to roasting in a small muffle furnace. They are then leached with the waste solution of the refinery to dispose of the remaining copper, the residue being mixed with lead and cupelled. A new plant is under construction, and when completed, the refining capacity of the works will be doubled. Output for past 4 years is as follows:

Year.	Gold ozs.	Silver ozs.	Copper lbs.
1913	32,380	180,000	9,873,566
1914	21,890	161,630	9,191,560
1915	26,530	149,660	10,389,787
1916	14,800	216,660	11,954,755
		Copper sulphate,	Cathodes,
		metric tons	metric tons
		1,089	119
		883	153
		959	143
		1,197	155

Production by all mines of the company since 1913 has been as follows:

Year.	Gold ozs.	Silver ozs.	Copper lbs.
1913	55,460	805,440	26,098,935
1914	49,300	821,000	27,135,547
1915	57,370	825,700	27,957,579
1916	45,700	883,300	30,619,497

The Mitsubishi is one of the 5 large mining companies operating in Japan, and, like the others, is exceptionally progressive. Success has not been won by the possession of mines of exceptional value, though the company has some excellent properties, but rather by the utilization of the most modern methods and appliances and in mining and metallurgy, directed by the best technical skill available.

MITSUI MINING CO., LTD.

JAPAN

Head office: No. 1 Surugacho, Nihombashi, Tokyo, Japan. New York office: 25 Madison Ave.

Directors: Gennosuke Mitsui, pres.; with Dr. Naoya Yamada, Kainchi Okamoto, Dr. Tamaki Makita, Genyeman Mitsui, and Dr. Takuma Dairi. Board of auditors: Jutaro Mitsui, Tanojiro Ono, and Shogoro Hatano.

Cap., 20,000,000 yen, paid up.

Property: the Kamioka, Kushikino, Sano, Kaisen, and Kongo metal mines; the Iwanonobori, Kobui and Araodake sulphur mines; zinc refinery by-product coke and gas power-plant and dye manufactory; and 8 coal mines, all in Japan.

Production: during 1915 the output of this company was 1,490 oz. gold, 295,800 oz. silver, 29,020 lbs. copper, 7,013,700 lbs. lead, 11,412,000 lbs. zinc, 1,230 lbs. bismuth, 21,800 lbs. arsenic, 2,360 lbs. tungsten ore and 13,850 metric tons of zinc ore.

KOREA (Chosen)

CHOSEN GOLD MINES, LTD.

KOREA

Mining and milling operations were abandoned at end of 1916.

Sec. and office: H. R. S. Aldon, Caxton House, Westminster, London. S. W., Eng. American representative: H. E. Collbran, 1002 First Nat. Bank Bldg., Denver, Colo. Korean representative: H. W. Davidson, Seoul (Korea).

Directors: H. Collbran, chairman; F. B. Lawson, E. T. McCarthy, M. F. Sayce, A. H. Collbran and H. E. Collbran. A. R. Weigall, cons. engr.; S. Weigall, gen. mgr.; D. C. McEwen, metallurgist.

Inc. Feb. 28, 1912, in Great Britain. Cap., £74,400; shares £5 per share, £62,310 issued.

Annual report for fiscal year ending June 30, 1915, shows: bullion transit, £2,325; cash, £757; debtors, £150; debit, £759; acc'ts payable, £8,411.

Property: a concession over 750 acres, including the Kok Kang Ka Mine at Chung An, Chosen, Province of North Chung-Chung, South Korea. A royalty of 1% upon the gross value of the output is payable to the Korean government, also an annual mining land tax of about 30¢ per acre for acreage actually in use.

Ore reserves: Dec. 31, 1915, estimated at 20,800 tons of \$6 ore, \$124,800.

Equipment: includes stamp mill and cyanide addition with 50 tons capacity.

ORIENTAL CONSOLIDATED MINING CO.

KOREA

Office: 15 Broad St., New York. Mines and works: Unsan district, Korea, Asia.

Officers: H. C. Perkins, pres.; Leigh Hunt, v. p.; Henry W. Bulkley, v. p.-treas.; L. T. Haggin, 3rd v. p.; with Ogden Mills, J. S. Fassett, P. Palmer and H. F. Meserve, directors. George Kennaby, sec.

Officers in Korea: Alf. Welhaven, gen. mgr.; Thos. W. Van Ess, asst. gen. mgr.; C. A. Crispin, auditor; E. S. Barstow, supt. of transportation; J. B. Lower, supt. of Tabowie, etc.; J. A. Vernon, asst. supt. of Chintui, etc.; E. H. Emerson, elec. engr.; W. H. Aldridge, mech. engr.; K. F. Hoefle, supt. of fuel and timber railway; W. D. Townsend, agent, Chemulpo.

Inc. Sept. 29, 1897, in West Virginia, to operate mining concessions in Korea. **Cap.**, \$5,000,000; outstanding \$4,293,900, and the balance is owned by the company; shares \$10 par. No bonded debt. Stock transferred and dividends paid at 15 Broad St., New York. Listed on London Stock Exchange.

Comparative general balance sheet (June 30):

Assets—	Mines & Prop.	Cash.	Supplies.	Misc.	Total.
1917	\$3,743,900	\$432,534	\$398,938	\$10,826	\$4,586,198
1916	3,893,900	401,490	381,922	13,774	4,691,088
1915	4,043,900	463,410	266,688	19,109	4,793,107
1914	4,043,900	512,781	356,085	69,301	4,982,067
			Sundry Surplus Profit		
Liabilities:	Capital Stock.	Creditors.	on Hand.	Total.	
1917	\$4,293,900	\$61,615	\$180,753	\$4,586,198	
1916	4,293,900	66,435	330,753	4,691,088	
1915	4,293,900	52,189	447,018	4,793,107	
1914	4,293,900	42,465	645,702	4,982,067	

Comparative income account (June 30):

Year....	Total Income.	—Costs—		Conc't. Exp's.	Other Exp's.	Total Exp's.	Surplus Divid's.	Year.
		Mine.	Mill.					
1917....	\$1,602,597	\$547,338	\$139,995	\$61,669	\$126,378	\$875,380	\$644,085	\$83,131
1916....	1,636,299	554,535	144,670	60,082	141,831	901,118	644,085	677,820
1915....	1,672,487	569,872	143,603	62,474	236,442	1,012,391	858,780	198,684*
1914....	1,731,473	596,189	167,219	96,845	248,439	1,108,692	644,085	21,304*
1913....	1,661,476	610,212	168,657	107,392	203,831	1,090,091	429,390	141,994
1912....	1,562,110	520,136	161,825	65,500	162,122	909,583	429,390	223,137

*Deficit.

Dividends: in recent years, 1903, \$1.25; 1904, 1905 and 1906, \$1 each; 1907, 60c.; 1908, \$1.50; 1909, \$1.15; 1910, \$1; 1911, \$1.50; 1912, \$1; 1913 and 1914, \$1.50; 1915, \$2; 1916, \$1.50; 1917, \$1.50. Total dividends to June, 1917, \$7,723,950, equal to \$18 per share, or 180%.

Property: a number of gold mines in the Unsan district, in the northern part of Korea, ore occurring in veins.

Development: by tunnels and shafts, deepest workings 2,296'. New workings for year ending June 30, 1917, were 39,201' Results at the Tabowie, Taracol, Chintui and Tongkol mines were satisfactory. The Charabowie is nearly exhausted. **Reserves** on July 1, 1917, were estimated as 840,000 tons, valued at \$4,593,800. Of this, the Tabowie contains 550,000 tons and the Taracol 220,000 tons. Mining costs totaled \$1.72 per ton, 7c. less than last year. The Tabowie mine is 2,296' deep. Extensive prospecting is carried on all the time on the concession.

Ores are treated in the company's 3 stamp mills, 200 stamps in all, and 2 cyanide plants. Power is electric, company having water-power, and buys excess required.

Production: (year ending June 30)

Year—	Tons		—Per Ton—		Year—	Tons		—Per Ton—	
	Crushed	Yield	Costs			Crushed	Yield	Costs	
1909.....	296,417	\$4.80	\$2.72		1914.....	301,162	\$5.60	\$3.68	
1910.....	320,707	4.40	2.43		1915.....	297,889	5.45	3.40	
1911.....	344,097	4.37	2.45		1916.....	309,730	6.04	2.90	
1912.....	323,703	4.76	2.68		1917.....	317,601	5.94	2.76	
1913.....	313,701	5.19	3.25						

Total to June 30, 1917, was 4,462,598 tons, worth \$27,629,894, 26% of which was paid in dividends. The August, 1917, yield was \$112,850. Milling costs, 44c. per ton.

Company's operations are extensive and ably conducted. Ore is complex, recovery averaging 89.8%. Geological conditions are continually studied, and while one of the mines is almost exhausted, the others maintain ore reserves. Altogether a highly profitable concern, operating on low-grade ore at low cost. Results are given with commendable detail and frankness.

SEOUL MINING CO.

KOREA

Office: 1002 First National Bank Bldg., Denver, Colo. Mine office: Hol-Kol, Hwang-Hai, Korea.

Officers: H. Collbran, pres.; H. R. Bostwick, 1st v. p.; S. S. Sheldon, 2nd v. p.; H. E. Collbran, sec.-treas.; preceding, with A. H. Collbran, F. B. Lawson and A. Coors, directors. A. R. Weigall, gen. mgr.; J. S. Collbran, asst. gen. mgr.; W. T. Hall, supt. at Tul Mi Chung mine; R. Blamey, supt. of Suan mine; H. G. English, mech. supt.; B. V. Barton, supt. of prospecting; H. Maki, cons. elec. engr.; F. A. Oldis, aud.; F. F. Bostwick, purch. agt.

Inc. April 27, 1908, in Connecticut. Cap., \$500,000; shares \$25 par; issued, 20,000 shares. Bankers' Trust Co. of New York, registrar. Annual meeting, third Monday in October.

Dividends: have been 25% in 1910; 50% yearly from 1911 to 1916, inclusive.

Statement submitted December, 1916, shows total earnings, \$1,836,340 for 1916; operating expenses were \$918,502, and profits, \$917,838. Cash balance at end of 1916 was \$766,302.

Property: a lease on the Suan concession, granted Nov. 4, 1905, to the Korean Syndicate, comprising a tract of land 13x20 miles in extent, about 52 miles from Pyeng-Yang. The concession carries full rights to examine, develop and operate all mines and deposits contained within the area covered by the grant. Company also has permission to cut timber and to use all the water required for mining, milling and other purposes from sources within, or adjacent to, the district. These privileges are given for a royalty of 1% on the gross value of the output of the mines. There is an additional annual tax of about 30 cts. per acre (50 sen for each 1,000 tsubo), on all land actually selected for mining operations, such selections to be made at any time before Feb. 1, 1916.

The rights in this concession are secured to the Seoul Mining Co. by an agreement made with the Korean Syndicate which provides for the payment of 8% royalty of the actual profits derived from the concession, clear of all depreciation charges.

Geology: property shows both granite and limestone, the principal orebody, known as the "Collbran Contact," lying between limestone and a batholith of granitoid rock. Ores carry gold, copper, tungsten and bismuth, the gold seldom being visible and rarely in coarse condition. Silver is also present, alloyed with the gold to an appreciable percentage. The copper ores contain chalcopyrite, bornite and tetrahedrite, with a high gold content, of fair average, probably being about 1.2% copper and \$10 gold. The orebodies are irregular and in general parallel with the limestone-granite contact, connected more or less by generally well-defined fissures. The gangue is a highly silicious crystalline limestone, altered by contact action and containing a considerable amount of magnesia and alumina.

Development: by tunnels, drifts, winzes and raises, is about 90,000' in the Suan and Tul Mi Chung mines, also many thousands of feet in prospects. Reserves: in 1915 were estimated at 1,206,136 tons, worth \$15,014,376; and in 1916, 1,221,331 tons, valued at \$13,460,210, plus 2,300,000 tons in the Socratic deposit, containing 40c. gold, 0.95% copper, and 0.25% tungstic oxide.

Equipment: one 40-stamp mill of 10,000 tons monthly capacity, and one ball mill reducing 15,000 tons per month. The Tul Mi Chung mill includes a flotation plant. The Suan mill is used for treatment of the gold tungsten ore. Company's power plant, 50 miles distant, generates 2,000 w.

Ore reserves:	Tons.	Value p. t.	Total Value.	
1916	1,206,136	....	\$15,014,376	
1915	1,221,331	....	....
1914	1,208,600	\$12.43	15,015,000	
1913	633,300	12.07	7,646,000	
1912	421,000	14.44	6,080,000	
1911	311,400	16.55	3,499,000	
Production:	Tons Ore.	Rec'y p.t.	Cost p. t.	Profit p. t.
1916	176,518	\$10.40	\$3.98	\$6.42
1915	108,078	9.05	3.94	5.11
1914	74,550	9.44	3.90	5.54
1913	71,535	9.39	4.13	5.26
1912	74,432	8.25	3.52	4.73
1911	70,229	7.83	3.01	4.82
1910	32,793	9.86	4.35	5.81

In 1917 the output averaged about \$130,000 per month in bullion and concentrate. This is a highly profitable company, directed by able technical men who have many problems to solve, not the least being the separation of gold, copper, and tungsten, upon which experiments have been under way for the past two years. Flotation is expected to make a good recovery. The Tul Mi Chung mill is now treating 460 tons daily of gold-copper ore and 1,000 tons is recommended, and if 80% of the gold, copper and tungsten can be extracted from the Soctario ore, a mill of 1,000 tons capacity will be erected. Over \$30,000 worth of bismuth is recovered yearly in concentrate. Company conducts extensive prospecting on its concession, following geologic examinations. Probably late in 1918 these properties will be producing at 3 times the present rate.

PHILIPPINE ISLANDS

The following is a complete list of all the metal mines in the Philippines. The **MINES HANDBOOK** has endeavored in vain to secure detailed information on these companies; the Benguet Cons. Mining Co. being the only company which supplied data on its operations.

Name	Address	Metal	Remarks
Alabat Mng. Assn., Manila	Alabat Island	Placer	Prospecting.
Benguet Cons. Mng. Co.	Antamok, Mt. Province	Gold	Mining and milling.
La Riqueza Nacional	" "	Gold	Development.
Colorado Mng. Co.	Aroroy, Sorsogon	Gold	Mining and milling.
Syndicate Mng. Co.	" "	Gold	" " "
Keystone Mng. Co.	" "	Gold	Mill closed. Dev'g.
Knight & Emberg	" "	Gold	Mining and milling.
Balete Mng. Co.	" "	Gold	Dev. Erecting 6-stamp mill
Acupan Mng. Co.	Baguio, Mt. Province	Gold	Dev.
Headwaters Mine, Hagen & Reynolds	" "	Gold	Operating 10-stamp mill.
Camote-Clayton	" "	Gold	Dev.
Copper King, care of Whitmarsh	" "	Gold	Mine and 8 stamps.
Mentzer Mine, G. W. Mentzer	Lubang	Gold	Operating 3-stamp mill.
Mambulao Dredging Co.	Mambulao, Camarines	Placer	Dredging.
San Mauricio Mng. Co.	" "	Gold	Dev. Mill idle.
Paracale Bucket Dred'g Proprietary, Ltd.	Paracale,	Gold	Dredging.
falaquit Dredging Co.	" "	Gold	"
Philippine Dredging Synd.	" "	Gold	"
Inabay River Placer Co.	San Teodoro, Mindoro	Placer	Sluicing.
Suriguan Placer Co.	Surigao, Surigao	Placer	Hydrauliclicking.
Surigao Mng. Co.	" "	Gold	Idle.
Suyoc Mng. Co., J. Gillies	Suyoc, Mt. Province	Gold	Surface sluicing and milling.

BENGUET CONS. MINING CO. PHILIPPINE ISLANDS**Address:** Box 10, Baguio, Benguet Prov., P. I.**Officers:** Chas. H. Sleeper, pres.; Chas. S. Cohn, sec.-treas.; with A. W. Beam, N. Leanco and M. Ossorio, directors. A. W. Beam, mgr.; C. M. Eye, supt.**Inc.** 1901, in Philippine Islands. **Cap.**, 1,000,000 pesos; shares 1 peso; all outstanding. Financial report for 1916 shows gross earnings, 598,748 pesos; operating expenses, 224,219 pesos (including bullion tax and marketing of bullion); profit, 329,453 pesos. Dividends to July, 1917, total 22½% in 5 payments, beginning Sept., 1916.**Property:** 12 claims, 6 patented, about 200 acres in the Antamok valley, about 7 miles from Baguio, shows a steeply dipping quartz vein containing pyrite with gold values of \$20 per ton. Orebodies large, one being reported to be 160' wide and one 500' long.**Development:** to depth of 275' by tunnel, workings aggregating a mile in length.**Equipment:** includes 10-stamp slime and cyanide mill with tube mill ½-mile aerial tramway and hydro-electric power. The mill extraction is given as 86% of the gold values, silver not determined. Management estimates ore reserves of 30,000 tons, with about 18,000 tons blocked out.**Production:** in 1916 amounted to 569,997 pesos from 13,000 oz. gold and 4,000 oz. silver, from 17,360 tons treated. Also, 22,688 pesos from slag.

Plans enlarging mill and equipment 1918.

SIAM**TONGKAH HARBOUR TIN DREDGING CO.****Office:** H. J. Wise, A. M. P. Chambers, Elizabeth St., Hobart, Tasmania. **Directors:** A. H. Ashbolt, chairman; F. Bond, H. G. Gray, H. Jones, M. Kennedy and K. J. Tok. E. T. Lewis, gen. mgr.**Inc.** 1906, in Tasmania. **Cap.**, £250,000; shares £1 par; all issued.**Dividend:** total 215% from 1909 to February, 1917.**Property:** 5,350 acres in Tongkah harbor, Siam, of which about 500 acres have been dredged. Estimates place the dredgable material at 150,000,000 cu. yd., carrying 2 lbs. black tin per yard. Five boats are at work**Production:**

	Tin Oxide, 70% metal (tons)	Value
1913-14	1,126	£108,053
1914-15	1,262	123,260
1915-16	1,077	

Costs are about 9c and profits 11c per yard.

AUSTRALASIA

AUSTRALASIA

(Includes the Commonwealth of Australia and Dominion of New Zealand.)

NEW SOUTH WALES

ABERCROMBIE COPPER MINES, LTD.

N. S. W.

Office: T. A. Day, sec., Winchester House, Old Broad St., London, E. C. **Directors:** C. J. McMahon, Hon. Sidney Smith, F. H. Aarons, J. T. Mail and Lt. Col. E. Robinson. A. E. Schroder, gen. mgr.

Inc. Sept. 29, 1916. Cap., £30,000; shares 6s. par.

Company acquired for £10,000 the property and plant of the Lloyd Copper Co.

Lands: 853 acres, formerly known as the Burruga and Thompson's Creek mine, 1 mile from Burruga, in the Bathurst district, which is arid, and operations are suspended at uncomfortably frequent intervals from lack of water, though the mine has an 85,000,000-gal. storage tank holding about 9 months' water supply.

Ore carries slightly argentiferous chalcopyrite, with quartz gangue, occurring in fissure veins traversing acid diorite. The main vein has an ore shoot of about 700' length worked to depth of 750'. The vein ranges 3' to 8' in width, an average of about 5'. The ore is highly silicious and gave average returns 1907, of 2.36 copper. To the eastward is a fault cutting off the extension of the vein from the 1st to the 14th levels, but protracted search has shown a continuation of the vein, to the eastward of the fault, which has given a 300' horizontal downthrow, the discovery of the extension greatly improving the prospects of the property. The future of the mine apparently depends upon the eastern ground, as it is practically worked out between the Melbourne and Sydney faults. Ore reserves at end of 1912 were estimated at 120,000 tons of about 4% copper tenor.

Equipment: includes steam and electric power, with hoists. Buildings include necessary shops and mine structure. Fuel is hardwood, about 75 choppers being employed when the property is in operation, as fuel requirements are about 60,000 cords yearly. Much trouble is experienced from shortage of wood. A 9-mile tram line was built 1912, at a cost of about £20,000. About 500 men are employed, normally.

The reduction plant includes a concentrator and smelter, built 1901, at a cost of £32,000, overhauled and enlarged 1906 and again remodeled in 1917. Present equipment includes a 40-ton calcining furnace, 19'x48' over all, treating 40-ton charges of matte, and a reverberatory furnace, 23'x65' over all, hearth having an inside width of 20', with grate area of 6'x8', and 5 charging hoppers; 64% matte is made and shipped direct to the refinery. A Minerals Separation plant for froth flotation concentration was erected, 1913, and is reported treating 150,000 tons of accumulated tailings, May, 1917.

Production: from beginning of mining to the end of 1908, when operations ceased, the company smelted 389,221 long tons of ore, yielding 15,812 long tons of fine copper, largest production having been 2,947,200 lbs. in 1902. Production was resumed Jan., 1913, amounting to about 110 tons of ore daily, of which about 10 tons was 12% smelting ore and the balance was milled, yielding 18 tons of 14% copper concentrate. Production of blister copper resumed early in 1917.

AMALGAMATED ZINC (DE BAVAY'S), LTD.**N. S. W.**

Office: 360 Collins St., Melbourne, Australia. **London sec. and office:** C. Lloyd, 1 London Wall Bldgs., London, E. C.

Directors: Hon. W. L. Baillieu, chairman; A. J. F. deBavay, H. W. P. Clinton, M. Cohen, F. A. Govett, G. W. W. Mackinnon, W. S. Robinson, and J. L. Wharton. A. J. F. deBavay, cons. chemist and metallurgist; David Meredith, gen. mgr.; Edw. H. Shackell, sec.

Inc. 1909, in Australia. **Cap.**, £500,000; **shares** £1 par; all issued and fully paid.

Accounts are submitted semi-annually. Report for 1st half-year 1916 showed: assets over liabilities, £245,199, and a net operating profit of £71,008; and for 2nd half, assets over liabilities, £250,209, with net profit of £93,281.

Dividends: 5% in 1910; 20% in 1911; 27½% in 1912; 32½% in 1913; 10% in 1914; 45% in 1916. A dividend of 1s was paid in Feb. and May, 1917, making total disbursements to date, £750,000.

Company acquired the entire assets of the De Bavay Treatment Co., Ltd., and the patents of the Potter's Sulphide Ore Treatment, Ltd. To avoid litigation with the Minerals Separation, Ltd., the companies were merged into the Minerals Separation and De Bavays Processes Australia Proprietary, Ltd., capitalized at £300,000, shares £1 par, of which 101,750 shares were issued the Minerals Separation Ltd., and 83,250 the Amalgamated Zinc. The Amalgamated Zinc has the right to use all the Mineral Separation patents, but must pay the usual royalties.

Company also owns the following share interests: 119,250 shares Minerals Separation & De Bavay's Processes, Australia Pty., Ltd.; 1,500 shares Barrier Munitions Co. Pty., Ltd.; 502 shares Zinc Producers' Association Pty., Ltd. and 100,104 shares in Electrolytic Zinc Co. of Australia.

Amalgamated Zinc has no mines, but buys zinc-lead-silver tailings from the Broken Hill South, Broken Hill Proprietary Block 10, and North Broken Hill mines at Broken Hill, N. S. W. Material is treated in a flotation plant capable of handling 40,000 tons per month.

During 1916, 263,294 tons of tailings were treated, yielding 72,990 tons of zinc concentrate and 1,535 tons of lead concentrate. The former assays: 48% zinc, 6% lead, and 8.8 oz. silver; latter 54% lead, 11% zinc, and 57 oz. silver per ton. Early in the war company's operations were seriously hampered by trouble in selling its products abroad. Much of its concentrate has since been reduced to metal in America.

BRITISH BROKEN HILL PROPRIETARY CO., LTD.**N. S. W.**

Office: F. H. Clark, Steamship Bldgs., Currie St., Adelaide, So. Australia. **Directors:** J. S. S. Wimby, chairman; F. S. Saunders, A. Stewart and W. H. Woodhead. C. J. Emery, gen. mgr.; G. C. Klug, cons. engr.; R. Beal, mill supt.

Inc. Nov. 11, 1887, in England. **Cap.**, £339,000; in 315,000 ord. 1s. shares and 60,000 privileged 8s. shares; all issued.

Dividends: since 1897 total 204%, but have been irregular.

Property: 141 acres at Broken Hill, New South Wales. **Reserves in 1916** amounted to 1,053,250 tons, assaying 13% lead, 6.6 oz. silver and 11.7% zinc.

Development: by shafts.

Equipment: complete for mining, also concentrating plant, using flotation (Minerals Separation and Lyster selective).

Production: the war has caused a suspension from August, 1914, to early in 1917. During 1913 the mill treated 204,374 tons of ore, yielding 41,296,640 lb. lead, 779,522 oz. silver and 5,873,280 lb. zinc.

BROKEN HILL PROPRIETARY CO., LTD.**N. S. W.**

Head office: F. M. Dickenson, 320 Collins St., Melbourne, Victoria, Australia. **Mine office,** Broken Hill, N. S. W.

Officers: D. E. McBryde, chairman; B. Kelly, v. c., with R. O. Blackwood, H. G. Darling, W. Jamieson, H. V. McKay and D. W. H. Patterson, directors. G. D. Delprat, gen. mgr.; E. J. Horwood, works mgr., at Broken Hill.

Hill; R. T. Slec, mine mgr.; D. Baker, steel works mgr.; J. A. Lindsay, chief engr.

Inc. Aug. 13, 1885, in Victoria, Australia. **Cap.**, £600,000; shares 8s. par; 1,181,006 issued. Debentures: £1,000,000—6% authorized; £940,000 outstanding.

Statement for half-year ended May 31, 1916, showed a revenue of £1,005,244 of which £243,559 was net profit. Dividends absorbed £118,100. Assets exceed liabilities by £629,294.

Dividends: total over £11,300,000, inclusive of shares in other companies distributed. From 1886 to 1889, each £2 share received 153s; in 1890 each £2 share received 10s and each 8s share 22s; from 1891 to 1913 each 8s share (960,000) received 55s, and from 1913 to 1916 each 8s (1,181,006) received 15s 6d. Present rate is 1s (24c) quarterly, equal to £236,201 per year.

Property: one of the leading lead-silver-zinc mines in the world, with a great past production, at Broken Hill, N. S. W.; also iron mines at Iron Knob, S. Australia.

Development: by shafts down to 1,300', huge open cuts and many miles of workings. Ore reserves amount to about 2,000,000 tons, carrying 14% lead, 8 oz. silver and 12% zinc. Diamond drilling was under way in August, 1917. Tailings on hand amount to 1,000,000 tons.

Equipment: at Broken Hill: power plant, hoists, compressors, tramways, crushing plants, 1,000-ton ore concentrator, flotation plant, etc.; at Port Pirie, So. Australia, up to June, 1915, company operated a large smelter with roasters, Huntington-Herberlein and Dwight-Lloyd sintering machines, briquet plant, blast furnaces and complete lead-silver refinery. This plant was transferred to the Broken Hill Associated Smelters Proprietary (which see) in June, 1915. At Iron Knob, Spencer's Gulf, So. Australia, company has mining plant for extraction of several million tons of 68% iron ore, which is shipped by boat to Newcastle, N. S. W.; at Bellambi, N. S. W., coke ovens, and at Port Waratah, near Newcastle, N. S. W., iron and steel works with an annual capacity of 170,000 tons. The last mentioned includes blast furnaces and rolling mills.

Production: has been irregular at Broken Hill on account of recent labor troubles. In July, 1917, the mill treated 9,214 tons of ore, the tailing plant treated 1,715 tons from dumps; the flotation plants were operated and all yielded 2,588 tons of lead concentrates and 7,530 tons of zinc concentrates.

BROKEN HILL PROPRIETARY BLOCK 14 CO., LTD. N. S. W.

Office: J. Brandon, 31 Queen St., Melbourne, Victoria, Australia.

Directors: A. Campbell, chairman; B. A. Moulden, V. J. Saddler and J. L. Wharton. F. V. Smith, gen. mgr.

Inc. Feb. 19, 1887, in Victoria. **Cap.**, £155,000, in 100,000 10% cum. pfd. 6s shares and 100,000 ord. 25s shares; all issued.

Dividends: 19s per share from 1896 to 1901, after which 30s on pfd. and 23s on ord. shares.

Property: at Broken Hill, N. S. W.; also a tungsten mine in N. S. W. Company has a mill, but the ore is sold to smelters at present. Reserves are estimated at 200,000 tons, but recent exploration has not been successful.

BROKEN HILL PROPRIETARY BLOCK 10 CO., LTD. N. S. W.

Office: J. Brandon, 31 Queen St., Melbourne, Victoria, Australia.

Directors: A. Campbell, chairman; C. Baillieu, W. Jardine, V. J. Saddler, C. Templeton. O. B. Ward, gen. mgr.

Inc. March 14, 1888, in Victoria. **Cap.**, £1,000,000; shares £10 par; all issued and £9 13s paid.

Dividends: from 1890, total £13 11s per share.

Property: at Broken Hill, N. S. W.; also at Zeehan, Tasmania, and on an island near New Guinea. The Broken Hill mine contains estimated reserves of 228,900 tons to a depth of 1,840'.

Production: from August, 1914, to May, 1916, the 500-ton mill was closed on account of war conditions. In the year ended Sept. 30, 1914, 46,592 tons of ore yielded concentrates containing 20,614,000 lbs. lead, 349,839 ozs. silver and 1,568,000 lbs. zinc.

BROKEN HILL SOUTH SILVER MINING CO.

N. S. W.

Head office: Collins House, Collins St., Melbourne, Victoria, Australia. Company owns interest in Broken Hill Ass'd Smelters' Prop. and Zinc Producers' Ass'n, Prop.

Directors: F. C. Howard, chairman; W. M. Hyndman, B. A. Moulden and Colin Fraser. W. E. Wainwright, mgr.

Inc. Oct. 11, 1893, in Victoria. **Cap.**, £200,000; shares £1 par; all issued; but 69,092 have only 9s 6d paid. **Debentures:** £250,000 6% authorized; £200,000 issued in bonds of £100.

Statements for 1916 show total revenue, £798,824, of which £481,754 was profit. Four dividends amounted to £240,000. Net cash assets were £587,607 at the end of 1916. During the first half of 1917 the profit was £248,234, of which £120,000 was distributed to shareholders. Cash assets increased to £712,698.

Dividends: since 1902 total £9 16s per share, or 980%. In 1917, to June, 12s, or 60%, was paid.

Property: 69 acres at Broken Hill, N. S. W.

Development: by shafts to 1,500' depth and extensive workings. During 1916, 10,712' of new work was done. All underground work is by contract. Ore reserves total 3,500,000 tons. On the 1,270' level, ore assays 14.8% lead, 10 oz. silver and 16% zinc.

Equipment: complete mining, also 8,000-ton per week concentrating mill and lead and zinc selective flotation plants of 2,000 tons per week capacity. New tailings is sold to the Amalgamated Zinc (De Bavay's) Company, and old dumps to the Zinc Corporation, which treat these in their flotation plants, at the rate of 170,000 and 40,000 tons per year, respectively. Commercial tailings on hand total over 1,300,000 tons. Lead concentrate is smelted by the Broken Hill Associated Smelters at Port Pirie, So. Australia.

Production: in 1916 was 244,990 tons of ore carrying 14% lead, 6.6 oz. silver and 13.5% zinc; also 44,635 tons concentrate carrying 60% lead, 22.5 ozs. silver and 9.8% zinc.

During the first half of 1917, 122,240 tons were treated. Costs are \$6.64 per ton, much above normal on account of war and labor troubles. There are 1,245 men employed.

COBAR-GLADSTONE MINING CO.

N. S. W.

Mine office: Wrightville, Robinson Co., N. S. W., Australia. Mine is opened by a 400' vertical shaft and makes weekly shipments of 35 tons of concentrates to the E. R. & S. Co. smelter at Port Kembla, assaying from 20 to 23% copper.

Equipment: includes rolls, jig and concentrating tables.

ELECTROLYTIC ZINC CO. OF AUSTRALIA PROP., LTD.

N. S. W.

Controlled by Amalgamated Zinc (De Bavay's) Ltd.

Office: E. H. Shackell, 360 Collins St., Melbourne, Victoria. **Directors:** W. L. Baillieu, M. Cohen, A. J. F. deBavay, and S. C. Magennis.

Inc. May, 1916, in Victoria. **Cap.**, £1,000,000; shares £1 par.

Works have been erected in Tasmama for the electrolytic treatment of zinc concentrate from Broken Hill, and production of high-grade spelter. The first unit treating 10 tons daily is at work. Hydro-electric power will be used at one plant.

GREAT COBAR, LIMITED

N. S. W.

Head office: 4b Fredericks Place, Old Jewry, London, E. C., England.

Mine office: Cobar, N. S. W., Australia.

Officers: Sir John Taverner, chairman; C. H. Wayte, W. P. Wethered, directors; E. H. Taylor, mgr.

Inc. May 22, 1906, in England. **Cap.**, £1,000,000, in 200,000 shares of

£5 each; 186,542 issued. Also 6% first mortgage debentures totaling £750,000, of which £667,300 are outstanding.

Property: copper mines, smelters, coal mines, coke works and refining plant, at Cobar and other parts of New South Wales. The price paid the Great Cobar Copper Mining Syndicate, which had operated profitably for years, was £800,000 cash, £55,000 in paid-up shares, and £151,000 in cash, shares, or debentures. Several well-known engineers examined the Cobar mine.

A new shaft was sunk to 1,540', and new 1,200-ton smelter erected. In 1913 reserves were estimated at 2,705,161 tons, 2,081,735 tons of which contained 2.5% copper. In that year, the yield was 13,016,640 lbs. copper, 27,136 oz. gold, and 127,542 oz. silver.

Many troubles arose in the mine and plant and in April, 1914, operations ceased and receivers (A. F. Whinney in England and W. H. Fletcher in Australia) were appointed. An independent report was made, which gave 3 years' ore opened. At £65 per ton for copper, the profit would be £88,800, and if no more ore were found, the plant might realize £63,700. The total profit of £152,500 would yield debenture-holders 23%. To enable the new scheme to be worked out, £62,000 was borrowed from debenture-holders, and £40,000 from the New South Wales Government. Net proceeds in 1916, 1917 and 1918 go to certificate-holders on certain terms.

Mining and smelting were resumed during 1917 under the new arrangement.

Production: from 1876 to 1906, inclusive, the Great Cobar mine yielded 1,592,895 long tons of ore, returning 138,593,280 lbs. fine copper. Production, under the former ownership, was 7,000,000 to 9,000,000 lbs. copper yearly, having been 9,027,200 lbs. fine copper in 1906; and production by present company was about 10,000,000 lbs. in 1907; 10,586,240 lbs. copper, 64,949 oz. silver and 13,002 oz. gold in 1908; 12,762,080 lbs. copper, 83,208 oz. silver and 14,452 oz. gold in 1909; 13,847,680 lbs. copper, 107,932 oz. silver and 21,524 oz. gold in 1910. Production for the year ending June 30, 1912, was 339,494 tons of ore from the company's own mines and 88,924 tons of custom ore, producing 15,089,760 lbs. copper, 178,938 oz. silver and 37,696 oz. gold.

From recent results it would seem as if an error was made in original estimates of the mine, the new smelter was unsuitable, and the capitalization was too heavy. The original owners (or lessees) made large profits prior to the new company taking hold. Cobar may yet turn out better than expected.

MT. BOPPY GOLD MINING CO.

N. S. W.

Office: W. F. Garland, sec., 5 and 6 Queen St. Place, London, E. C., England. **Mine office:** c/o J. Negus, supt., Mount Boppy, N. S. W., Australia.

Officers: S. F. Hoffnung-Goldsmid, chairman, with P. D. Henderson, B. J. Levenson, V. H. Smith, E. Taylor, and R. Taylor, directors.

Inc. Nov. 24, 1899, in England. **Cap.,** £151,000, in 30,000 pfd. and 121,000 ord. shares at £1 par. Pfd. shares entitled to first cumulative dividend of 10% per annum, plus share in ordinary profits; after 100% has been paid they rank as common.

Balance sheet for 1915 shows profit of £26,937. Dividend absorbed £10,550.

Dividends: were 5% in 1901, 6¼% in 1902, 35% in 1903, 40% in 1904, 47½% in 1905, 45% in 1906, 47½% in 1907, 47½% in 1908, 27½% in 1909, 35% in 1910, 20% in 1911, nil in 1912 and 1913, 7½% in 1914, 5% in 1915.

Property: 344 acres in Cobar district of New South Wales.

Ore reserves: at end of 1915 were estimated as 215,956 tons containing 88.50 gold per ton; also 100,000 tons in shaft-pillars and 300,000 tons of residue.

Equipment: complete, with 40-stamp mill and cyanide plant.

Production: in 1916, 79,326 tons, yielding £119,508. Costs are 22s. 5d. (£5.38) per ton.

Company can make substantial profits for some time to come; it is the largest gold producer in New South Wales. .

NORTH BROKEN HILL, LTD.

N. S. W.

Offices: G. Weir, sec., 36 Collins House, Melbourne, Victoria; Broken Hill, New South Wales; and E. Habben, Palmerston House, London, E. C.

Directors: W. M. Hyndman, chairman; M. H. Baillieu, W. L. Baillieu, T. B. Birkbeck, A. Campbell and H. Sheppard.

Inc. Dec. 4, 1912, in Victoria, Australia. **Cap.**, £600,000; shares £1 par; all issued. **Debentures:** £250,000 6% authorized; £200,000 issued.

Accounts for half-year ended Dec. 31, 1916, show a net profit of £164,203, of which £120,000 was distributed. **Cash assets** show surplus of £422,103.

Dividends: 30% in 1913, 25% in 1914, 25% in 1915, 40% in 1916.

Property: 452 acres at Broken Hill, New South Wales.

Development: by 3 shafts, deepest 1,470'.

Ore reserves: above 1,400' are estimated at 2,850,000 tons.

Equipment: complete with concentrating plant. **Tailings** sold to Amalgamated Zinc (De Bavays) for treatment by flotation.

Production: in 6 months ended Dec. 31, 1916, mill treated 117,190 tons of ore, yielding 23,123 tons of concentrate assaying 60.6% lead, 20.6 oz. silver and 8.6% zinc. **Costs** were \$5.20 per ton. In June, 1917, the weekly output was 4,700 tons of ore, averaging 16.3% lead, 8.2 oz. silver and 13.6% zinc.

This is one of Australia's most profitable lead mines.

SULPHIDE CORPORATION

N. S. W.

Office: C. R. Fisher, sec., Finsbury House, London, E. C., England. **Mine office:** Broken Hill, N. S. W., Australia.

Officers: Earl of Kintore, chairman; Hon. V. Gibbs, F. A. Keating, G. M. Reid and A. Williamson, directors. C. F. Courtney, gen. mgr.; J. Hebbard, mine mgr.; F. H. Evans, mgr. of smelter in N. S. W.; J. C. Moulden, mgr. zinc works in England.

Inc. Oct. 29, 1895, in England. **Cap.**, £1,050,000; 600,000 pfd. shares at £1 par and 600,000 ord. at 15s. par. **Statement for year ended June 30, 1916,** showed a net profit of £391,404, of which £315,000 was distributed in dividends. **Reserve fund** was £172,000 and accumulated profit account £324,867.

Dividends: since 1898 total 232% on pfd. and 205% on ord. shares; in 1915-16, 30% on each class of shares was paid.

Property: a large lead-silver-zinc mine at Broken Hill, N. S. W.

Development: by shafts and extensive openings. **Reserves** amount to 1,858,200 tons.

Equipment: complete mining and 1,000-ton milling plants at the mine, lead smelter at Cockle Creek, N. S. W., and zinc works at Seaton Carew, Durham, England. **Company** is a pioneer in flotation processes.

Production: during the last financial year, the concentrator yielded 37,503 tons of concentrate containing 64.4% lead, 38.1 oz. silver and 8.7% zinc; also 56,773 tons of concentrate assaying 47.5% zinc, 13.6 oz. silver and 6.3% lead.

ZINC CORPORATION, LTD.

N. S. W.

Head office: F. A. Crew, 20 Copthall Ave., London, E. C., England. **Works office:** Broken Hill, N. S. W., Australia.

Directors: F. A. Govett, chairman; J. A. Agnew, H. W. P. Clinton, W. J. L. Loring, W. C. C. Romaine, R. W. Skepwith, T. White and T. J. Hoover. **Bewick-Morcing & Co.**, gen. mgrs.; C. G. Hylton, supt.

Inc. July 8, 1911, in Victoria, Australia. **Cap.**, £575,000, in 245,692 pfd. £1 and 658,616 com. 10s. shares. **Company** is interested in the Broken Hill Smelters Associated Proprietary, Zinc Producers Association Proprietary and Barrier South, Ltd.

Statement for year 1915 showed a profit of £140,640 plus £98,883 brought forward. **Dividends** absorbed £94,080.

Dividends: 15% on pfd. and 10% on ord. in 1911; 37½% and 35% in 1912; 35% and 30% in 1913; 20% and nil in 1914; 25 and 10% in 1915; 10% on pfd. in January, 1917.

Company buys tailings from other Broken Hill mines and treats them in a flotation plant, also operates the South Blocks mine and mill.

Development: by 1,069' and 1,548' vertical shafts and considerable openings. Reserves at last accounts were 1,504,211 tons, containing 14.8% lead, 2.5 oz. silver and 9.2% zinc.

Equipment: is complete and modern. The mill uses rolls and concentrators; while at the flotation plant is a highly developed system including Minerals Separation process and the Lyster and Horwood selective processes.

Production: since the war started, and due to labor troubles, operations have been erratic. In 1916 the zinc plant treated 200,510 tons of tailings, and the lead plant 136,901 tons of ore, both yielding 37,376 tons of 66% lead and 45,464 tons of 48% zinc concentrates.

Company is an important zinc and lead producer.

QUEENSLAND

CORELLA COPPER CO. (N. L.)

QUEENSLAND

Registered office: 360-366 Collins St., Melbourne. **Mine office:** Rosebud mine, via Ballara, Cloncurry, North Queensland.

Officers: J. L. Wharton, chairman; F. G. Hughes, Alfred Tolhurst, directors. J. W. Moule, gen. mgr. E. H. Shackell, mgr.

Profit in working account for half year ending Oct. 31, 1916, was £8,134, net profit was £6,378, giving total balance of £7,561, after deducting £3,000 for general taxation reserve, £648 for depreciation and £3,800 for equalization reserve, £113 was carried forward. Surplus of liquid assets on Oct. 31, 1916, was £8,039. Total liquid assets were £39,440, including products on hand £28,624, cash £1,778, supplies £8,110. Total liquid liabilities were £31,400, which included bank overdraft, £22,014.

Property: 85 acres in the vicinity of Duck Creek, including the Rosebud, Secret, Galah, Northern outcrop and Parrot mines, all of which have shafts from 25' to 200' deep. The ore reserves of the company are reported as 15,300 tons. Development work amounted to about 450' for the year.

Production: during 1916, 13,556 tons were treated by the smelter, yielding 1,545 tons of matte which contained 1,533,200 lbs. of fine copper and 305 oz. of gold.

Equipment: a small smelter with reverberatory matting furnace and necessary mine equipment.

Owing to unfavorable mining developments, Government shut down the mine, Aug., 1917.

GREAT FITZROY MINES, LTD.

QUEENSLAND

Head office: Collins House, Melbourne, Victoria.

Officers: J. L. Wharton, chairman; P. Charley, G. P. Doolette, C. B. Jessop, W. J. Loring, directors; T. E. Smith, sec., 20 Copthall Ave., London, E. C.

Inc. 1912, in Victoria, Australia. **Cap.**, £225,000, in 900,000 shares of 5s. (\$1.25) each.

Property: 275 acres of gold-copper claims at Mt. Chalmers, Queensland, containing 442,409 tons of 2.73% copper and \$2.27 gold ore; also the Laloki mine on the island of New Guinea, estimated to contain 319,600 tons of 4.6% copper and \$2.50 gold ore. The Laloki mine is reported under option for £40,000 to 1918.

Equipment: 200-ton smelter, sintering plant, 200-ton flotation plant, sold in 1916 to satisfy debenture-holders. In 1913-14, when the mine closed on account of the low price of copper, 22,698 tons of ore smelted direct, and 12,995 tons of concentrate smelted from 64,457 tons milled, yielded 4,323,200 lbs. copper, 8,842 oz. gold, and 22,038 oz. silver.

One of the real causes of the shut-down is the difficulty in treating

Fitzroy ore. A suitable flux has been found, and operations may be resumed.

HAMPDEN CLONCURRY COPPER MINES, LTD. QUEENSLAND

Office: E. H. Shackell, Collins House, Melbourne, Australia. London office: E. Habben, sec., Palmerston House, London, England.

Directors: J. L. Wharton, chairman; W. L. Baillieu, F. G. Hughes, H. F. C. Keats, W. Orr, H. H. Schlapp. London directors: W. D. Reid, G. W. W. Mackinnon and G. W. Staples. E. Huntley, gen. mgr., Friesland, via Cloncurry, No. Queensland. D. Wentworth, metallurgist.

Inc. July 31, 1909, in Australia, as a reorganization of a company of same name. Cap., £400,000; shares £1 par; 350,000 issued.

Net profits for year ended Aug. 31, 1916, were £285,789; and half-year ended March 1, 1917, £64,540.

Dividends: in 1913, 40%; 1914, nil; 1915, 20%; 1916, 40%, and 1917, 20% for half-year. Total to date is £402,500.

Company owns 4,000 shares of the Electrolytic Ref. & Sm. Co. of Australia, Ltd., and 15,000 shares of Metal Mfrs. stock. Latter company is building works at Port Kembla, New South Wales.

Property: over 450 acres in the Cloncurry mining district, North Queensland. Mines are connected by 2' gauge railway with the Cloncurry Copper Mines, Ltd.

Ore: copper, gold, silver. Ore reserves: estimated, March, 1917, at 284,200 tons containing 20,108 tons of copper.

Equipment: includes 375-ton smelter and converter. Management considering the erection of a Minerals Separation plant.

Production: for year ended Aug. 31, 1916, was 104,479 tons smelted, yielding 16,856,000 lbs. copper, 59,119 oz. silver, and 2,234 oz. gold. In the half year ended March 1, 1917, the smelter reduced 46,443 tons of ore, yielding 6,948,480 lbs. copper, 23,418 oz. silver, and 1,028 oz. gold.

Is a small though profitable copper mine.

IRVINEBANK MINING CO., LTD.

QUEENSLAND

Office: J. H. Reid, managing director, 18 Bridge St., Sydney, N. S. W. Works office: Irvinebank, Queensland.

Property: company owns tin mines and tin concentrating works at Irvinebank, Koorboora and Watsonville; copper mines at Watsonville and wolfram mines and mill at Mt. Carbine, all in North Queensland. The tin smelter includes a reverberatory furnace and is the only tin works in the State.

MANY PEAKS COPPER MINING CO., LTD.

QUEENSLAND

Office: J. D. Murray, sec., East St., Mt. Morgan, Queensland.

Inc. 1906, in Queensland. Cap., 81,640 shares, 6d. (12c) par, originally 2,041 shares £1 par, changed in 1911 to present amount.

Company owns a cupriferous pyrite deposit from which the Mt. Morgan G. M. Co. draws its supply of fluxing material at a royalty of 2s 6d (60c) per ton. The lease calls for not less than 25,000 tons annually.

Receipts for year ending June 30, 1917, amounted to £6,222, plus credits of £2,535, making £8,757. Of this £6,803 was distributed in dividends. Cash on hand was £1,165 at end of the term.

Dividends: total £52,641 in 9 years to 1916, equal to 562% for the first 3 years and 2,016% for the remainder.

Property: 320 acres, well timbered, on terminus of Boyne Valley railway. The property shows promising gossan outcrops, carrying occasional small quantities of copper ore, with a vein up to 90' in width, oxidized to some little depth, but apparently having no secondary sulphides, the zone of oxidation being succeeded by chalcopyrite of about 3.5% copper tenor. Development is exclusively by 3 tunnels, the main tunnel being on the 470' level, with 3 levels above, at 100' intervals, these and the main tunnel being driven nearly due south from a gully near the northern end of the property. The walls are somewhat treacherous and require careful attention. A winze opens the deposit to 570' depth. The ore is very pyritic and is all used by the Mt. Morgan company as a flux. Its copper content is about 1½%. Reserves are about 1,000,000 tons.

Production: in the year ended May 31, 1917, was 49,774 tons, making 464,682 tons in 10 years, on which royalties totaled £58,085.

This is probably the only way such a property could be profitably handled and the figures are certainly interesting.

MOUNT CUTHBERT, N. L.

QUEENSLAND

Office: W. B. Arnold, sec., 39 Queen St., Melbourne, Australia. **British office:** Edwin Habben, sec., Palmerston House, London, E. C., Eng. **Mine office:** Mount Cuthbert, Queensland.

Officers: P. Pigott, chairman; Robert Philp, T. P. Power, F. E. Power, John G. Robertson and J. Forsyth, directors. R. W. Powell, mine mgr.; Jos. Armstrong, metallurgist; W. H. Corbould, cons. engr.

Inc. February 21, 1907, in Victoria, Australia. **Cap.**, £240,000; shares £1 par. Reorganized Oct., 1909 and Aug., 1916, in Victoria. Capital increased to £300,000; shares £1 par; 241,000 issued. Original debentures outstanding, £55,500. At the reconstruction in Aug., 1916, £50,000 prior-lien debentures were created to secure creditors; these debentures expired in Sept., 1917.

Property: 553 acres at Mount Cuthbert in the Cloncurry district, 70 miles from Cloncurry, Queensland.

Geology: there are several orebodies in schistose formation, of which seven under development range from 2' to 18' wide. Outcrops are traceable through the various sections. Ore exposed by development is estimated to average 8% copper. Ore shows azurite, melaconite, glance, cuprite and copper pyrite, with some bornite in depth.

Ore reserves: estimated at 149,000 tons, containing 24,000,000 lbs. copper.

Equipment: includes 200-ton smelter, started in March, 1917. Power is supplied by 2 generators, 320 h. p., direct-coupled to Belliss & Morcom engine; high-speed vertical air compressor; Acme blowers for blast furnace; compound-steam blowing engine for converters, steam supplied by 2 large Babcock & Wilcox boilers. Water is piped for 6½ miles. The Cuthbert and Kalkadoon mines have equipment to mine at a depth of 2,000'. The government railway from Cloncurry runs to Mount Cuthbert and sidings have been built to connect with several of company's mines.

Production: to June 30, 1917, 22,667 tons of ore have been smelted, yielding 3,556,000 lbs. copper. Of this, 13,815 tons were treated at Mount Elliott, the remainder at Mount Cuthbert smelter.

MOUNT ELLIOTT, LIMITED

QUEENSLAND

Office: F. G. Hughes, Collins House, Collins St., Melbourne, Australia; E. Habben, Palmerston House, London, E. C., England; Mt. Elliott, Selwyn, North Queensland.

Officers: H. J. Hill, chairman; W. Clark, H. Dessoudeix, E. H. Dunning, R. H. Henning, W. D. Reid, G. deC. deVenancourt, W. L. Baillieu, directors. L. E. Nicolson, mgr.; W. H. Corbould, cons. engr.

Inc. June 14, 1907, in England. **Cap.**, £1,250,000; shares £5 par; 237,518; issued.

Balance sheet for year ending June 30, 1916, shows a profit of £29,938; balance carried forward, £31,200.

Dividends: 10% in 1910-11, 15% in 1911-12, 27½% in 1912-13; 5% in 1913-14; none since.

Property: 173 acres, 160 miles N. W. of Cloncurry, Queensland, Australia.

Development: by shafts.

Ore reserves: July, 1916, were estimated as 715,000 tons containing 71,456,000 lbs. copper.

Equipment: complete, with 500-ton smelter, recently remodeled.

Production: high-grade (10%) ore was shipped years ago, after which smelter was erected, but operated very irregularly. New plant started in June, 1917, and is treating custom ore. In 1915-16, 11,842 tons of ore yielded 4,518,000 lbs. copper, 2,612 oz. gold, and 4,753 oz. silver.

Property should make good profits.

MOUNT MORGAN GOLD MINING CO., LTD. QUEENSLAND

Offices: E. W. Moran, sec., Mt. Morgan, Queensland; S. W. Thornton, sec., 118 Pitt St., Sydney, New South Wales; T. H. Williams, sec., 105 William St., Melbourne, Victoria; E. Habben, sec., Palmerston House, Old Broad St., London, E. C., England.

Directors: (Australia) R. G. Casey, chairman; Kelso King, J. L. Wharton, J. M. Mall, John Sanderson, W. L. Baillieu, K. deL. Cudmore, R. S. Archer, H. Perrier, D. W. Jackson. (England) C. S. Cockburn, chairman, and W. F. D'Arcy. A. A. Boyd, gen. mgr.

Inc. Oct. 1, 1886, in Queensland. **Cap.**, £1,000,000; shares £1 par; fully issued and fully paid.

Balance sheet for year ended May 27, 1917, showed total revenue of £1,301,377; expenditure, including development and depreciation, £992,172; profit, £309,205; dividends, £250,000; and balance forward, including previous balance, £95,986. Cash assets total £522,108.

Dividends: paid quarterly, have ranged from a minimum of 8d., at the beginning, 1886, to a maximum of £1 2s., in 1889. To end of 1916 the company had paid about 825% in dividends, which were 6s. yearly, 1893-97; 6s. 6d. in 1898; 7s. yearly 1899-1900; 5s. 10d. in 1901; 5s. 9d. in 1902; 8s. yearly 1903-06; 4s. 3d. yearly 1907-08; 4s. yearly 1909-13; 3s. in 1914; 4s. in 1915; 5s. in 1916, while 1s. was paid in Aug., 1917. Dividends total £5,879,167, or about \$43,000,000.

Property: 90 acres perpetual leasehold, and 640 acres freehold; also flux quarries, pyrite deposits (Many Peaks mine), coal beds, and magnetite deposits.

Company has a large interest in the Electrolytic Refining & Smelting Co. of Australia, Ltd., which refines Mt. Morgan and custom copper and is the recently organized Metal Manufacturers, Ltd., which is to make copper products from Australian metal. Mt. Morgan is about 25 miles west of Rockhampton, and the mine has been, since 1890, one of the greatest gold producers of the world.

Geology: the Mount Morgan gold deposit proved to be the siliceous gossan of a great copper deposit. As the ore showed increased copper content at depth the company wisely began extensive diamond-drilling which proved an immense tonnage of copper ore. The mine has been operated as 2 connected mines, the upper section being worked open-pit. The oxidized ores were exhausted in 1910, and only sulphide ores are now mined. The sulphide gold ore is known locally as 'mundic', being auriferous and slightly cupriferous pyrite.

Development: is done through 2 principal shafts, known as the Main shaft, of 1,050' depth, and the Lynda incline shaft, about 1,500' deep. Underground ore extraction is from the 360' to 950' levels. Depleted stopes are filled with waste, on the pigstye system, some of the stopes being of great size. New openings in the half-year ended Nov. 30, 1916, totaled 765', which does not seem extensive, but when the character of the deposit is considered such footage is considerable.

Reserves at above date were given as 4,176,795 tons, averaging 25% copper and \$6.17 gold per ton. This includes smelting and concentrating ores.

Equipment: this is now very complete, having undergone great changes in the past 3 years. Buildings include necessary shops, offices and workhouses, the mine, mills, smelter and power plant occupying a single site. At the portal of the Lynda tunnel there is a 30'x100' change-house, having shower-baths and 504 lockers. In connection with the power plant there is a firewood storage area of 5,000 tons' capacity, at the west works, with rail connection, and a Government railway connecting Mt. Morgan with the Dawson coal mines.

The district being arid, extensive dams have been built for water storage, there being 7 dams, of which 5, in commission, have an aggregate capacity of 387,000,000 gal., No. 7 holding 270,000,000 gal.

Gold ore was treated in the mills until 1912 by dry crushing and concentrating in open vats. Some of the tailing is now being retreated.

Company has a large smelting plant, the outcome of many changes in the original works. The present blast furnaces, converters, rotary-furnaces, pot-sintering plant, etc., have been erected during and since 1914. In the last financial year there was reduced 278,380 tons of charge, including 41,452 tons of Many Peaks pyritic ore and 42,197 tons of concentrate.

A concentrating plant, using jigs, tables and flotation, was erected in 1916. A recent half-year shows 79,217 tons of 2.19% copper and \$5.59 gold ore treated, yielding 22,694 tons of 7.04% copper and \$15.24 gold concentrate, giving 91.84% recovery of the copper and 78.11% of the gold. About 25% of the concentrate was saved by flotation, and was nearly 7 times as high in copper as the table product, 20.47% against 3.16%.

Production: in year 1916-17 amounted to 18,014,080 lbs. copper and 98,950 oz. gold. During June, 1917, the yield was 1,370,880 lbs. copper and 8,615 oz. gold, valued at £115,960. Costs are \$13.84 per ton of ore mined, which seem somewhat high.

Mt. Morgan may now said to be fairly on its feet again, after many troubles underground, in the smelter, power-plant and labor, and should continue increased dividends for many years. To Sept., 1917, distributions total nearly £9,000,000.

MUNGANA MINING CO., LTD.

QUEENSLAND

Office: 31 Queen St., Melbourne, Aus. **British office:** Palmerston House, Old Broad St., London, E. C., Eng. **Mine office:** Mungana, North Queensland, Aus.

Officers: V. J. Saddler and John L. Wharton, directors; John Brandon, sec.; Edwin Habben, London sec.

Inc. April 1, 1912, in Queensland, as successor of Mungana (Chillagoe) Mining Co., Ltd. **Cap.:** £150,000; shares 6s. par; fully issued and fully paid. Shares are listed on the London, Melbourne, Sydney and Adelaide stock exchanges. Annual meeting, in July.

Property: 286 acres, held by 6 leases for 50 years from Jan., 1898, at annual rental of £1 per acre, about 10 miles west of Chillagoe, in the Walsh and Tinaroo district. Property includes the Girofla and Lady Jane mines, showing "cave" or replacement deposits of lead and copper ore mostly oxidized in limestone of Midde Devonian age, alongside of crystalline schists.

The 7 orebodies known occur along an E.-W. direction and are nearly vertical. Two deposits are worked, the largest, the Girofla, being 70' wide and 200' long, and averaging 1% copper, 12% lead, 7% zinc, and 9 oz. silver per ton.

Development: consists of the 823' Girofla, 460' Saddler, 330' Saddler No. 2, 150' Dorothy, 200' Dorothy No. 2, and 200' Calumet shafts.

The Girofla mine, worked continuously since 1900, has a good surface showing, with a large orebody in limestone. Development is by a large opencut, stripped to depth of 50', and a working shaft 823' deep. The mine shows considerable ore assaying up to 8% in copper tenor, but is primarily a silver-lead mine, values in order named being in silver, lead and copper. A new lens of high-grade ore 60'x100' was cut on the 710' level in Sept., 1913. Reserves estimated at 115,782 tons blocked out for stoping. Timbering is by square sets, and the mine is very wet, giving considerable trouble at times.

Equipment: includes 500-h. p. steam and 35-h. p. electric plant, 2 hoists good for 1,000', 15-drill air-compressor, and 16 buildings.

The Lady Jane mine has met with a series of misfortunes, losing its old main shaft through drawing, this being replaced by the Saddler shaft, with 4 compartments, sunk to depth of 426'. A fire broke out 1909, and continues burning, and the mine was flooded up to the 250' point. Reserves are estimated as 48,213 tons. The property is served by the Chillagoe to Mareeba railway.

Production: gross output to end of March, 1913, amounts to 237,885 tons of ore yielding 23,102,977 lbs. fine copper, 2,628,800 oz. silver and 35,144 tons pig lead. Latest production: 16,356 tons of ore, yielding 620,480

lbs. copper, 4,146,240 lbs. lead, and 107,956 oz. silver in 1912-1914.

The Mungana mines suspended operations at the time of the closing down of the Chillagoe smelter, March, 1914, and there seems little immediate prospect of work being resumed.

SCOTTISH GYMPIE GOLD MINES, LTD.

QUEENSLAND

Head office: Dunlop & Murray, secs., 188 St. Vincent St., Glasgow, Scotland. Mine office: Mary St., Gympie, Queensland, Australia.

Officers: G. B. Hoggan, chairman; R. G. Campbell, J. B. Hilliard, A. Robertson and W. Walker, directors. D. E. Reid, gen. mgr.; J. Harris, mine mgr.

Inc. June 11, 1902, in Scotland. Cap., £700,000; shares £1 par; 660,000 issued.

Profit of £7,275 was made in year 1915-16, of which £4,125 was paid as a dividend. Balance forward was £6,375.

Dividends: since 1898, total about £6 2s. per share; £5 8s. to 1902, since when profits have been small. The total to July, 1917, is £603,212.

Property: 126 acres, at Gympie, Queensland. Reserves estimated at 1,000,000 tons.

Equipment: necessary for treatment of about 9,000 tons per month.

Production: in year 1915-16, 83,800 tons of ore and 27,950 tons of tailing cyanided for \$6.44 per ton. In August, 1917, 8,600 tons of ore and 3,400 tons of tailing yielded \$6.77 per ton. Costs are about \$4.70 per ton.

Property has been a large producer, but now makes little profit. Geological conditions at Gympie are peculiar, and the district is dull at present.

SOUTH AUSTRALIA

BROKEN HILL ASSOCIATED SM. PROPRIETARY, LTD.

S. A.

Office: H. L. Shackell, sec., 360 Collins St., Melbourne, Victoria, Australia.

Directors: W. L. Baillieu, chairman; C. Fraser, F. C. Howard, B. Kelly, D. E. McBryde, W. S. Robinson; W. Robertson, gen. mgr.; G. C. Riddell and G. Rigg, cons. engrs., at lead and zinc works; H. W. Leavens, J. Jobson and J. Winter, supts. at smelters.

Inc. May 7, 1915, in South Australia. Cap., £1,000,000; shares £1 par; 700,000 shares issued and held by the Broken Hill Proprietary (£200,000), Broken Hill South Silver M. Co. (£200,000), North Broken Hill (£200,000) and Zinc Corporation (£100,000).

Works: extensive lead smelter of the Broken Hill Proprietary Co. at Port Pirie (said to be the largest in the world), So. Australia, was purchased by this company for £300,000 cash and 200,000 shares. The plant includes railroads, blast furnaces of 6,000-ton per week capacity on 60% lead concentrate, roasting furnaces, Dwight-Lloyd and H. H. sintering machines, 3,000 ton per week lead refinery, 200-ton per week spelter works, limestone quarries in So. Australia and coke works at Bellambi, N. S. W. The ore supply for these works comes from 8 Broken Hill companies, also from outside sources. The smelter can produce 150,000 tons of lead, 5,000 tons spelter, and 6,500,000 oz. silver per year. The coke plant makes 100,000 tons yearly. Antimonial lead, assay lead, litharge, zinc dust, lime metal and bar and granulated silver are made.

MT. LYELL CONSOLS WALLAROO COPPER MINES, N. L.

S. A.

Reorganized as New Lyell Consols Copper Mine, which see.

NEW LYELL CONSOLS COPPER MINE, N. L.

S. A.

(Formerly Mt. Lyell Consols Wallaroo Copper Mines, N. L.).

Address: T. Rollason, sec., 31 Queen St., Melbourne, Aus. London secretary, Arnold W. Goodfellow, 17 Coleman St., London, E. C., England. Mine office: Kadina, Daly Co., So. Australia. J. A. Wauchope, gen. mgr.; T. C. Dunster, chairman; S. Cherry, George Dunham and Cecil Bain, directors.

Inc. Nov. 20, 1911, as a reconstruction of Mount Lyell Consols Copper Mines, N. L. Cap., £250,000; shares 10s. par; issued, 350,000 shares.

Operations were suspended on account of the War for 2½ years, until

March, 1917. Enough money is being remitted from London to continue development, and ore shipments will soon be resumed.

Lands: 150 acres, leasehold, including the Wallaroo Central mine, 70 acres, adjacent to the Wallaroo mine. Property shows schists and slates carrying numerous parallel veins including the famous Wallaroo Blue lode.

Development: by a 260' shaft, showing 2 lodes of 18' and 7' average width, carrying ore with about 6% copper and \$8 gold per ton. Shaft is being sunk to 350'.

Equipment: includes 250-h. p. steam plant with hoist, compressor, mine pump, and necessary mine buildings.

WALLAROO & MOONTA MINING & SMELTING CO., LTD. S. A.

Head office: Steamship Bldg., Currie St., Adelaide, S. A. **Mine offices:** Wallaroo and Moonta, S. A. **Works office:** Port Wallaroo, S. A.

Directors: Sir J. L. Stirling, (chairman); Simpson Newland, F. H. Downer, J. R. Corpe and J. R. Baker. H. L. Hancock, gen. mgr.; F. G. Murdock, sec.

Inc. 1889, in South Australia. **Cap.,** £400,000; shares £2 par; 160,000 issued.

Statement for 1916 shows total revenue of £852,670 and a net profit of £231,505, of which £120,000 was paid in dividends. Cash assets at the end of the year were £250,851. In Jan., 1917, £20,000 was distributed.

Dividends: to Feb., 1917, total £2,454,254, of which £836,000 had been paid by the present company, the remainder by the old Moonta and Wallaroo companies.

Property: the Wallaroo mines at Kadina and the Moonta mines, 3,010 acres, at Moonta, S. A., which have yielded 689,812,480 lbs. copper valued at £18,086,900 to the end of 1916.

Geology: Bull. 6, of the Geological Survey of South Australia, 1917, by R. L. Jack, states that the Wallaroo lodes traverse schistose rocks of sedimentary origin; while the Moonta lodes are found in a mass of hard and brittle feldspar-porphry, or in an igneous schist formed by selective crushing of the feldspar-porphry. Minerals at Wallaroo are chalcopryrite, pyrite, pyrrhotite, with a little galena, blende, and gold; at Moonta, chalcopryrite, bornite, chalcocite, pyrite, a little gold and silver, etc. During the past 9 years copper content averaged 3.85%.

Development: at Wallaroo the main lode has been opened for a length of over 3,400' and a depth of 2,900'; at Moonta the main lode extends for 3,840' and a depth of 2,520'. During 1916 new openings, including 1,170' of diamond drilling, totaled 9,057'. Total openings in the Wallaroo mines amount to 38 miles, and in the Moonta mines to 40 miles.

Equipment: includes electric power plant, steam plants, complete mining and pumping plants, ore sorting and concentrating works, tailing, leaching plant, smelter, sulphuric acid and bluestone plants, electrolytic refinery, etc.

Production: 1,758,038 tons of 15% ore (sorted) up to 1909, after which, to 1917, 415,103 tons of dressed ore, yielding a total of 689,812,480 lbs. copper. In 1916 there was 251,078 tons of 3.05% ore handled, dressed to 67,754 tons of smelting grade. The metal output from ore and concentration plant was 19,248,320 lbs. copper, 3,100 oz. gold, and 3,014 oz. silver; also 6,930 tons of sulphuric acid. The average price received was £113 3s. per ton (24.24c per lb.) and cost £80 7s. per ton (17.22c per lb.), against £78 9s. 5d. (16.82c per lb.), and £55 9s. 1d. (12c per lb.) in 1915. Costs from 1909 to 1916 were fairly steady at about 11 or 12c per pound. About 2,000 men are employed.

This is one of the great copper companies of Australia.

TASMANIA

BRISEIS TIN AND GENERAL MINING CO., LTD. TASMANIA

Office: T. P. Husband, Royal Bank Chambers, Collins St., Melbourne, Victoria, Australia.

Directors (in London): F. S. E. Drury, chairman; W. Clark, and H. W. Lake; (in Melbourne): Sir A. J. Peacock and F. G. Hughes. **L. C. Clark**, gen. mgr.; **D. Currie**, cons. engr.

Inc. Nov. 25, 1899, in England. Cap., £600,000; shares £1 par; all issued.

In 1915 a profit of £20,007 was made. Dividends total 74% in 11 years.

Property: alluvial tin claims of 180 acres at Derby, Dorset Co., Tasmania; also alluvial gold claims of 2,112 acres in N. E. Victoria.

Equipment: complete with ditches and hydraulic gear at the tin mine and 4 dredges at the gold property.

Production:

Year	Tin, pounds	Gold, ounces
1914	311,160	6,015
1915	611,520	5,125
1916	1,046,080	5,538

**ELECTROLYTIC ZINC CO. OF AUSTRALIA
PROPRIETARY, LTD.**

TASMANIA

See same title under New South Wales.

MT. BISCHOFF TIN MINING CO.

TASMANIA

Office: H. Ritchie, sec., 51 George St., Launceston, Tasmania. **Mine office:** Waratah, Tas., Australia.

Officers: F. K. Fairthorne, chairman; S. Eardley-Wilmot, A. Evans, F. P. Hart, E. M. King, L. G. Thompson, J. B. Waldron, Jr., directors; J. D. Millen, mine mgr.; F. B. Jackson, smelter mgr.

Inc. 1872, in Tasmania. Cap., £60,000; shares £5 par; all issued, 4,400 fully paid, and 7,600 £1 paid-up, making paid-up capital £29,600.

Balance sheet for half-year June, 1916, showed profit of £7,278, of which £4,500 was distributed. Balance forward was £86,918.

Dividends: to June, 1916, total £205 (\$984) per share.

Property: tin-bearing lands at Waratah, West Coast region of Tasmania. **Ore reserves:** estimated at 1,616,000 tons of ore, mostly low grade, but profitable. Mining in this wet region is by open-cut methods.

Equipment: includes complete mining plant, electric railway, power-plant, concentrating mill and smelter at Launceston, which also treats custom ore.

Production: for half-year ended June, 1916, 1,539 tons of concentrate yielding 1,060 tons (2,374,400 lbs.) of metallic tin, 160 tons (358,400 lbs.) coming from company's mines.

Mt. Bischoff is one of the world's greatest tin mines, and has made very high returns on a small capital.

MOUNT LYELL MINING & RAILWAY CO., LTD.

TASMANIA

Office: Collins House, Melbourne, Australia. **British office:** Palmerston House, Old Broad St., London, E. C., Eng. **Operating and works office:** Queenstown, Tasmania. **Mine office:** Gormanston, Tasmania. **Bowes Kelly,** chairman; Lindsay Tulloch, Colin Templeton, W. Jamieson and P. C. Holmes Hunt, directors. **London directors:** A. Williamson, chairman; Sir John A. Cockburn, K. C. M. G., John Ball and W. Douglas Reid; D. G. Lumsden, sec.; W. G. Moss, asst. sec.; Edwin Habben, London sec.; Robt. C. Sticht, gen. mgr.; Basil Sawyer, local supt.; B. Stafford Bird, Tasmanian agt.; Robt. P. Roberts, chief metallurgist; R. M. Murray, mine supt.; E. Carus Driffeld, railway supt.; G. F. Jakins, asst. engr.; G. W. Wright, mech. engr.; Thos. W. Haynes, business mgr. of chemical works.

Inc. Aug. 11, 1903, in Victoria, as a merger of a former company of the same name, with the North Mount Lyell Copper Co., Ltd. Cap., £1,300,000, shares £1 par; issued £1,289,195. Debentures of the former North Mount Lyell, £140,000, at 5%, were retired 1908, leaving the company without bonded debt.

Half-yearly meeting, May; annual meeting, November.

Profit for fiscal year ending Sept. 30, 1916, was £139,002. Balance of liquid assets was £443,674, March 31, 1916, and £433,087, Sept. 30, 1916.

Dividends: have been as follows: £150,000 in 1904, £195,000 in 1905, £345,000 in 1906, £330,000 in 1907, £210,000 in 1908, £210,000 in 1909,

£180,000 in 1910, £75,000 in 1911 and 1912, £80,424 in 1913. £64,460 in 1914, £145,034 in 1915, £209,494 in 1916; total £2,269,412.

Former company paid dividends of £996,574, giving total dividends, to end of 1916 of £3,265,986. In June, 1917, there was distributed £80,574.

The operations of the company are very extensive, including the mining and smelting of copper ore in Tasmania, the mining of pyrite in Tasmania, with the manufacture of acid and superphosphates in the states of Victoria and Western Australia, and the manufacture of coke in New South Wales. The methods employed in the various works of the company are of a notably high technical order.

Property: 2,124 acres, inclusive of 5 consolidated claims, leased for 21 and 30-year periods, and 565 acres of mill and smelter sites, in the Mt. Lyell district, with mineral lands in other parts of Tasmania where prospecting and mining work is in progress.

The principal mining operations are in the Mt. Lyell district, on the west coast of Tasmania, at a distance of about 14 miles in an air line from the port of Strahan, on Macquarie harbor. The Mt. Lyell pyritic orebody was discovered 1883, but its value for copper was not recognized. Actual mining was begun 1882. Other mines in the same district were unsuccessful and the value of the North Mt. Lyell mine was recognized in 1897, but it was not profitable until it was merged in the present company, 1903. Owing to the silicious nature of the No. Lyell ore, neither concentration nor smelting was successful and the undertaking was a failure financially after the expenditure of about £800,000. The amalgamation of the 2 mines, effected 1903, gave a single magnificent property, the pyritic ore of the Mt. Lyell and the silicious ore of the North Mt. Lyell being natural smelting complements.

Geology: rocks of the Mt. Lyell mine are hydro-mica schist, conglomerate, quartzite and sandstone, with mineralization occurring along a schist-conglomerate contact that is a crush-zone formed by an overthrust fault. The orebody is a huge lenticular mass, measuring 270' wide by 660' long, on the 4th level, with an ascertained depth of 685'. This lens originally contained 6,500,000 long tons of ore, about two-thirds of which has been extracted. The average ore at present carries 0.53% copper, 1.25 oz. silver and 0.04 oz. gold per ton. The ore is a very clean, slightly cupriferous pyrite, carrying only about 6% silica, 2% alumina and 2.5% barium sulphate, with a little zinc and a trace of lead.

The copper occurs as chalcopyrite and tetrahedrite, disseminated through the pyrite. One end of the orebody carried an enrichment, persisting from surface to the bottom of the lens, consisting of a mixture of chalcopyrite and bornite, with a little chalcocite, and in 1894 this part of the mine yielded 850 tons of this ore, enriched by stromeyerite up to a tenor of 21% copper, 1,010 oz. silver and 0.1 oz. gold per long ton, this bonanza deposit netting the old company £105,000 in London, which sum, together with the report on the property from the late Dr. Edw. Dyer Peters, afforded the necessary stimulus to finance the original company.

Development: since 1892, by a system of tunnels, crosscuts, and contour drifts encircling the orebody, in 8 levels, but the 5 upper levels have been obliterated by an enormous open cut, from which the ore is extracted in a series of benches with simultaneous removal of overlying or underlying country rock. The ultimate bottom of the quarry is No. 5 level, 450' from surface; below this level only underground extraction is feasible. A vertical blind shaft connects the 5th level with the 3 levels below, and all are accessible from surface by an incline hoisting shaft, which also serves the open cut. Underground development beneath the pit was begun actively early in 1909, giving a productive capacity of 800 to 1,000 long tons of ore daily, from open-cast and underground workings combined. In the underground workings ore is stoped in large sections and depleted stopes filled with waste rock from the capping previously removed. The pit has a traveling crane and is electrically lighted. The removal of the schist and conglomerate overburden is nearing completion and the finished work will give about 2,000,000

cu. yds. of capping removed, to render available 1,070,000 cu. yds. of ore. It was estimated, Sept. 30, 1916, that the Mt. Lyell proper had ore reserves of 1,726,485 long tons available for extraction, having an estimated average assay of 0.53% copper, 1.96 oz. silver and 0.04 oz. gold per ton. For the half year ending Mar. 31, 1917, the Mt. Lyell mine shipped 84,755 long tons of ore, averaging 0.45% copper, 1.03 oz. silver and 0.04 oz. gold per ton. The mine output is about 700 tons of pyrite ore daily, mostly from the 3 underground levels, the 3 lower benches of the opencut supplying a minor amount.

The South Mt. Lyell orebody is a lens of the same character as the big orebody of the Mt. Lyell, though much smaller, and not outcropping at surface, being opened from the Mt. Lyell mine and practically a part of that mine.

Equipment: the incline shaft at the Mt. Lyell, which raises all ore from the mine, has a 200-h. p. electric hoist, capacity 600 tons in 8 hours, taking current from the reduction works power-plant by a 1½-mile special line. Hoisting is by self-dumping skips. At this mine there are three 300-h. p. motor-driven compressors with a combined capacity of 3,600 cu. ft. of free air per minute to 80 lbs. pressure per sq. inch, and the air supply is diverted, when required, to the North Mt. Lyell mine by means of a 6,000' pipe line. A triplex pump, capacity 100 gal. per min., lifts all the water requiring discharge.

Geology: The North Lyell mine carries ore as disseminations in highly quartzose-schist, in the vicinity of a conglomerate contact, the schistose ore shoots occurring as pipes, or columns, of irregular cross-section, in the recesses of the highly-contorted contact surface of the conglomerate. Copper contents are mainly in bornite, but there are limited quantities of chalcopyrite and chalcocite, associated with small amounts of pyrite, and there are no deleterious elements. The North Lyell ore averages, as broken, about 6% copper and 1.33 oz. silver per long ton, with a trace of gold, the gangue averaging about 66% silica, 7% iron and 7.5 to 11% alumina. The North Lyell has a number of closely associated but distinct orebodies, the 2 largest being the Main and New Development orebodies. The Main orebody outcropped at surface, and has a vertical dip with depth proven to 1,000'. The New Development orebody connects with the Main orebody on the 400' level, descending at a very sharp pitch, and carries disseminated bornite of good average grade on the 1,200' level, which is the deepest working of the mine. The character of the ore remains unchanged down to the lowest level opened, except that perhaps chalcocite is increasing with depth.

Development: consists of tunnels of 850' and 1,080', and 3 shafts, the Main of 1,200', the Auxiliary of 800', and a blind shaft from the 800' level. Lower levels are opened at 150' and 100' intervals. Stopping is in progress on all levels from the 700 to 1,200', inclusive, and is heaviest on the 1,000' level. Filling for depleted stopes is brought from surface by means of 2 main waste passes, and run to place through branch passes. For 6 months ending Mar. 31, 1917, the North Lyell produced 45,755 tons of ore, with average assays of 6.59% copper, 1.40 oz. silver, and 0.008 gold per ton.

In Sept., 1916, ore reserves were estimated at 1,083,211 long tons of an average assay value of 6% copper, 1.33 oz. silver and 0.005 oz. gold. The North Lyell has developed wonderfully well and it is evident that the property has excellent prospects of further considerable orebodies, while the ore is persistent to the greatest depth yet reached and high in copper tenor and, although too silicious for straight smelting, blends with the pyritic ore of the Mt. Lyell in an ideal smelter charge. The daily output of the mine averages 400 tons.

Equipment: North Lyell shaft has a 150-h. p. electric hoist, good for 1,500' depth, and the plant includes a 20-drill air compressor, driven by a 350-h. p. motor. The mine water, which is very acid, is lifted by 3-throw electric pumps of 100 gal. per min. capacity.

The Lyell Tharsis mine, formerly considered worked out, was acquired by the company some years ago and is worked for ore of the same mineralogical character as that of the North Lyell, though very much lower in grade.

The South Tharsis and Royal Tharsis mines are idle. The South Tharsis mine was worked opencast for a time, and the Royal Tharsis has been developed for underground working by an incline shaft. These properties carry chalcopyrite and pyrite, disseminated sparingly in schist, and the ore, of very low average grade, though not amenable to ordinary wet concentration, will be mined at some future time for flotation concentration.

Other mines: an important property purchased by the company in 1912 was that formerly owned by the Mt. Lyell Comstock Mining Co., Ltd. Total area of leases 339 acres. The southernmost sections are contiguous to the North Mt. Lyell leases and contain the northern extensions of the orebodies in the latter, which give them a special value to the company. The deposit worked by the former owners is, however, remote from this locality, being 6 miles, by steam train, from the reduction works. The mine has been recently reopened by the company and is worked on a steadily increasing scale for concentration by flotation. The deposit here occurs on the same line of contact of schist and conglomerate as the other properties in the district and the character of the ore is similar to that of the North Mt. Lyell mine, though more basic, while the ore in the southernmost sections is, of course, identical with that of the North Mt. Lyell orebodies themselves.

Near the reduction plant there are quarries of silica and limestone which are used for flux.

General equipment: company has sawmills for furnishing mine timber and lumber for general building purposes.

A 1½-mile aerial tram transports 750 tons daily from the Mt. Lyell mine to the smelter. There also is a 4,500' incline surface tram, operating cars in counterbalance, connecting with a ¾-mile steam railway.

The company owns 2 railway lines; a 22-mile line connects the reduction works at Queenstown with the seaport of Strahan, giving rail connections with all parts of the State. The second line connects Gormanston with Kelly Basin, near the head of Macquarie harbor, 25 miles from Strahan. The company's private narrow-gauge line has about 7 miles of track, connecting the mines and works.

An extensive hydro-electric plant at Lake Margaret supplies power for all purposes, and superseded a large steam plant.

The reduction works are at Queenstown, on the Queen river, 1½ to 2½ miles from the mines. No. 1 smelter has been dismantled for some years. No. 2 smelter has four 34x210" blast furnaces, with cast-iron water jackets of solid construction, suitable for pyrite smelting. The furnaces have special mechanical feeders and hydraulic lifts.

The first successful pyritic smelting ever accomplished was done in this plant, in 1896, under direction of Robert Sticht. The method has been greatly improved since then.

The charge, averaging 2.5% copper, is brought to a matte of 40 to 50% copper. Slags average about 0.33% copper, 32 to 38% silica, 42 to 52% iron protoxide and about 4% calcium oxide.

The percentage of coke was formerly as low as 1% but is now 3 to 5% in consequence of a reduction of the iron sulphide contents of the ore and an increase of the zinc and lead.

The furnaces have a stationary rectangular forehearth, supplemented by smaller rectangular forehearths, from which the slag flows into a stream of water for granulation. Granulated slag is distributed over the slag dump by centrifugal pumps or alternately by electric bucket elevator. Blast is supplied to furnaces by 4 motor-driven centrifugal blowers, with 25,000 cu. ft. of free air capacity at from 72 to 96 oz. per sq. in. pressure. Matte tapped from the main forehearth is allowed to cool before conversion, the conversion of matte direct from the blast furnaces being subject to local difficulties that have not yet been overcome.

The 75-ton converter plant has 2 remelting furnaces, with 6 stands, and 14 shells of the Stahlmann type, each 60x96". Converter blast is furnished by 2 electrically-driven centrifugal compressors, each of 3,500 cu. ft of free air capacity to 12 lbs. per sq. in. Motors are of 250 h. p. Concentrates and flue dust are treated by the Dwight-Lloyd process.

The final product is blister copper averaging 98.83% copper, about 80 oz. silver and 1.5 oz. gold per long ton, the silver contents having declined about 20% and the gold contents about 40% in recent years. For many years, until the end of 1910, blister copper was sent to Baltimore for electrolytic refining, but now goes to the Port Kembla works in New South Wales.

Company owns 3 acid and fertilizer plants, all having Herreshoff calciners sulphur burners and the ordinary chamber process for making sulphuric acid. Crude phosphate rock is secured from Ocean and Christmas Islands. The products of these plants include a variety of superphosphates and commercial fertilizers, demand for which is rapidly increasing in Australia. The raw material for acid is furnished by the Tasmanian mine. Spanish pyrites and sulphur from Japan and Italy. Unfortunately, it is commercially impracticable to utilize the sulphurous acid fumes from the Mt. Lyell smelter, because of the high freight rates, either in carrying the acid away from Mt. Lyell, or bringing in the crude phosphate rock.

The superphosphate works are in Victoria, South and Western Australia.

The company employs about 1,700 men in Tasmania, in addition to considerable forces at the fertilizer plants. About 850 men are employed at the mines, 150 on the railways, and 700 at the reduction works.

Although the average of all ores and concentrates smelted is only about 2.5% copper, and the pyritic ore now mined from the Mt. Lyell mine proper barely exceeds a copper content of one-half of 1%, the cost-sheet makes an excellent showing. Mt. Lyell pyritic ore, won opencast, cost about 3s. 6d. per long ton, inclusive of the charge of 2s. for removal of overburden, and cost of ore extracted from underground workings does not exceed 6s. (\$1.44) per long ton. Ore mined from the North Mt. Lyell costs about 14s. (\$3.36) per long ton and constitutes about one-third of the total ore tonnage.

Costs: average cost of mining, smelting, and converting, from 1896 to 1903, was \$5.48 per ton, and by this company for 6 years ending 1909 the total mining and smelting cost per ton was \$3.56, a figure that reflects great credit upon an efficient manager and staff. For the half-year ending Mar. 30, 1916, costs were \$6 per long ton. Recent advances are due to increased underground work and cost of supplies.

Production: since the organization of the present company in 1903, average production has been 408,000 long tons yearly, while the production of blister copper has averaged 8,550 long tons. Including the production of the old company, from 1896 to Aug. 11, 1903, the total production by the company, to Mar. 31, 1917, was 6,633,972 tons of ore yielding 148,817 tons of fine copper, 11,841,771 oz. of silver, and 349,215 oz. gold. Of the ore tonnage, Mt. Lyell contributed 4,743,098 tons, North Lyell 1,536,418 tons, Lyell Comstock 18,563 tons, concentrates 4,336 tons, purchased ore 167,459 tons, and metalliferous fluxes 170,476 tons.

A flotation plant was completed in Sept., 1916 and to April, 1917, 5,503 tons of 3.04% copper, 0.19 oz. silver, and 0.03 oz. gold ore from the Lyell Comstock, and 1,458 tons of 3.06% copper ore from North Lyell were treated. Concentrates assayed 8.97% copper. Recoveries were 89.11% copper, 74.26% silver, and 67.34% gold.

In the half-year ended Mar. 31, 1917, the smelter reduced a total of 131,679 tons of charge, yielding 6,720,000 lbs. copper, 3,952 oz. gold, and 149,829 oz. silver.

The Mt. Lyell enterprise has had to contend with a series of grave financial, mining and metallurgical problems, all solved with skill and success. A serious handicap is the heavy rainfall, averaging 110" yearly,

hampering a mine worked by open cuts. Furthermore, two-thirds of the ore averages even lower in copper-contents than the leanest of the successful native copper mines of the Lake Superior district, which, for 2 generations, have been treating the lowest grade copper ore in the world, until this unenviable, but highly creditable distinction, passed to the Mt. Lyell. The management is excellent, in all departments, and the success of the company is due to an effective combination of financial ability with high-technical skill.

VICTORIA

BENDIGO AMALGAMATED GOLDFIELDS

VICTORIA

Office: Bendigo, Victoria, Australia.

Property: this company was organized in 1917 to consolidate a number of old producers in the center of the Bendigo Goldfield (which has yielded over 18,000,000 oz. since 1850), explore them systematically by new openings and diamond-drilling, and equip them, if warranted, with modern plant. Operations are concentrated at a number of central points.

Development: in Sept., 1917, work was under way to a depth of 1,947' in the Garden Gully shaft, 1,018' in the Unity, 1,264' in the Carlisle, 1,601' in the Cornish, 2,040' in Koch's, 1,127' in the Northern, 2,380' in the Virginia, 1,225' in the Nelson, and 1,326' in the Extended Hustlers. Generally, recent results have been fair.

Production: in August, 1917, was 6,694 tons of ore, yielding from 11s. (\$2.64) to 47s. (\$11.28) per ton; also 5,905 tons yielding from 8s. (\$1.92) to 18s. (\$4.32) per ton. In the second half of August the gold output was 1,774 oz., worth about \$32,000.

Many schemes have been tried to resurrect this great goldfield and probably if this one does not, a rapid decline will set in.

WESTERN AUSTRALIA

ASSOCIATED GOLD MINES OF WESTERN AUSTRALIA, LTD.

WESTERN AUSTRALIA

Office: R. Davidson, sec., 20 Copthall Ave., London, E.C., England.

Mine office: Kalgoorlie, W. A.

Directors: H. B. Hooper, chairman; B. Brookman, A. H. Collier, F. H. Hamilton, E. Hooper, H. Landau and E. T. McCarthy. D. F. McAulay, gen. mgr.

Inc. Dec. 19, 1894, in England. Cap., £500,000; shares £1 par; 495,364 issued. Company is largely interested in the North Thompson, Huronian Belt and Keeley mines in Ontario, Canada.

During the year ended March 31, 1917, a profit of £5,544 was made, from a revenue of £124,611.

Dividends: from 1898 to 1909 totaled 150%. In 1913 and 1914 2½% each were paid, and nothing since.

Property: 52 acres in the "Golden Mile," Kalgoorlie, W. A. It has produced a large amount of gold, especially from 1898 to 1904.

Development: by vertical shaft 2,200' and extensive workings. Reserves are difficult to estimate. Ore is a sulpho-telluride.

Equipment: complete mining, also 350-ton plant using crushers, ball mills, roasters, pans, cyaniding equipment and filter presses.

Production: now at a low point, the year ended March 31, 1917, yielding £124,611 from 93,430 tons.

GOLDEN HORSESHOE ESTATES CO., LTD. WEST. AUSTRALIA

Office: A. Swanne, Salisbury House, London, E.C., England.

Directors: Sir J. S. Purcell, chairman; R. E. Bucknall, Earl of Kenmore, C. L. H. Loeffler, A. Reitlinger and E. P. Jones. J. W. Sutherland, gen. mgr.

Inc. Feb. 28, 1899, in England. Cap., £1,500,000; shares £5 par; all issued. Debentures: £43,800 of 6% outstanding.

In 1915 a profit of £95,818 was made, dividends absorbing £82,500.

Dividends: since 1899 total 48s. 6d. per share.

Property: 24 acres of producing ground and 85 acres of other areas on the "Golden Mile," Kalgoorlie, W. A.

Development: by 2,242 and 3,114' vertical shafts and extensive workings. Reserves at end of 1915 were 704,359 tons of \$9.20 ore, which is a sulpho-telluride.

Equipment: complete modern mining machinery, including compressors, hoists, crushing plants, 170 stamps, tube mills, concentrators and cyanide plants.

Production: in 1916, 162,316 tons yielded gold worth £345,529.

This is one of Australia's big mines and has a great past record.

GREAT BOULDER PERSEVERANCE GOLD MINING CO., LTD.

WESTERN AUSTRALIA

Office: C. F. Bell, 607 Salisbury House, London, E.C., England.

Directors: P. Bright, chairman; G. S. Borwick, E. Hooper, Sir J. F. F. Horner, A. Reitlinger and W. J. Wilson.

Inc. Aug. 17, 1895, in England. Cap., £1,500,000; shares £1 par; 1,400,007 issued.

Dividends: from 1897 to 1912 total £3 18s. per share on old and new companies, mostly before 1904. Since 1906 only 4s. per share.

Property: 24 acres on the "Golden Mile," Kalgoorlie, W. A.

Development: by shafts 2,230' deep. Reserves in 1915 were placed at 544,474 tons of \$5.28 and 317,480 tons of probable \$5.04 ore, which is a sulpho-telluride.

Equipment: complete and modern, with 8 ball mills, 6 roasting furnaces, 2 tube mills, 12 grinding pans, cyanide plant, and filter presses, capable of treating 650 tons per day.

Production:

	1916	1915
Ore, tons.....	194,106	239,514
Gold yield.....	£204,643	£247,470

Costs are about \$4.50 per ton.

Mine has been a great producer, but during 1917, it operated at a loss and in October it was decided to close the mine down.

GREAT BOULDER PROPRIETARY GOLD MINES, LTD.

WESTERN AUSTRALIA

Office: J. Edwards, 80 Bishopsgate, London, E.C., England.

Directors: Sir G. P. Doolette, chairman; A. Joshua, G. North and J. Waddington. Richard Hamilton, gen. mgr.

Inc. June 20, 1894, in England. Cap., £175,000; shares 2s. par; all issued.

Statement for 1915 shows a revenue of £583,367, of which £314,933 was profit. Dividends amounted to £262,500. The reserve fund is £60,000.

Dividends: total 1,582% from 1895, to the end of 1917.

Property: 85 acres on the "Golden Mile," Kalgoorlie, W. A.

Development: by vertical shafts, 2,844, 2,879 and 2,000' deep, with extensive workings. Reserves at end of 1915 were placed at 494,564 tons, averaging \$15 per ton. Exploration at depth has not been successful, as the main lode passed into the Golden Horseshoe mine adjoining at about 1,800' depth.

Equipment: complete and modern, with 600-ton dry crushing and roasting plant. Ore is a sulpho-telluride.

Production:

	1916	1915	1914
Ore, tons.....	176,787	195,524	190,117
Gold yield.....	£525,168	£583,367	£563,959

Costs are about \$6.50 per ton.

This is one of the most regular gold producers and dividend-payers known, and is ably directed.

IVANHOE GOLD CORPORATION, LTD. WESTERN AUSTRALIA

Head office: London Wall Bldgs., London, E.C. **Mine office:** Kalgoorlie, Western Australia.

Officers: F. A. Govett, chairman; with H. W. P. Clinton, A. H. Collier, G. A. Touche and T. White, directors; C. Lloyd, sec. J. McDermott, gen. mgr.; Bewick Moreing & Co., cons. engrs.

Registered: Oct. 14, 1897, in London. **Cap.**, £1,000,000; shares £5 par.

Production: in 1916, 238,514 tons treated yielding £381,984; profit was £115,984. Costs totaled 21s. 9d. (\$5.22) per ton. Dividends in 1916, 7s. 6d. (\$1.80) per share, totaling £105,000. No dividends missed since 1898; 24s. (\$5.76) being paid in 6 different years. The reserve fund is £140,000.

Property: 95 acres in the "Golden Mile," Kalgoorlie, W. A., the best mine in the group at present.

Development: by 3,800' main vertical shaft with levels opened to this depth. Exploration by drilling and sinking is kept well ahead and valuable geological data are secured. Ore reserves are estimated at 1,026,000 tons, averaging 36s. 11d. (\$8.86) per ton.

Equipment: plant for mining and treating 700 tons daily, including cyanide works.

Property has a profitable future for several years and is managed with excellent technical knowledge.

KALGURLI GOLD MINES, LTD.**WESTERN AUSTRALIA**

Office: F. H. Carlton, 7 Crosby Square, London, E.C., England.

Directors: C. M. C. Roberts, chairman; P. F. Dietz, E. Hooper and C. S. Stafford. R. S. Black, gen. mgr.

Inc. June 14, 1895, in England. **Cap.**, £120,000; shares £1 par; all issued.

Profit for year ended June 30, 1916, was £45,947, of which £45,000 was distributed. Investments were valued at £53,436 and reserves £18,534.

Dividends: total 1,300%.

Property: 18 acres on the "Golden Mile," Kalgoorlie, W. A.

Development: by 1,900' shaft. The lode in this mine is of peculiar shape and below 1,800' left the quartz-diorite and entered a calc-schist zone, where the gold content is low. Drilling has failed to reveal other shoots of sulpho-telluride ore.

Equipment: complete with 350-ton dry crushing and a roasting plant.

Production:

	1916	1915
Ore, tons.....	119,180	125,990
Gold yield.....	£194,795	£249,878

Costs are around \$5 per ton.

On a small capital and with excellent management this property has done remarkably well.

SONS OF GWALIA, LTD.**WESTERN AUSTRALIA**

Office: E. Pears, sec., 20 Copthall Ave., London, E.C., England.

Mine office: Leonora, Western Australia.

Directors: D. Richards, chairman and managing; J. Barry, G. P. Doollette, C. A. Moreing and T. W. Wellsted. Bewick, Moreing & Co., gen. mgrs.; W. A. McLeod, supt.

Inc. Jan. 7, 1898, in England. **Cap.**, £350,000; shares £1 par; 325,000 issued.

In 1916 the net profit was £39,890, of which £40,625 was paid in dividends; £740 carried forward.

Dividends since 1900 total 63s. per share; 2s. 6d. being paid in 1916.

Property: 863 acres near Leonora, Western Australia. A highly profitable mine throughout its life.

Development: by incline shaft 3,500' deep. Ore reserves are over 600,000 tons.

Equipment: complete mining and milling, with suction gas power plant. Mill includes 50 stamps, concentrators, pans, tube mills and cyanide plant.

Production: in 1916 was 158,956 tons, yielding 54,837 oz. gold, worth £232,924. Costs were \$4.18 per ton.

SOUTH KALGURLI CONSOLIDATED, LTD. WEST. AUSTRALIA

Office: W. Bramall, sec., 529 Salisbury House, London, E.C., England.
Mine office: Kalgoorlie, Western Australia.

Directors: A. H. Marker, chairman; J. H. Birtwistle, J. Cutcliffe, W. St. D. Griffith, C. T. Hilder, C. B. Jessop and W. W. Slater. J. M. Embleton, gen. mgr.

Inc. March 11, 1913, in England, as a consolidation of the South Kalgurli Gold Mines and Hainault Gold Mine companies. **Cap.,** £150,000; shares 10s. par; 250,007 issued.

For year ended March 31, 1916, the net profit was £16,335, plus £706 brought forward. Dividends absorbed £12,500. The sum of £4,541 was carried forward. Cash assets amounted to £38,700. In 1916-17 the profit was only \$4,050, yielding a dividend of £3,125.

Dividends: 5% in 1913-14, 7½% in 1914-15, 10% in 1915-16 and 2½% in 1916-17.

Property: 36 acres in the "Golden Mile" of Kalgoorlie, Western Australia. Claims have been productive since 1896.

Development: by vertical shafts 1,000' and 1,800' deep. Reserves, March 31, 1916, totaled 157,617 tons of \$6.14 ore and 89,095 of \$5.90 probable ore. A year later the reserve was 133,221 tons of \$5.75 ore.

Equipment: complete mining and milling plants electrically driven, the latter including crushers, ball mills, roasting furnaces, grinding pans, cyaniding apparatus and filter presses.

Production: during 21 months ended Dec. 31, 1916, 199,640 tons of ore yielded gold worth £243,710. Costs are \$5.48 per ton.

This gold mine has been a profitable producer for years, but apparently dividends will be few and far between in the future.

YUANMI GOLD MINES, LTD. WESTERN AUSTRALIA

Office: G. G. Hay, 1 London Wall Bldgs., London, E.C., England.
Mine office: L. B. Williams, mgr., Yuanmi, Western Australia.

Directors: J. H. Corder-James, chairman; with Theodore J. Hoover and G. G. Hay.

Inc. April 27, 1911, in England. **Cap.,** £350,000; shares £1 par.

Earnings for year ended June 30, 1917, were £72,429; and mine expenditures, £65,596; compared with £77,865 and £70,143 in 1915-16.

Dividends: were 12½% in 1912-13, 5% in 1913-14 and none since.

Property: 218 acres in the East Murchison goldfield, W. A. Ore is a sulphide and reserves are estimated at 46,481 tons averaging 58s. 1d. (£13.94) per ton.

Development: by 680' incline shaft, and considerable openings.

Equipment: 80-ton plant, including ball mill, roasters and cyanide plant. To treat the oxide ore, company originally had a 10-stamp mill and cyanide plant.

Recent results have not been of encouraging character.

NEW CALEDONIA

CHROME CO., LTD. NEW CALEDONIA

Office: H. W. C. Dermer, 19 St. Swithin's Lane, London, E.C., England.
Directors: E. Davis, chairman; F. J. Burt, J. Kitchin, F. E. Lander, and F. M. Singer.

Inc. Feb. 1, 1911, in England. **Cap.,** £190,000; shares £1 par; all issued. **Debentures:** £86,460, 5% outstanding. In 1915 the profit was £18,809, less £9,500 for dividends. £11,395 was carried forward.

Dividends: 5% in 1913, 10% in 1914, 10% in 1915.

Property: Chrome mines, near Port Pagoumène, New Caledonia, via Australia.

Production: 61,416 tons in 1914, 62,585 tons in 1915 and 35,303 tons in 1916.

NEW ZEALAND

CONSOLIDATED GOLD FIELDS OF NEW ZEALAND, LTD. N. Z.

Office: F. J. Cox, 20 Copthall Ave., London, E.C., England.

Directors: Sir W. B. Percival, chairman; L. Ehrlich, A. L. Foster, G. A. Jones, E. T. McCarthy and L. Welstead. V. Hartog, gen. mgr.; R. Burley, mine supt.

Inc. Feb. 22, 1896, in England. Cap., £300,000; shares £1 par; 250,000 issued. Company holds 91,324 shares in the Blackwater Mines and Progress Mines companies.

In 1915 a profit of £23,722 was made. Dividends to 1911 totaled 18s. 6d.

Property: the Wealth of Nations mine at Reefton, South Island, N. Z. This, with the Blackwater and Progress mines, are in the same district. They are fully equipped with mining and treatment plants.

Production: the three may be summarized as under for 1916:

Mine	Tons	Gold Yield	Profit	Costs	Dividends Total
Blackwater	40,247	£80,565 .	£35,528	\$4.80	65%
Progress	26,780	31,405	4,065	4.80	119
Wealth of Nations 25,844		41,577	18,045	4.40	92

TALISMAN CONSOLIDATED, LTD.**NEW ZEALAND**

Head office: Auckland, New Zealand.

Officers: A. W. Blanchard, M. Casey, R. B. Jackson, C. P. Knight, J. Smith and T. S. Weston, directors. Bewick, Moreing & Co., gen. mgrs.; H. Stansfield, mgr.

Inc. Sept. 14, 1916, in New Zealand, to acquire English company of similar name, inc. in 1904. Cap., £345,000; shares £1 par; all issued.

Dividends: since 1905 total 67s. per share.

Property: 668 acres at Karangahake, N. Z., in mountainous country.

Development: by tunnels and shafts. Reserves are difficult to estimate, but are high grade, \$24 per ton.

Equipment: complete mining plant, aerial trams, 50 stamps, 3 tube mills and cyanide plant.

Production: In 1916 the yield of silver and gold was £83,227 from 16,935 tons, giving a profit of £22,260.

WAIHI GOLD MINING CO., LTD.**NEW ZEALAND**

Offices: H. Akers, Coronation House, Lloyds Ave., London, E.C., England, and Waihi, N. Z.

Officers: A. M. Mitchison, chairman; H. E. Beddington, W. Bristow, E. J. Brutton, W. B. Percival, directors; with S. T. George and Charles Rhodes in New Zealand. E. G. Banks, supt.; W. P. Gauvain, asst. supt.; J. L. Gilmour, mine mgr.; H. P. Barry and R. E. Williams, cons. engrs.

Inc. Dec. 7, 1887, in England. Cap., £500,000; shares £1 par; 495,907 issued.

Balance sheet for 1915 shows a gross profit of £160,858, from which was deducted £99,181 for dividends, £24,965 for taxes, £21,840 for depreciation, etc.; £13,277 was carried forward. Reserve fund amounts to £90,000.

Dividends: since 1893 total £11 10s. per £1 share, the highest being 18s. in 1909, and the last four years paying 4s. each.

Property: 518 acres of mining claims, 3 large millsites, extensive timber lands, power sites, etc., at Waihi and adjacent areas, New Zealand. Mine has had an interesting history; was one of the first in the world to use cyanide; and has produced over £6,000,000 of gold and silver.

Development: by 4 shafts, deepest over 1,300'; two are equipped with large electric and Cornish pumping plants. Reserves estimated at 1,479,948 tons, 673,896 being in pillars and arches.

Equipment: extensive mining plant, 6-mile railway, 50-mile transmission line from power plant on Waikato river, one 40-stamp, one 90-stamp, and one 200-stamp mill driven by water and electricity; also sand, slime, and concentrate cyanide plants.

Production: in 1916 was £327,506 from 194,231 tons. Ore yields silver and gold in the proportion of about 5 to 1.

WAIHI GRAND JUNCTION GOLD CO., LTD. NEW ZEALAND

Office: S. Leah, 10 Throgmorton St., London, E.C., England.

Directors: H. D. Bishopp, chairman, G. H. Earle, S. Lee, and H. J. Rothwell. W. McConachie, mine mgr.

Inc. Dec. 29, 1897, in England. Cap., £400,000; shares £1 par; 384,375 issued.

Statement for 1915 shows a profit of £39,344, of which £38,437 was paid in dividends. Cash was £43,943; investments, £59,668; reserve, £30,000; accounts payable, £12,807. Since 1910 company has paid 50% in dividends.

Property: 280 acres of mining land, and a timber area, at Waihi, New Zealand.

Development: since about 1893 this has been under way to cut an extension of the Waihi company's lodes, which were not found until a depth of under 500'. Considerable water was encountered. The main shaft is 1,386' deep. Reserves are given as 136,400 tons.

Equipment: complete power and mining plants, with 60-stamp mill, 10 tube mills and cyanide plant.

Production: in 1916 about 115,000 tons yielded gold and silver valued at £194,461.

CENTRAL AMERICA

CENTRAL AMERICA

COSTA RICA

ABANGAREZ GOLD FIELDS OF COSTA RICA COSTA RICA

17 Battery Place, New York City. Mine office: Abangarez, Costa Rica. Officers: Minor C. Keith, pres.; A. W. Preston, v. p.; H. M. Keith, treas.; E. W. Ong, sec.; E. S. Hyde, asst. treas.; directors, M. C. Keith, E. W. Ong, B. W. Palmer, A. W. Preston, J. F. Tilden (and, 131 State St., Boston, Mass.).

Inc. Sept. 8, 1899, in Del. Cap., \$4,000,000 Com. and \$1,000,000 6% cumulative Pfd.; outstanding, \$3,880,000 Com. and \$1,000,000 Pfd.; par \$25. Transfer agt.: Old Colony Trust Co., Boston; registrar, American Trust Co., Boston. No dividends on Pfd. since May, 1911, when semi-annual dividend of 3% was paid. Annual meeting, 3d Monday in Dec. Listed on Boston Stock Exchange.

Funded debt: \$374,000 1-year 6% gold notes; dated May 1, 1915; due May 1, 1916; int. payable May and Nov. 1st, at company's office. Coupon \$50, \$100, \$500, and \$1,000. Issued in exchange for \$353,300 1-year 6% notes due May 1, 1915, callable at par and interest on any interest date on 4 weeks' notice; \$476,000 2-year convertible 6% notes; dated May 1, 1914, due May 1, 1916, int. payable May and Nov. 1st, at company's office. Coupon \$100, \$500, and \$1,000. Convertible at maturity at option of holder into Com. stock. Issued to retire \$461,200 3-year 6% notes which matured May 1, 1915.

Balance sheet for year ending Dec. 31, 1916, shows assets \$6,452,165, which includes cost of property, \$3,519,833; mine equipment, \$1,506,309; supplies, \$159,265; cash, \$119,288; bullion, \$124,354; accounts and notes receivable, \$38,876; profit and loss, \$977,474. Liabilities include notes payable, \$1,333,426; current liabilities, \$158,063; compared with \$240,570 in 1915. Income account for 1916 shows: surplus from operations, \$244,951, compared with deficit of \$9,244 in 1915; interest charges, \$79,562; surplus for the year, \$165,389, as compared with deficit of \$87,789 in 1915. Total deficit Dec. 31, 1916, \$977,474, as compared with \$1,006,369 the previous year.

Property: Company acquired the properties of the Guanacaste Syn. and the Guacimal Expl. Co. After obtaining possession of three-fifths of the capital stock of the Costa Rica Esperanza Mng. Co. in exchange for land, the Abangarez Co., Dec., 31, 1909, acquired the balance of the stock by giving one share of Abangarez and \$1.87 in cash for each share of Costa Rica Esperanza. Owns mining properties in full operation covering 118 sq. miles in the province of Guanacaste, Costa Rica, C. A. The ore developed at Majica Creek on the Tres Hermanos Lode is transported by aerial tramway to the Abangarez mill. Also owns a power plant in the Guacimal River, 12 miles from the mill.

Production:

Year	Tons		Cost Per Ton			Total (a)	Prod. (b)	Earn (b)	Int. Chgs. (b)
	Milled	Mng.	Mlg.	C'yg.					
1916.....	50,221	\$4.08	\$0.71	\$1.36	\$8.48	\$13.35	\$4.87	\$1.58	
1915.....	25,262	4.33	0.84	1.60	8.18	7.82	d0.36	3.11	
1914.....	37,742	4.47	0.58	1.39	7.89	5.27	d2.62	2.00	
1913.....	69,346	4.92	0.64	1.70	8.68	8.36	d0.32	1.00	
1912.....	50,011	9.11	1.07	2.28	14.71	12.14	d2.57	0.94	
1911.....	42,514	10.06	1.61	2.38	16.98	21.84	4.86	0.42	

(a) includes cost of production, administration and marketing.
(b) per ton. (d) deficit.

CENTRAL LIBRARY

In view of the company's financial condition and conditions in general, an arrangement has been made with J. N. Popham, who has been successful in the management of a neighboring mining property, to undertake the operation of the company's property. He is to furnish all necessary capital for carrying on operations. As compensation he will receive 10% of the net profits over and above operating and development expenses. Company reserves the right to withdraw from agreement upon due notice. Since Mr. Popham assumed charge there has been a gradual but fairly constant improvement in the output of the mine. Net earnings from operations for 1916 amounted to \$244,951.

AGUACATE MINES INC.**COSTA RICA**

Office: c/o White Investing Co., Room 2503, 55 Liberty St., New York City. **Mine office:** San Mateo, Costa Rica. **Persefer G. Spilsbury**, gen. mgr.; **Robt. McGarraugh**, gen. supt.

Officers: W. W. White, pres.; E. Gibbon Spilsbury, v. p.; W. Foster White, treas.; Edgar H. Woodward, asst. treas. and sec.

Inc. 1907, in Maine. Cap., \$8,000,000; \$3,999,630 outstanding and \$4,000,370 in hands of trustees for benefit of company. Listed on New York Curb.

Property: the Quebrada Honda mine, carries gold ore in fissure veins 2½' to 3' wide, with ores that average \$9 per ton value recovered. The orebody is 1,500' long, developed down to the 900' level.

Development: by tunnel and a shaft below the 700' level. On the Black vein, the deepest workings are on the 850' level, opened 1917, for 200' in length and stoping started, ore being hoisted to 700', the main tunnel level. Shaft sunk to 925' level and station cut 1917. The 700' tunnel is the working or haulage level, the mill being near its portal. Company's report of July 17, 1915, is said to state that original estimates of tonnage and values, must be reduced as development has shown that the vein has pinched in places, reducing the size of the ore in reserve.

Cyanide mill handles 2,000 tons per month. Company made a profit of about \$25,000 in 1916.

COSTA RICA MANGANESE & MINING CO.**COSTA RICA**

Address: A. M. Yonge, mgr., Playarcal, Costa Rica, C. A., or American Manganese Manufacturing Co., Dunbar, Pa.

Property: on the Nicoya peninsula, province of Guanacaste, Costa Rica, in a region difficult of access and with bad climate. Described in the Eng. & Mng. Journal of Oct. 27, 1917.

Geology: outcrops are of basic volcanic rock and of highly metamorphosed sedimentaries. The former is porphyritic in structure. Weathering and erosion has left considerable high-grade manganese float in water-courses. Ore is found near the contact of the volcanic and sedimentaries. There are 3 grades; (1) 53 to 58% Mn., (2) 50% Mn. and 6% SiO₂ and (3) high silica ore which can be mined with purer ore to make it marketable.

Development: a large area shows the deposit to be from 1 to 30' thick. To produce a ton of 50% ore, costs are placed at \$2.

Equipment: steam tramway, loading pier on the coast and 3 ore steamers delivering at Baltimore, or Philadelphia.

HONDURAS**NEW YORK & HONDURAS ROSARIO MINING CO.**

Office: 17 Battery Place, New York. **Mine office:** San Juancito, Honduras, C. A.

Officers: W. S. Valentine, pres.; Sidney Abenheim, v. p.; J. M. De Hart, 2nd v. p.; Ernest Schernikow, sec.-treas.; J. Perlman, asst. sec. **Directors:** Sidney Abenheim, Lewis L. Clarke, J. C. F. Jacoby, M. F. Soto, Ambrose G. Todd, W. S. Valentine, H. A. Guess, I. Heidell, W. C. Langley, P. R. Weiler and W. L. Saunders. **Executive Committee:** Lewis L. Clarke, chairman; Sidney Abenheim, J. C. F. Jacoby, Ambrose G. Todd and H. A. Guess; F. H. Minard, cons. engr.; A. R. Gordon, mgr.

Inc. Nov., 1880, in New York. Cap., \$2,000,000; shares \$10 par; all issued. Stock is listed on the New York Curb.

Dividends: to May 1, 1917, total \$4,290,000. Payments in 1916 amounted to 20% or \$400,000. American Exchange Nat'l Bank, New York, registrar. U. S. Mortgage & Trust Co., New York, transfer agents.

Income Account:

	Income	Expenses	Net Income	Reserve Fund	Net Surplus
1916.....	\$1,566,173	\$970,080	\$596,093	\$135,983	\$460,110
1915.....	1,200,743	847,276	353,466	117,324	236,142

Balance sheet: for 1916 shows assets totaling \$3,514,674, including property and plant, \$2,308,444; bullion in transit, \$353,116; cash, \$85,515; current assets, \$664,076; and investments, \$103,521. Liabilities included \$257,499 accounts payable. The surplus totaled \$1,050,620, after deduction of dividends, \$400,000.

Property: owns 25 sq. miles of mineral-bearing land, including the Rosario mine, at San Juancito, Honduras, C. A., and prospecting rights over 400 sq. miles of territory on Chile Mountain.

Development: at the Rosario mine in 1916 amounted to 12,638' as against 13,000' in 1915. This mine has about 20' mineral-bearing veins, which have been or are now being worked. The Rosario was the main producer in 1916, the ore coming from above the lower 200' and above the upper 200' levels. This vein will be an important producer in 1917. The San Joaquin vein can continue to supply large quantities of ore. The South San Miguel has proved a splendid orebody, and was almost unknown a year ago. It is to be explored to the south, also in the upper 550' and below the upper 250' levels. North San Miguel-Concepcion is nearing its end as a large producer. The Colonia and Capitana produced over 8,000 tons each. The former will continue as a good producer; the latter is almost worked out within its known limits.

Geological investigations of the entire zone, as well as surrounding country, were concluded in 1916. Electric haulage on the Pena Blanca and lower 650' levels was very satisfactory, and another locomotive added.

Two crosscuts are being driven—the Pena Blanca-Esperanza, beginning at the S. E. end of the Esperanza No. 3 and running in a S. W. direction to develop the southern territory, and the Pena Blanca Southwest crosscut, starting at the juncture of the Southwest and Jucuara veins in Block 84 and planned to reach Jucuara gulch. When this connection is made, additional water power and cheap timber will be obtainable from the western side of the mountain. This crosscut was 2,226' long Dec. 31, 1916, with 600' to go. Rock passed through was not favorable for ore deposition. The Esperanza crosscut opened some ore, which is being developed.

The company spent 37,871 pesos for prospecting and development on the Chile Mountain Concession without very promising results. Three gold-silver veins showing low-grade values did not persist at depth and work was stopped.

Ore reserves: estimated by the management, Jan. 1, 1917, at 312,148 tons, valued at \$9.51 per ton, gross value of \$2,970,698 (U. S. currency), as compared with 343,718 tons at \$9.76, gross value, \$3,353,098 at end of 1915.

Equipment: includes electric compressors, air-drills, 350-ton stamp mill, cyanide plant, 1,200-h. p. hydro-electric plant and hoists. The company maintains a school and hospital.

A ball mill and Dorr thickener tank, added in 1916, are expected to increase the milling capacity to about 400 tons.

Total bullion production 1882-1916 was \$22,726,082 (U. S. currency).

Recent Production:

	Crushed Tons Ore	% Extr.	Silver Oz.	Gold Oz.	U. S. Cur. Value
1917*.....	10,309	....	138,363	1,129	\$.....
1916.....	128,080	90.28	2,033,737	15,905	1,334,958
1915.....	117,790	88.66	1,748,803	15,210	1,178,614
1914.....	109,170	89.63	1,894,361	14,298	1,203,144

* Average per month.

Operating Costs (pesos):

	Total Cost				Cost Per Ton			
	Mng.	Mlg.	Admin.	Total	Mng.	Mlg.	Admin.	Total
1916.....	1,054,319	708,523	306,117	2,068,959	8.23	5.53	2.39	16.15
1915.....	1,055,637	659,533	273,862	1,989,032	8.962	5.559	2.235	16.886
1914.....	1,087,231	551,326	248,582	1,887,139	9.963	5.050	2.277	17.290

One peso equals 46.5 cents U. S. currency.

Company has decided to erect a 50-ton mill using flotation at its Sabanagrande mine, 40 miles W. of the Rosario mine.

Is a well managed concern and with silver at 1917 high prices, large profits should be made.

NICARAGUA**BABILONIA GOLD MINES, LTD. (LA LIBERTAD)**

Address: Mills Bldg., San Francisco, Cal. Mine at La Libertad, Nicaragua, C. A. J. V. Lake, mgr.

Inc. in London, June 9, 1911, as Sierra Guaranty Syndicate, changed Dec. 1911 to present title. **Cap.**, £200,000 shares; £1 par; 170,007 issued. fully paid; 150,007 shares held by Lake View & Oroya Ex., Ltd.

Property: 3 gold claims, Crimea, Babilonia and Santa Maria, at La Libertad, Chontales district, Nicaragua. Has 60-ton stamp mill and cyanide plant.

Development work in progress, 1917, and crosscut started from shaft at 120' depth.

Production: for 1914, 7,675 tons milled and 5,294 cyanided, yielded £21,155. In 1915, 9,586 tons milled, yielded £37,152, giving a profit on years' operation of £25, after writing off £3,000 for depreciation. Reserves estimated end of 1916 as worth £85,326.

COCO RIVER MINING CO.**NICARAGUA**

Office: 50 Broad St., New York.

Officers: J. G. Turrii, pres.; H. A. Currie, v. p.; Gordon D. Bruce, sec-treas.; A. A. Holland, managing director. J. A. Calder, J. T. Brown and J. H. Lamont, directors.

Inc. in Delaware. **Cap.**, \$1,000,000; \$1 par; 500,000 issued. U. S. Corporation Co., 36 Nassau St., N. Y. City, registrar and transfer agent.

Property: 175 acres in Cabo Gracias district, Nic., C. A., 60 miles inland and 3 miles from navigable river, via Cabo Gracias.

Ore: free milling gold quartz said to average \$5 per ton., including all developed oxidized ore.

Equipment: costing \$125,000, includes 200-ton mill "of ironwood and mahogany," electric motors, etc. A report by A. A. Holland, mining engineer, is said to give 2,000,000 tons blocked out and 4,000,000 partially blocked out.

Company plans installation of 300-h. p. hydro-electric plant on Coco River and to enlarge mill to 500-tons daily capacity, addition of cyanide mill and disintegrator.

Management expects to make a 95% extraction less \$1 a ton for all costs, leaving a profit of \$1,875 daily when treating 500 tons. Costs seem to be figured very low.

EDEN MINING CO.**NICARAGUA**

Controlled through ownership of 55% of capital stock, by Tonopah Mining Co., of Nevada.

Office: 572 Bullitt Bldg., Philadelphia, Pa., and Bluefields, Nicaragua, C. A.

Officers: J. S. Austin, pres.; J. H. Whiteman, v. p.; P. S. Bickmore, sec.; C. A. Higbee, treas. Directors: J. S. Austin, J. H. Whiteman, C. A. Higbee, Chas. R. Miller, C. A. Daniel, Henry D. Moore, Samuel Bell, Jr., Geo. S. Munson and Wm. I. Forbes. J. L. Phillips, gen. supt.

Inc. Nov. 24, 1914, in Delaware. **Cap.**, \$1,000,000, all outstanding; shares

\$1 par, non-assessable. Company office, transfer office, Fourth St. National Bank, Philadelphia, registrar. Annual meeting, 1st Wednesday in May.

Property: 9 square miles in the Pis Pis mining district, a remote part of Nicaragua, C. A. Only a comparatively small amount of development and construction of power and milling plants has been done; not yet operating or treating ore. Net average value of ore reported to be \$12 to \$15 gold per ton, with mining and milling costs estimated under \$6 per ton.

Development: mainly by tunnels.

First unit of the mill with a daily capacity of 150 tons, in operation 1917, and a shipment of 1,161 oz. gold ore was made in June. A wireless plant was installed 1917, to communicate with outside world. Electric power obtained from the hydro-electric plant of the Tunkey Trans. & Power Co., which was organized to acquire and operate the power plant, railroad and river transportation. The entire stock of that company is owned by the Eden Mining Co.

TUNKEY MINING CO.

NICARAGUA

A subsidiary of the Tonopah Mining Co. of Nevada.

SALVADOR

BUTTERS DIVISADERO CO.

SALVADOR

Office: 625 Market St., San Francisco, Cal. **Mine office:** Divisadero, Dpto. Morazan, Salvador, C. A.

Officers: Chas. Butters, pres.; Chas. W. Slack, v. p.; Sidney M. Stone, sec.-treas., with Chauncy S. Goodrich and Sydney A. Cloman, directors. R. R. Leslie, supt.

Inc. Jan. 23, 1905, in California. **Cap.**, \$750,000; shares \$5 par; all issued. Annual meeting 2nd Monday in April. Owns gold-silver mines at Divisadero, Dpto. Morazan, Salvador, C. A.

BUTTERS SALVADOR MINES, LTD.

SALVADOR

Office: 51 Commercial Union Bldg., St. James St., Montreal, Que.

Officers: Chas. Butters, pres.; D. J. Pullinger, v. p.; J. J. Meagher, sec.; with J. Johnstone, directors.

Inc. Nov. 9, 1912, in Canada. **Cap.**, \$750,000; shares \$5 par; all issued. In voluntary liquidation, October, 1917.

COMACARAN GOLD MINING CO.

SALVADOR

Address: Don Emilio Gonzalez, res. mgr., El Harmiguero, Rep. del Salvador, C. A. **Gen. office:** Ciudad, Salvador, R. del Salvador.

Officers: Benj. Gonzales, pres.; Gustave Vides, v. p.; Lucio Quifiones, sec.-treas., above are directors. G. A. Swanquist, supt.

Inc. 1909, in Salvador. **Cap.**, \$500,000; shares \$100 par. Semi-annual meeting in January and June.

Gross earnings for 1916 reported at \$245,920, and \$308,694 for 6 months ending July, 1917. Two dividends have been paid to date.

Property: 3 mines, Gallardo, Harmiguero and Guadalupe, 550 acres mineral land and 12,000 acres timber and agricultural land. Ore occurs in fissure veins in andesite, averaging \$7-\$8 in gold and silver.

The ore of Harmiguero is a very hard quartz carrying silver sulphide. The gold bearing Gallardo ore is soft and friable, and carries calcite; the Guadalupe ore carries gold, is soft, highly oxidized, contains iron and manganese and slimes heavily. The ore from all three mines is conveyed by aerial tram to the mill.

Development: by about 37,200' of workings, including 2 shafts, 464' and 344' deep and a 250' tunnel.

Equipment: includes steam power, hoist, 3 compressors, tramway and a 180-ton cyanidation mill, making an extraction of 92%.

Production: in 1914, 30,483 tons; 1915, 49,430 tons; 1916, 40,976 tons, with total output to date of 150,000 tons.

Management plans installing electric power in 1917.

SAN SEBASTIAN MINE**SALVADOR**

Address: Gustave Scogland, supt., via La Union, Department of La Union, Salvador, Central America.

Property: 30 miles N. of La Union, San Salvador.

Geology: fully described by C. Erb Wuensch in Mining and Scientific Press of Sept. 8, 1917. Deposit consists of contact fissure veins carrying gold-bearing pyrite. Veins occur at contact between a quartz monzonite porphyry dike and the surrounding eruptives, which are basalt capped by trachyte. No ore has been developed below 700' depth, where the ore is erratic in rich pockets. At 800' there is general impoverishment.

Development: by 800' shaft, with 1,800' drainage tunnel 30' below, and 30 miles of workings. Work proceeds at 100 points, and 2,000' of work is done monthly.

Production: 3,500 tons milled each month. Total output is approximately \$15,000,000.

Deposit is unusual and although there are practically no reserves, exhaustion cannot be predicted.

EUROPE

EUROPE

GREAT BRITAIN

AFRICAN ORE CONCENTRATION SYNDICATE, LTD. ENGLAND

Secretary and office: J. A. Stocker, 701 Salisbury House, London, E. C., England. A. S. Elmore, Walter McDermott and C. Pakeman, directors.

Inc. June, 1905. Cap., £12,000; shares £1 par; issued and fully paid.

Company has patents for the treatment and concentration of ores and has erected plants at the Transvaal Consolidated Land & Exploration Co., and Namaqua Copper Co.'s properties in South Africa.

DOLCOATH MINE, LTD.

ENGLAND

Office: R. A. Thomas, mgr., Camborne, Cornwall.

Directors: F. Harvey, chairman; O. Wethered, H. C. Godfrey, J. M. Holman, F. A. Robinson and F. W. Thomas.

Inc., July 15, 1895, in England. Cap., £350,000; shares £1 par, all issued.

Dividends: since 1896 total 135%. None have been paid since 1913.

Property: a well known tin producer in Cornwall. From 1700 to 1799, it was worked for copper and from 1799 to 1867 yielded copper, tin, arsenic, silver, and cobalt, valued at £3,234,693.

Equipment: includes machinery for the present 3,000' shaft, 16 Holman pneumatic stamps, concentrators and Elmore flotation plant.

Production:

	Ore Treated tons	Black Tin (tons) (70% metal)	Costs per ton
1916.....	79,347	1076	\$6.52
1915.....	82,967	1187	6.36
1914.....	105,302	1439	5.80

EAST POOL AGAR, LTD.

ENGLAND

Office: G. F. Maynard, sec., Carn Brea, Cornwall.

Directors: H. W. Rogers, chairman, J. H. Bain, J. M. Holman, J. C. Gardner, W. J. Loring and C. A. Moreing. Bewick, Moreing & Co., gen. mgrs.

Inc. Jan. 11, 1913, in England. Cap., £100,000; shares £1 par; 92,155 issued.

The net profit for 1916 was £22,485, of which £9,116 was paid in dividends.

Dividends: 10% in 1916.

Property: a lease of 42 years on 2 mines that were worked from 1834 to 1912 at Illogan, Cornwall.

Development: in 1916 amounted to 4,501'; besides 189' of diamond drilling. On the 1,440' level, for a length of 39' and 5½' width the vein assayed 55 lb. black tin and wolfram per ton and for 185' and 6' width assayed 10.8 lb. Other openings at this depth were satisfactory. Reserves are being maintained.

Equipment: includes 10 Holman pneumatic stamps, 5 tube mills, 38 concentrators, slime plant, magnetic separators.

Production: in 1916, 81,395 tons treated, 9 stamps averaging 26.1 tons per day each. Ore averaged 21.95 lb. metallic tin per ton, of which 72.9% was extracted. Recovery was 1,411,000 lb. tin, 100 tons wolfram, 527 tons of arsenic and 237,400 lb. copper.

MINERALS SEPARATION, LTD.**ENGLAND****Sec. and officers:** A. O. Williams, 62 London Wall, E. C., England.**Directors:** J. Ballot, chairman and managing director; J. H. Curle, F. L. Gibbs, Dr. S. Gregory, H. A. Krohn, W. W. Webster.**Inc.** in 1903 to carry on metallurgical operations. **Cap.**, £50,000; shares £1 par; all issued and fully paid.**Annual report:** for 1915, submitted Dec. 28, 1916, shows a profit of £22,302; balance forward, £55,014; cash, £19,463; investments, £83,343; creditors, £14,827; debtors, £22,995; share premium account, £19,944.

The chief assets of the company are a number of patents (said to be over 50) for flotation processes and machines for recovery of concentrates from silver and lead, zinc, copper, and other ores. The use of flotation has been as great an advance in the treatment of zinc and copper ores as the cyanide process has been for gold ores. United States, Canadian, and Mexican Minerals Separation patents are owned by Minerals Separation North American Corporation, which see.

ORE CONCENTRATION CO. (1905), LTD.**ENGLAND****(Elmore Process Co.)****Office:** 701 Salisbury House, London, Eng. **Managing directors:** Alex. Stanley Elmore, chairman, and F. E. Elmore; Walter McDermott and B. C. Hinman, directors. **J. A. Stecker, sec.****Inc.** Nov. 18, 1905, in Great Britain. **Cap.**, 230,000 ord. shares of £1 each, 224,544 issued, and 20,000 pfd. of £1 each, 8,795 issued.

Company owns the Elmore patents in certain parts of the world, for concentration of ores by the use of oil, and has installed plants at low grade copper properties in many parts of the world.

TINCROFT MINES, LTD.**ENGLAND****Office:** Wm. Thomas, mgr., Carn Brea, Cornwall. **F. E. Martin, sec.****Directors:** Jas. Wickett, chairman; T. R. Bolitho, J. Gilbert and H. Bolitho.**Inc.** May 20, 1900, in England. **Cap.**, £37,000, in 50,000 priority and 100,000 ord. 5s shares, of which 38,607 and 96,953, respectively, are issued. **Debentures:** £30,000 authorized, of which £10,000 have been issued.

Statement for 1916 shows earnings from ore sales of £77,846. Operations cost £72,844. Deducting "lord's royalties" (owners), etc., there was a loss of £1,191 for the year. Since 1900 profits and losses have been very erratic, but about balanced one another.

Dividends: priority shares received 10% in 1907, 5% in 1912 and 1913.

Property: 142 acres at Carn Brea, Cornwall, shows a lode, 3' to 15' wide, dipping 60°, and opened to a depth of 1,248' in granite. Ore carries arsenic, copper, tin and wolfram. Reserves are about 80,000 tons.

Equipment: includes beam hoist, 2 Cornish pumps, motor driven Ingersoll-Rand compressor and 200-ton dressing plant.

Production:

	Ore Treated	Arsenic tons	Copper lbs.	Tin lbs.	Wolfram tons	Yield p. t. ore	Cost p. t. ore
1916.....	57,500	663	197,120	1,155,840	44	\$6.48	\$6.06
1915.....	59,000	538	67,200	1,361,920	39	5.22	5.04
1914.....	59,000	467	107,520	1,375,360	19	5.08	5.32

GERMANY**MANSFELD COPPERSCHIST MINING CO.****GERMANY****(MANSFELD'SCHE KUPFERSCHIEFERBAUENDE GEW.)****Mine office:** Eisleben, Prussian Saxony, Germany.

Officers (at last accounts): Dr. Dittrich, Dr. Lehmann, Dr. Lengnick, E. Kreuzer, Br. Windisch and I. J. Tobias, executive committee; Bergrat Dr. Vogelsang, gen. mgr.; Rudolph Franks, gen. smelter supt.; Herr Ludwig, gen. mgr. and supt.

Inc. 1852, as a consolidation of numerous independent operators, and reorganized, April 10, 1876, under laws of Prussia. **Cap.**, 69,120 shares, apparently without assigned value.

Dividends: have been 90 marks per share in 1900; 45 in 1901; 15 in 1902; 40 in 1903; 40 in 1904; 80 in 1905; 120 in 1906; 70 in 1907; nothing in 1908 and 1909; 10 in 1910; 15 in 1911; 45 marks in 1912; no information available since.

Treasury shares to the amount of 2,000,000 marks, and a new issue of 5,000,000 marks, were authorized 1908, to provide for the deepening of shafts, rebuilding and enlarging of the electric plants at the Krughütte and Kupferkammer works, construction of new copper and brass works at Hettstedt, and other improvements.

Forces employed are upwards of 22,000 men, and exclusive of the Westfalen coal mines, averaged 19,735 men 1912, of whom about 70% were employed at the mines and 13% at the smelters.

Property: is extensive, including besides the Mansfeld copper mine, large coal mines in Westphalia, and a potash bed near Wansleben, opened by 1 shaft, which has been in operation since 1903. Landed holdings also include considerable tracts of forest.

The coal mines at Langendreer, near Hamm, Westfalen, include several adjoining mines, with 4 operating shafts, and in connection is a coke plant of about 225,000 metric tons yearly capacity, production averaging about 2,500 metric tons of coal and coke daily. There are 2 crushing plants, 1 near Walzwerke and the other at Rothenberg.

The Mansfeld mine was opened A. D. 1199, was immensely profitable during the fourteenth and fifteenth centuries, but the industry nearly suffered extinction during the Thirty Years' War. Activity was resumed in 1671, when the right of working the mines was declared free, this resulting in the building up of a great number of small independent operators. The present company was first formed 1852, as a consolidation of the various small mine operators and smelters, and the merging of many small interests has resulted in a nearly seventeenfold increase of production, from 1,179 metric tons fine copper and 6,489 kilograms silver in 1852.

Geology: The principal orebody of the Mansfeld mines is the kupferschiefer, a fine-grained bituminous shale, lying nearly horizontal, having a dip of about 5° only, with average thickness of 1', of which only 8" are workable, but covering several hundred square miles. The principal ore is slightly argentiferous chalcopyrite, bornite and chalcocite, occurring as speiss, disseminated in very fine grains through the kupferschiefer. Lying just under the kupferschiefer is an arenaceous shale, carrying chalcopyrite. There also is a slightly cupriferous limestone bed, known as the Dachberg. The kupferschiefer carries 2.9 to 10% copper, and ores smelted average 2.5 to 3% copper and 0.015 to 0.020% silver.

The mine has been modernized in methods and equipment since the beginning of the 20th century. Owing to the great age and extent of the old workings, the headings usually were 2 to 4 kilometers from the shafts, hence the actual mining was done under considerable disadvantages, the thinness of the bed and the great extent of the workings rendering it necessary for miners to work on their sides, stomachs or backs, as in coal mines, wearing boards upon their trunks and thighs, in order to protect themselves from the rock floors. Recent mining operations are through a row of 6 deep-level hoisting shafts, intersecting the kupferschiefer at depths of 300 to 600 meters. Three other shafts reach the seam at still greater depths, and 2 of these also intersect a bed of excellent carnalite. These shafts are all circular, 6 meters in diameter, with a lining of brick, backed by concrete. Many of the scores of old shafts which average about 400 meters in depth, are used for ventilation, safety and raising water. The principal new shafts are the Hohenthal, at Helbra, the Herman, at Helfta, and the Paul, at Helmsdorf. All new shafts have steel headframes. Underground haulage, formerly done by horses has been supplanted by electric locomotives, in the newer workings. Ore is hand-sorted on reaching surface, and waste rock, including considerable limestone, is used for underground filling.

Water from the entire mine is drained to the Hohenthal, Ernst and Niewandth shafts, whence it is raised by steam and electric pumps to the main adit, 150 meters below surface.

Equipment: is very complete. The shafts have mainly cross-compound steam hoists, with conical drums for deep winding, but the Hermann and Paul shafts and the newer exploratory shafts have electric hoists employing the Igner system of balancing. All hoisting is done by double-deck cages, raising 4 trucks. Electric power is used extensively and increasingly, and this is developed mainly from gas installations, with power stations at the Krughütte and Kupferkammer reduction plants.

The company maintains independent machine shops, capable of repairing or building any mining or pumping machinery in use, and also has extensive smithies and wood-working shops.

The Krughütte gas power station has two 1,300-h. p. units, the blast furnaces being connected with 2 parallel gas trunks, taking blast gases to a purifier house, where there are Zschöcke and Theisen centrifugal washers, through which the gas passes, and is then dried by passing through a Theisen vapor separator, going thence to a gasometer of 500 cubic metres capacity, from whence it is drawn, as required, to two 1,300-h. p. Ochelhäuser gas engines, direct-connected to a Siemens-Schuckert 3-phase alternator of revolving field type. Current is transmitted to various works at 3,000 to 10,000 volts, and there stepped down for use.

Transportation is by railway lines and a number of Otto aerial trams, the Hermann mine having a 7-kilometer electric aerial tram.

The Mansfeld has numerous reduction plants, including 2 smelters for raw ores, 2 roasting smelters with acid plants, 2 matte smelting works, and a desilverizing plant, the various works having a total of 13 reverberatory furnaces.

The method of reduction is by heap roasting, and calcining in shaft furnaces. Roast heaps are built about 1,000 meters long, 6.5 meters broad at the bottom and 3.5 meters broad at the top, and 2 meters high. The only fuel used is a little brushwood, at the edges and bottoms of heaps, and each heap is roasted about 4 weeks. If the ore carries any fines, these are screened, briquetted and added to the roast heaps. Roasting reduces the ore 7 to 10% in weight, and is more for the elimination of carbon dioxide and bituminous matter than to throw off sulphur, the latter running only 2 to 3% in the raw ore, while the bituminous matter ranges 10 to 17%, and carbon dioxide 7 to 13%. There are 2 roast stalls near the shafts, and at the furnaces the first-fusion product is a matte carrying 40% copper and 0.25% silver. This matte is broken up and roasted in 2 calcining kilns, and the roasted matte, with the addition of 5 to 10% raw matte, is smelted in reverberatory furnaces to white metal carrying 74 to 75% copper and 0.45 to 0.50% silver. The slags from the white metal carry 4 to 6% copper and are returned to the shaft furnaces. Slag is utilized extensively for the manufacture of slag brick and paving blocks. The white metal is ground in Krupp ball mills and sent to the Saigerhütte refinery.

The Kochhütte, at Helbra, is the principal smelter, treating about three-fifths of the total production. There are 8 furnaces, 1 held in reserve, of circular shaft type, using cold blast.

The Krughütte treats about two-fifths of the total production. This plant, at Eisleben, near the mines, has 6 furnaces, 1 being held as a spare, of circular shaft type, with forehearth, using cold blast.

The Eckardthütte, at Leimbach, has 4 copper furnaces of circular shaft type, using cold blast. This plant also has 1 lead stack, producing silver and lead matte, and makes a little nickel speiss from resmelted fine dust. In connection with the Eckardthütte is an acid plant having 72 kilns and 5 lead acid chambers, using the chamber process of acid making.

The Kupferkammerhütte, at Hettstedt, has 3 furnaces of circular shaft type, but, unlike the other plants, employs a hot blast to some extent. The acid plant at the Kupferkammerhütte has 82 kilns and 6 lead acid chambers, turning out 50 metric tons of 50° Beaumé sulphuric acid weekly.

The Gottesbelohnungshütte is one of the smaller and less modern smelters, equipment consisting of 13 small reverberatory furnaces, 17 roasting furnaces and 2 small furnaces for refining slags.

The Saigerhütte is mainly a refinery, including a desilverizing plant, operating on the Ziervogel process, which roasts the matte and retains the silver as a sulphate which is dissolved in water and the solution run over metallic copper, which precipitates the silver, the cement silver so secured being pressed and resmelted to metal 999 fine. The final furnaces product, after the extraction of the silver, is blister copper of 99.7 to 99.8% tenor.

Production: which was only 5,865,898 lbs. in 1867, increased to 15,230,287 lbs. in 1877, to 29,176,000 lbs. in 1887, and 40,230,400 lbs. in 1897. Recent production has been as follows: 42,500,278 lbs. in 1903; 41,629,349 lbs. in 1904; 43,824,141 lbs. in 1905; 40,108,000 lbs. in 1906; 38,822,000 lbs. in 1907; 39,686,800 lbs. in 1908; 41,891,400 lbs. in 1909; 44,769,800 lbs. in 1910; 45,955,600 lbs. in 1911; 45,188,600 lbs. in 1912. Production in 1912 was secured from 873,305 metric tons of cupriferos material smelted. Estimates place the 1915 yield as 44,100,000 lbs., and in 1916, 59,000,000 lbs.

The Mansfield is handled with high technical skill, and its orebodies, by reason of their vast extent, are among the largest known.

SAXON TIN & WOLFRAM MINING CO., LTD. GERMANY

Office: H. W. Chappell, 63 London Wall, London, E. C.

Directors: O. J. Stannard, chairman; W. B. Dick, A. Jourdan, A. H. Wethered.

Inc. March 1, 1913, in England. Cap., £60,000, in 30,000 6% pfd. £1 and 300,000 ord. 2s shares, all issued.

Property: the Vereingt-Zwitterfeld Fundgrube tin and wolfram mine of 44 acres in the Saxon Erzgebirge, 37 miles from Dresden, Germany.

Reserves: as mine filling, dumps, etc., amount to over 250,000 tons. In 1913, 62 tons of concentrate was recovered from 7,048 tons of ore. A 200-ton mill was started late in 1913. No recent returns are available on account of the war.

GREECE

ANGLO-GREEK MAGNESITE CO., LTD.

Office: J. D. Henderson, 24 Finsbury Square, London, E. C., England.

Directors: C. F. Colville, chairman; J. McLaren, W. G. Waldron and J. Hogg, gen. mgr.

Inc. Aug. 21, 1902, in Eng. Cap., £125,250 in 50,000 7% cum. pfd., 74,000 £1 ord. and 25,000 1s dfd. shares.

In 1915, profit was £49,359, of which dividends absorbed £21,310. There was £18,512 carried forward. The reserve fund was £32,000 and depreciation account, £66,064.

Dividends: 7% each year on pfd. shares; total on ord. shares since 1904 is 116% and 425% on dfd. shares since 1911, the 1915 distribution being 300%.

Property: 5,000 acres on the island of Eubea, Greece, mostly magnesite bearing.

Production: is not given, but operations must be highly profitable, judging by profits. Much of the ore comes to the United States in normal times.

ITALY

LIBIOLA COPPER MINING CO., LTD.

Office: Bishopsgate House, 80 Bishopsgate, London, E. C., Eng. **Mine office:** Sestri Levante, Genoa, Liguria, Italy.

Officers: T. V. Anthony, chairman; H. Hubert James and Albert Straube, directors; C. J. Whitaker, sec.; Robert H. Cravens, mine mgr.

Inc. Jan., 1867, in Great Britain, and reconstructed 1888. Cap., £252,000; shares, £5 par. Paid dividends of 2s 6d in 1903; 3s 6d in 1904; 3s 6d in

1905; 2s 6d in 1907; 2s in 1908; 1s 6d in 1909; 1s 6d in 1910; 2s in 1911; 3s in 1912; 2s 6d in 1913; 1s 6d in 1913; 1s 6d in 1915; 1s 6d in 1916; with total dividends of £5 12s 9d.

Property is worked through a subsidiary company, organized under laws of Italy.

Property: 4 claims, leasehold, 1,000 hectares, also a half-hectare mill site, including the Libiola mine, in the Carrara district. The mine, worked by the Romans, and reopened 1867, has about 10 miles of workings. The property has veins of good average size in serpentine and diabase carrying a little malachite in the upper workings, but mainly chalcopyrite associated with pyrite, ores estimated by management to average 3.45% copper and 45.03% sulphur, with 64,440 tons of ore blocked out for stoping at the end of 1918.

Equipment: includes a 150-h. p. steam plant, 60-h. p. electric plant and a 30-h. p. hydraulic plant, with 90-h. p. used at the mine and 150-h. p. at the mill. There is 1 hoist, and 2 air compressors of 12 drills aggregate capacity. The mine has a machine shop, smithy and carpenter shop, all of stone, and there is a sawmill, with band saws.

The mill, covering 550 square meters, is built of reinforced concrete and stone, and has a daily capacity of 180 tons.

Production: was 19,643 tons of ore in 1916, of which about 8% was copper ore averaging 5.64%, production of fine copper being about 210,132 lbs. The company is well managed and by careful handling the property, though small and by no means rich, is made to return satisfactory profits.

NORWAY

AAMDALS KOBBERVERK.

Formerly owned by the Mandak Elektrolitiske Kobbervaerk.

Address: Telemarken, Norway. N. A. Nielsen, Christiania, chairman; H. D. Dahll, managing director.

Property: about 3,000 acres, at Foldal, Norway, carrying considerable producer for nearly three centuries. The ore is low grade, carrying chalcopyrite and bornite, averaging about 2% copper, with a gangue of slate and quartz.

The new concentrating works built in 1915, consist of coarse-sorting house, crusher, jigs and tables. Concentrates produced contain about 25% copper.

Production, 1916, amounted to 900 tons concentrates, equivalent to 225 tons copper.

DUNDERLAND IRON ORE CO., LTD.

NORWAY

Office: F. C. Heley, 4 Copthall Ave., London, E. C., Eng.

Inc. April 22, 1902, in England. **Cap.,** £450,000 Bonds £250,000 prior lien, in £25, £50, £100 and £500 bonds.

Property: concession of several square miles, 35 miles from Mo, W. coast of Norway. Iron ore available is about 80,000,000 tons, averaging 39%. A plant is to be erected to dress this ore, as the Edison process is unsuitable.

FOLDAL COPPER & SULPHUR CO., LTD.

NORWAY

Office: 7 St. Michael's Alley, Cornhill, London, E. C., England. **Mine Mgr. and office:** W. H. Lund, Foldal, Lille-Elvedal, Norway.

Directors: Sidney St. J. Steadman, chairman; Walter Gardner, Edw. T. McCarthy, Geo. Schuster, M. S. Stutchbury and J. C. Williamson; W. A. Carlyle, cons. engr.; D. N. Forbes, sec.

Inc. Jan. 27, 1906, in Great Britain. **Cap.,** originally £350,000; shares £1 par, in £150,000 preferred and £200,000 deferred stock. Company re-organized in 1914 and capitalization reduced to £185,000; shares £1 par; 28,000 shares issued, Dec. 31, 1915.

Balance sheet: for year ending Dec. 31, 1915, issued Nov., 1916, includes: Assets—mining properties, £60,000; equipment, £52,479; ore stocks, £17,405; provisions and livestock, £16,006; debtors, £19,669; cash, £18,478. Liabilities—capital stock, £28,000; mortgages and liens, £155,074;

creditors and credit balances, £21,911. Net receipts from ore sales amounted to £8,808. Operations for the year showed a loss of £1,610, with a total debit to date, £18,712.

Property: about 3,000 acres, at Foldal, Norway, carrying considerable timber, and including 5 old mines, known as the Juliana Marie, Knutshovd, Foldal, Grev, Moltke and Grimsdal, worked for about 150 years. Mine, opened mainly by tunnels, shows a vein of about 12' average width, carrying massive cupriferous pyrite, with only traces of arsenic, vein giving indication of persistence. Ore estimated to average about 2% copper and 46% sulphur. Property also has some ore of high copper tenor.

Development: during 1915 amounted to 5,385', compared with 6,328' in 1914. The main shaft was sunk to the 6th level, but exploratory work on this and the 5th and 7th levels did not fulfill expectations of the management.

Equipment: includes an excellent mining plant, installed at a cost of £105,000, and company has expended about £22,000 for substantial mine buildings. A large waterfall, on the Einuna river, held under a 25-year lease, subject to renewal, at annual rental of £25, has been improved with a hydro-electric power station. Good wagon roads have been built.

A 22-mile Pohlig aerial tram, which is one of the longest in the world, built at a cost of £38,412, runs from the mines to the Lille-Elvedal railway, and has a capacity of 40 metric tons per hour. Miscellaneous improvements include a telephone line, and a quay at Trondhjem, for ore shipments.

The tonnage of clean ore shipped from the mine to the railway was:—

Year	Tons	Copper, %	Sulphur
1910	58,558	1.93	46.31
1911	48,832	1.96	45.84
1912	45,334	1.99	46.38
1913	38,579	1.85	44.79
1914	40,457	1.84	44.87
1915	58,400	1.81	44.33

Property considered promising and management good.

ORKLA GRUBE-AKTIEBOLAG

NORWAY

Address: N. E. Lenander, mgr., or V. B. Lange, LökkensVerk, Norway.

Directors: Marcus Wallenberg, pres.; Th. Fearnley, v. p.; with Aug. Nachmanson, N. E. Lenander, Yohs Schwabroch, Odd Klingenberg and F. M. Treschow.

Inc. Oct., 1904, in Norway. Cap., 16,000,000 kroner (\$4,160,000); shares 180 kroner (\$46.80) par.

Dividends of 7% are paid.

Property: at Meldalen, Norway. Deposits are lenses in gabbro. Ore is a cupriferous iron pyrite, carrying 2% copper and 42 to 44% sulphur. The mine is opened by 1 incline and 2 vertical shafts to 1,300' depth.

Equipment: five 1,200-h. p. electric hoists, four 1,400-h. p. compressors, two 130-h. p. pumps and a mill of 500,000 tons annual capacity.

Production: in 1915 was 180,000 tons, and in 1916, 100,000 tons.

ROSTVANGEN AKTIESELSKABET

NORWAY

Head office: Skippergaten 19, Christiania, Norway. **Mine office:** Rostvangen, via Tonset, Norway.

Directors: Johan Didrichsen, chairman; V. Koren, managing director. B. Bredesen, mgr.

Inc. May 18, 1908, in Norway.

Mine: is connected with the Kristiania-Trondhjem railway by an aerial tramway.

Production (annually): 40,000 tons of pyrite containing an average of 2.5% copper and 45% sulphur.

PORTUGAL

MASON & BARRY, LTD.**PORTUGAL**

Office: 87 Cannon St., London, E.C., Eng. **Mine office:** Pomarac, Alemenjo, Portugal. **Jas. Francis Mason**, chairman; **D. H. Barry**, deputy chairman; **Edw. O. Barry**, managing director; preceding officers, **Henry E. Beddington** and **Francis Ricardo**, directors; **Philip O'D. Greene**, sec.; **Wm. Neville**, resident administrator.

Inc. June, 1878, in Great Britain and reorganized June 2, 1892. **Cap.**, £210,000; shares £1 par; issued, £185,172.

Net profits were £68,325 in 1906; £66,135 in 1907; £56,701 in 1908; £30,934 in 1909; £65,458 in 1910; £64,546 in 1911; £85,665 in 1912; £76,211 in 1913; £31,338 in 1914; £59,737 in 1915; £99,167 in 1916.

Balance sheet for 1916 shows profit of £99,167, of which £83,327 was distributed, equal to 45%. Amount forwarded to 1917 was £36,138, inclusive of balance from 1915.

Dividends: paid regularly since organization, ranging from 2s. to 13s. per share. Recent dividends have been as follows: 13s. in 1901, 11s. in 1902, 7s. in 1903, 7s. in 1904, 7s. in 1905, 7s. in 1906, 6s. in 1907, 6s. in 1908, 5s. in 1909, 6s. in 1910, 6s. in 1911, 7s. in 1912, 7s. in 1913, 3s. in 1914, 6s. in 1915, 9s. in 1916; all less income tax. Total to date, £1,453,592, plus return of capital £740,888.

The company has a staff pension fund.

Company was formed to acquire the lease on the San Domingos copper and sulphur mine at Mertola, Portugal, just over the border of Spain, and in the same belt of pyrite deposits as the Rio Tinto, Tharsis and others. The mine had then been worked since 1858.

The report for 1916 shows that 193,127 tons of pyrite was mined, and that the shipments of raw and washed ore were 202,176 tons. No details are given as to the production of copper or as to the nature of the ore mined and shipped.

Lands are held by lease for a 50-year term, ending Oct., 1958. The property originally was opened and worked extensively by the Romans. Development is by several shafts, deepest level being at 300 meters from surface. A mineral zone of about 200' width, and proven length of 2,000', carries lenses of cupriforous pyrite averaging slightly under 1% copper and about 50% sulphur, the principal values being in sulphur rather than in copper. With increasing depth copper values have decreased slowly but steadily.

Ore reserves: were 6,400,000 long tons at the end of 1916.

Ore is leached for copper values on the same general plan as at the Rio Tinto and at end of 1916 there were 480,000 tons in stock containing 1,400 tons of fine copper. Metal from precipitate in 1916 was 906 tons. Sulphur ore is shipped to various works in Europe and America for burning.

The company owns a railway to Pomarao, a tide-water port on the Rio Guadiana, where there is a shipping pier and tugs.

Production: maximum was 8,353,229 lbs. fine copper in 1901, and recent production has been as follows: 6,605,750 lbs. in 1904, 6,088,320 lbs. in 1905, 5,519,360 lbs. in 1906, 5,871,040 lbs. in 1907, 6,186,880 lbs. in 1908, 5,299,840 lbs. in 1909, 6,619,200 lbs. in 1910, 6,545,280 lbs. in 1911, 7,925,120 lbs. in 1912; 202,176 tons ore in 1916.

Apparently the day of the San Domingos has passed as an important copper producer, but the property, which has a long and honorable record of production, is carefully managed and is made to yield good profits from its sulphur ores.

RUSSIA

CAUCASUS COPPER CO.

Office: R. G. Jordan, 81 Palmerston House, London, E.C., England.

Directors: J. Colquhoun, chairman; M. Grancini, Viscount Grimston, E. B. Lockhart.

Inc. Oct. 4, 1900, in England. Cap., £1,000,000; shares £1 par; 513,500 issued. Debentures: £42,620 of 5%.

Property: near Dzansul, Caucasus, southern Russia. In 1912 reserves were estimated at 3,600,000 tons of 3.1% copper ore. In 1914 the Turkish army took possession, but was ejected 5 months later.

The mine has a 1,000-ton mill using flotation. In 1913-14 the yield was about 8,900,000 lbs. copper.

FINNISH-AMERICAN MINING CO.**FINLAND**

Office: Calumet State Bank, Calumet, Mich. **Operating office:** Fennia Bldg., Helsingfors, Finland. **Mine offices:** Kisko, Abo, Finland and Joensuu, Kupio, Finland.

Officers: Dr. Aartavara, pres.; Edw. Ulseth, first vice-pres.; Jacob E. Saari, second vice-pres.; Akseli Rauanheimo, sec.; Chas. O. Jackola, asst. sec.; J. H. Jasberg, treas.; Oscar J. Larson, counsel; preceding officers, John Saari and Chas. J. Wickstrom, directors.

Inc. Dec., 1906, in Minnesota. Cap., \$750,000, shares \$1 par, as successor of Sampo Mining & Development Co.

Property: 4 groups, bought of the Fiskars Aktiebolag, including mineral rights, without royalty, to all ores and minerals except iron ore, for the entire estate of about 90 sq. miles and an additional tract, adjoining the Orijarvi mine, was bought, 1910, from the same company. Property has both water and rail transportation. Is now idle.

The Orijarvi mine, about 50 miles from Helsingfors, which is the principal property, was opened A. D., 1757, and mining was continued without interruption until 1875. The property is popularly credited with an output of \$5,000,000 in copper and silver. The Orijarvi shows slight surface indications of the large orebodies below; these lying in silicious limestone near an intrusive quartz-diorite contact, ore being chalcopyrite, sphalerite and occasional galena, all more or less auriferous and argentiferous, associated with pyrrhotite. The Orijarvi tract is a parallelogram of approximately 2 by 5 miles, and the old mine was opened very peculiarly, by a series of truncated conical caves, with apexes at surface, openings gradually increasing in diameter with depth, there being no drifting. The old workings show stopes up to 60' wide. Diamond-drill borings, with 8 holes, have shown the orebodies to continue beneath the bottom of the old workings. The mine has 9 shafts, deepest 500', with levels at 100' intervals. The old stockpile carried upwards of 30,000 tons of zinc and lead ores discarded from previous operations, but probably of present value, as a zinc smelter could be built at a reasonable cost if shipping were found impracticable. Equipment at the Orijarvi includes a steam plant with a good modern hoist and air compressor.

The Illijarvi mine, 3 sq. miles, bought 1909, adjoins the Orijarvi. The old workings, about one-half mile from the Orijarvi mine, show a well mineralized vein, carrying silicious chalcopyrite, similar to that of the Orijarvi, but with higher gold values.

The Hokka and Kykka mines are included in the mineral claims taken up in 1909 near the Illijarvi. The Hokka mine, carrying a continuation of the Orijarvi orebody, was opened 1850, and has two 125' shafts, developing slightly argentiferous and auriferous chalcopyrite of good average tenor, with quartz gangue. The company has made 650' of new openings on this property. The Kykka shows conditions much similar to the Hokka.

The Brödthorp mine, 4 miles from the Orijarvi, in the parish of Johja, near Skuru, has an area of 20 sq. miles, with mineral rights to the entire

tract, save for iron ore. The Brödthorp, carrying a contact deposit between diorite and quartzite, has a 100' shaft showing complex mixture of copper, lead and zinc sulphides, zinc predominating. The Brödthorp shows numerous ancient pits and trenches, with 1 shaft of about 125' depth.

The Kerkela mine, in the parish of Enare, Finnish Lapland, about 100 miles from a railroad, has a fissure vein carrying free-milling gold ore, of good average assay tenor. The company also has options on iron properties in northern Finland, carrying magnetic ore assaying up to 69.5% iron.

The Orijarvi mine is 10 miles from the state railroad at Turku, but the management plans building a private line, of either 5 or 10 miles, to a seaport, the longer route having a wharf at its terminus. The millsite is on Lake Orijarvi, 5 miles from the Orijarvi mine, and mill is now erected.

About 75 men were employed, at wages of 50 to 80c per day, labor being abundant, good and cheap.

Local prejudice, taking the form of legal obstruction, increased and annoying taxation and innumerable petty interferences has hindered operations, discouraged the company's backers and caused a lack of confidence in the company's ability to carry out its plans. After having spent \$350,000 and demonstrated that the property could be made a success, the company was forced to suspend operations and is now both idle and out of funds.

IRTYSH CORPORATION, LTD.

RUSSIA

Office: J. P. B. Webster, 7 Gracechurch St., London, E.C., England.

Directors: L. Urquhart, chairman; B. G. Brown, A. A. Davidoff, D. P. Mitchell, C. A. R. Scott and Baron V. V. Meller-Zakomelsky. H. H. Knox, cons. engr.

Inc. Nov. 27, 1914, in England. Cap., £2,000,000; shares £1 par. Debentures: £1,000,000—6% authorized, £500,000 issued; bonds £20 and £100 each. This company acquired the whole capital of the two Russian companies, the Ridder Mining and Kirgiz Mining. It was promoted by the Russo-Asiatic Corporation, which see.

Property: the Ridder and other zinc-lead-copper mines in the Altai region, Western Siberia. The company also owns a coal mine producing 75,000 tons yearly.

Development: in March, 1916, reserves were estimated at 945,000 tons assaying 31.2% zinc, 18.1% lead, 1.5% copper, 9.7 oz. silver and 0.47 oz. gold; also 2,229,000 tons of concentrating ore containing 6.7% zinc, 3.5% lead, 0.5% copper, 1.7 oz. silver and 0.7 oz. gold per ton.

Equipment: concentrating mill, of 200,000 ton per annum capacity. power plant, coke plant, zinc distillation plant of 20 blocks of retorts (6 finished), lead smelter, refinery and accessories, 143-mile railway, 8 river steamers with barges.

The ore is mined and treated at the Ridder property, carried 63 miles by rail, 430 miles by river, again 80 miles by rail to the colliery and smelters.

When in full operation this great property will add considerably to the world's metal output.

KYSHTIM CORPORATION, LTD.

RUSSIA

Head office: 7 Gracechurch St., London, E. C., England. Operating office: Nevsky Prospect 1, Petrograd, Russia. Mine office: Kyshtim, Perm, Russia.

Officers: C. J. C. Scott, chairman; L. Urquhart, mng. director; R. G. Brown, V. V. Meller-Zakemelsky, D. P. Mitchell, S. Polak, T. B. Reynolds and A. J. H. Smith, directors; J. P. B. Webster, sec.

Inc. Oct. 29, 1908, in Great Britain, to acquire the entire share capital of the Kyshtim Mining Works, a Russian corporation. Technical officers of this company are P. A. Ivanoff, managing director; R. G. Brown, cons. eng., and F. J. Jones, advisory eng. in Russia. Cap., £1,260,000; shares £1 par; 1,254,240 issued and fully paid. Debentures authorized: £650,000 at 6%, of which £13,300 are outstanding, the balance having been converted or redeemed into fully-paid shares at £2 10s. each.

Dividends: initial dividend paid in Dec., 1912, equal to 5%, total in 1912, 22½%; 25% in 1913, 5% in 1914, 10% in 1915 (paid in Nov., 1916, and calculating on normal rate of exchange for the ruble.)

Balance-sheet for year ended Jan. 13, 1916, submitted Nov. 16, 1916, on account of the war, shows a profit of £111,278, which with previous balance, made available £257,064. After paying dividend of £88,616, and taxes £37,029, the balance for 1916-17 was £136,419. The Kyshtim Mining Works in 1915 had a gross trading profit of 4,397,445 rubles, of which 219,872 rubles was placed to reserve, 1,947,760 rubles to depreciation, leaving 2,229,813 rubles net. Out of this taxes are estimated at 760,000 rubles, and 1,067,623 rubles was reserved for loss in exchange. The war has greatly affected the finances of this great copper producer.

Property: 2,198 sq. miles, or 1,406,700 acres, the mineral lands covering 189,000 acres, the remainder being farm and forest areas, all situated in the Government of Perm, southern Urals, Russia. The copper mines are 36 miles from Kyshtim, connected by company's own line to the Government railroad. The iron mines are of importance, and the timber is used for fuel and mining purposes, also sold to the public.

Principal copper mines are the Amerikansky, Ivanoff, Kaniukoff, Smirnoff and Tissoff. Ore reserves in these are given as 3,148,000 tons, averaging 2.75% copper, an increase of 845,000 for the year.

Geology: as described by A. W. Stickney, the pyritic ore deposits of Kyshtim are compact, dense, massive aggregate of granular pyrite, barite, and quartz, carrying irregular blotches, streaks, and minute grains of chalcopyrite, sphalerite, and tennantite. The evidence indicates that the ore is the result of the metasomatic replacement of alternating bands of a sheared and broken schist by a rather fine-grained, cracked, and broken pyrite, anhedral barite, and quartz. This granular aggregate contained considerable open interstitial space, which was later filled by contemporaneous chalcopyrite, sphalerite, and tennantite. Tennantite probably also marks a slightly-later stage in the primary mineralization, and with it are contemporaneously associated chalcopyrite and quartz of a second generation. The paragenesis of the sulphide minerals is one of decreasing iron and increasing copper content. The orebodies, as viewed in a vertical section, normally show four distinct, roughly horizontal and parallel zones. From the outcrop downward they may be designated as: (1) the gossan zone, which extends from the surface to a maximum depth of 60'; (2) the zone of loose baritic sand, extending from the bottom of the gossan to a maximum depth of 150', the greater part of which lies beneath the level of the ground-water; (3) the loose, leached sulphides, which reach from the bottom of the baritic sand to a maximum depth of 180', where they gradually pass into (4) the underlying, firm, massive, mainly unaltered sulphide ore. Downward enrichment of secondary sulphide does not occur in the form of a shallow, well developed, commercially important, horizontal zone, typical of many other localities, but has taken place to a relatively slight degree along the immediate walls, especially the hanging wall, to the greatest depth yet attained in exploration, which is 600' below the ground-water level.

Equipment: complete mine plants, also smelter at Karavash capable of producing 10,000 tons of copper yearly. There are 3 blast-furnaces of 400-ton capacity each, 1 reverberatory-furnace for fines and flue-dust and a large gas, regenerative-type reverberatory for fine ore. Company has an electrolytic refinery at Kyshtim, where it also treats blister copper from other companies.

Production: 1914, about 16,726,000 lbs. monthly; 1915, 18,229,000 lbs., 1916, 14,780,000 lbs. and in 1917, about 1,000,000 lbs. Gold and silver yield is considerable.

LENA GOLDFIELDS, LTD.

RUSSIA

Head office: 441 Salisbury House, London, E.C., England. Agency: Russian Mining Corporation, Ltd., Nevsky 19, Petrograd, Russia.

Officers: Lord Harris, chairman; A. Wischenegradski, vice-chairman;

with I. H. Amory, F. W. Baker, G. Benenson, L. Hoskyns and A. Poutiloff, directors; H. Richards, sec.; C. W. Purington, cons. eng.

Inc. July 10, 1908, in England. Cap., £1,405,000; shares, £1 par; 1,158,297 issued. Company holds 55.25% of capital of the Lena Gold Mining Co. (Lenskoie), the operating company in Russia. Ruble exchange and share-holdings make the financial situation complicated.

Balance-sheet for year ended Sept. 30, 1916,—presented 9 months later on account of the war,—shows a revenue of £1,050,730, including balance from previous year, £613,872; sale of Lenskoie shares, £245,635; Lenskoie dividend, £50,071; loans and interest, £38,554; and repayment of advances by Lenskoie, £102,598. Expenditure included advances to Lenskoie, £32,877; dividends, etc., £159,651; re-payment on account loan, £37,000; and purchase of Russian 5% Treasury bills, £663,219. This left a cash balance of £157,983.

Dividends: were 20% in 1909-10, 30% in 1910-11, 20% in 1911-12, nil in 1912-13, 5% in 1913-14, 1½ rubles per share in 1914-15, paid in April, 1916.

Gross profit of the Lenskoie company in 1915-16 was £954,191. Of this a 12% dividend absorbed £209,524.

Property: gold placers worked since 1863, yielding over \$100,000,000. Four groups totaling 62,476 acres in Irkutsk province of Siberia.

Development: for many years operations were on somewhat primitive lines, but modern methods are gradually being introduced, including prospecting by drilling, underground drift mining, hydraulicking, dredging, and winter washing of gravel; also improved sluices, riffles, jigs and clean-up accessories. There are 7,000 men and 800 horses employed, which great number the engineers are trying to reduce considerably.

Ore reserves are enormous. Drifting material is estimated at 1,395,412 cu. yd., with over 7,000,000 cu. yd. possible; and dredging material 48,520,000 cu. yd., plus 275,000,000 cu. yd. possible. The drift ground averages \$8.60 per yd.; the dredging ground 37c.

Production: in 1915-16, there was washed 788,942 cu. yd. of gravel, yielding £1,503,736; of this 753,240 cu. yd. yielded \$9.56 per yd. Cost is about \$3 per yd., but owing to unsettled conditions, nothing definite is given. Costs are decreasing through improved methods.

Is an immense project, with a long life and is in a transition stage from primitive to modern methods of extraction and treatment. Engineers find themselves handicapped by old prejudices, complex finance, indifferent labor, severe winter climate and distance from sources of supplies; yet management is gradually overcoming these obstacles. Alaskan methods should be applicable in Siberia, and these are being tried, especially as gravel yields up to \$9 per yd.

ORSK GOLDFIELDS, LTD.

RUSSIA

Office: 65 Broad St. Ave., London, E. C., England. Thos. Mallinson, sec.

Directors: G. W. W. Mackinnon, A. C. Abrahams, Edw. Hooper, Wm. Goldie and J. C. Williamson. G. L. Nelson, gen. mgr. Hooper, Speak & Co., cons. engr.

Total income for year ending Jan., 1916, was £105,611; expenditures, £51,323 in Siberia; London expenses, int., depreciation, etc., £24,460; net profit, £26,944.

Dividends: two paid in 1916, totaling £16,827.

Operates two gold dredges in Siberia. Treated 784,552 cu. yds. of gravel from May-Dec., 1915, yielding 975,913 rubles, of which 195,536 rubles came from leasers' work.

RUSSIAN MINING CORPORATION, LTD.

RUSSIA

Office: Henry Richards, sec., 441 Salisbury House, London, E. C., England.

Directors: F. W. Baker, H. D. Boyle, A. B. Haig, Walter McDermott, Baron A. de Gunzburg. Advisory engineer in Russia, A. Gernet; J. P. Hutchins, cons. engr.

Inc. Jan 6. 1911 in England. Cap. £250,000; shares £1 par; 245,250 issued.

Property: two mining concessions in the Altai region of western Siberia, the Zmeinogorsk of 12,292 sq. miles and the Zyrianovsk of 21,195 sq. miles. Minerals have been mined here from early times and records show an output of 45,550,000 oz. silver, 30,000 tons of copper and 500,000 tons of lead up to 1866. The Zmeinogorsk mines produced silver and lead with some copper; records placing the yield at 30,000,000 oz. silver and considerable lead up to 1855. The copper district yielded 25,500 tons of copper, 7,000 tons of lead and 3,100,000 oz. silver. The Zyrianovsk property has a series of lenses of complex ores; those developed, are estimated to contain 500,000 tons, assaying 23% zinc, 11% lead, 2.6% copper, 19 oz. silver and 0.35 oz. gold per ton. The war has greatly hindered exploration, but the Byelousovsk copper mine on the Zmeinogorsk concession promises well, drilling showing 3 to 6.7% copper ore for 20' in width. To develop the Zyrianovsk, a Russian company will be organized as soon as possible. Transportation is much easier than in other mining regions of Siberia.

RUSO-ASIATIC CORPORATION, LTD.

RUSSIA

Office: J. P. B. Webster, 7 Gracechurch St., London, E.C., England.

Is an exploration company acquiring and developing mining properties in Russia. In 1914 it formed the Irtysh Corporation, Ltd. (which see), to operate the Ridder Concession and Ekibastus coal field.

SISSERT COMPANY, LTD., THE

RUSSIA

Office: 1 Broad Street Place, London, E.C., England.

Officers: J. B. Dale (chairman), W. Selkirk, C. Benenson, H. Guedalla, A. Kiaer, directors. N. C. Stines, resident eng.; E. J. Carlyle, metallurgical eng.

Inc. June 26, 1912. **Cap.**, £1,000,000; shares £1 par; issued 755,000 shares, fully paid. Paid a dividend of 5% in 1913 and 1914. Shares are listed on the London Stock Exchange. An option expiring two years after peace, on 166,000 shares treasury stock has been granted. Title to property is held through the Sissert Mining District Co., Ltd., registered in Russia, which the company controls through ownership of entire share capital.

Property: about 340,000 acres, held under a perpetual lease, in the Urals, 30 miles S. of Ekaterinburg, on the Ekaterinburg-Cheliabinsk railway. The property includes many old copper, gold, and iron mines, and extensive forests, the principal copper properties being Degtiarsky, also the Poleskoy and Gumeshevsky mines, which have been worked since 1727, and the Sysselsky, opened in 1906. There are also about 100 iron mines, yielding limonite ore of 40 to 53% iron content, with other mines yielding chrome and manganese. Iron ore reserves are estimated at 6,000,000 tons. The annual output of iron ore is 40,000 tons.

Development: the Sysselsky copper mine is opened by 3 shafts, deepest 245', showing ore of about 5% copper tenor. Mine has a plant with a productive capacity of 1,500 tons per annum, making its copper at a cost of about 10c per lb. Ore reserves are estimated at 70,000 tons of 4¼% ore.

The Gumeshevsky and Polefskoy mines, discovered in 1716, have been operated almost continuously since 1727. These mines are about 500' deep, and up to 1870 produced a total of about 63,500,000 lbs. fine copper, though only oxidized ore was mined. The orebody is a contact deposit, genetically related to augitic rocks, and lying between limestone and augitic biotite syenites, the oxidized are occurring in a decomposed irony and calcareous clay belt, fully 2 miles in length and about 1,000' wide. The sulphide ores carry chalcopyrite in lenses of garnet-magnetite rock. The old ore dumps at the Gumeshevsky, consisting of clay material with fine ore that escaped hand-picking in earlier operations, are now being worked with excellent results. They still contain 500,000 tons. The ore is leached at the rate of 80,000 tons yearly.

Old slag dumps at Polefskoy are also to be reworked. These dumps, estimated at 640,000 tons, are said to contain 1% copper, about 75% of which is thought to be recoverable by pyritic smelting.

Fifty drill holes at the Degtiarsky mine showed 3,530,000 tons of 2.77% copper ore, with 3s. (72c) gold and silver. The orebody is about 10,000' long, 5,800' being fully proved. Over 5,000,000 tons is ultimately expected. Two shafts to 150', with laterals, confirm drilling results.

At the Staro Poldnefskoy and Kadnakofsky iron mines the surface is a true gossan and the underlying sulphide is certain to be copper bearing and of commercial value.

In the Krilatofsky mine, 6 miles from the Degtiarsky, are gold quartz veins in granitic schist. Reserves to 280' are estimated at 371,000 tons of 13s. 3d. (\$3.18), and 227,000 tons of 10s. 6d. (\$2.52) per ton ore. In the Blagoveshensky, near Sissert, is considerable 20s. (\$4.80) gold ore. These ores will be used as a flux, in reducing the copper ores.

The Degtiarsky and Susselsky mines also contain several million tons of iron pyrite.

From the Bgorshinsky and Isyhks mines a large quantity of coal is available.

Production: 40,000 tons of iron ore, 17,500 tons of pig iron, 10,000 tons of pyrite and some coal.

SPASSKY COPPER MINE, LTD.

SIBERIA

Office: J. A. Clark, mgr. and sec., 60 London Wall, London, E.C., England.

Directors: A. Fell, chairman; Ernest Carnot, v. c., J. B. Depelley, F. H. Hamilton, E. W. Parker and F. G. C. E. Robellaz. H. C. Bayldon, gen. mgr., at Spassky Zavod, Akmolinsk, Siberia; C. J. Hall, smelter supt.; C. Farmer, mine supt. of Spassky; J. R. Horsley, mgr. at Atbasar; E. T. McCarthy, cons. eng. Henry Puzly, mgr., Miasnitzzokaia 17, Moscow, Russia.

Inc. July 9, 1904, in Great Britain. **Cap.**, £1,250,000; shares £1 par; 978,940 issued.

Statement for 1915, published Nov., 1916, showed a net profit of £126,453 earned in Siberia. This, and the previous balance is being used in the business. The remittance of funds from Russia is not permitted, so money will accumulate there. The rate of exchange is very unfavorable, £15 in Moscow realizing only £10 in London. These conditions will probably remain so until after the war. Assets included cash, £162,316; supplies, £159,256; and metals, etc., £163,039. Creditors, etc., amounted to £100,202.

Dividends: 15% in 1910, 17½% in 1911, 25% in 1912, 10% in 1914, declared in Oct., 1915. Further dividends postponed on account of the war.

Property: in the Kirghiz Steppes, in 2 main groups, about 300 miles apart, 250 and 500 miles, respectively, from the nearest point on the Trans-Siberian railway. After the war the government is to construct a line that will pass near the mines.

The Spassky group, comprising about 100 sq. miles, in the Akmolinsk district, includes the Yuspenssky copper mine and the Karagandy and Saran coal mines; also lands carrying iron and limestone.

Geology: the Yuspenssky mine has a network of veins at and near the contact of slate and arcose sandstone, in sedimentaries, of Permian age. The 2 main veins, known as the Annensky and Vladimir, or Yuspenssky, are about 200' apart and substantially parallel, and it is thought they may join at depth. Principal development is on the Annensky vein, which is 10 to 60' in width, carrying a hanging-wall paystreak of massive chalcocite, succeeded by bornite, largely massive, with silicious gangue, followed by small quantities of chalcopyrite and occasional tetrahedrite, the vein growing gradually leaner in copper toward the footwall, which is imperfectly defined and carries low-grade copper impregnations. The gangue is mainly quartz and barite, and the ore is estimated by the company to average 13 to 20% copper. The upper workings show some native copper, cuprite, azurite and malachite. The mine was gouged for rich ore by the former owners, who left a large amount of low-grade material unstopped.

Development: the Yuspensky mine is opened by 3 shafts, the Anesky being 700' deep. Chalcopyrite is taking the place of bornite in the enrichment zone, while the mineral contents are becoming more evenly distributed. Reserves at the end of 1915 were 10,000 tons of 19% and 429,475 tons of 7.8% ore. Considerable diamond drilling was done in 1915 and 1916, with fair results.

Equipment: includes 900-h. p. steam plant, hoists, compressors, pumps, 150-ton concentrator and smelter, 26-mile railway and quarters for employes. During 1915-16 heavy supplies were transported by a portable 10-mile line, which is relaid in front of the train.

The Karagandy coal mine, 24 miles from the Spassky smelter, is developing well and produced 90,215 tons in 1913, 80,901 in 1914 and 63,984 in 1915.

The Atbasar group, 28½ sq. miles, 250 miles N. E. of Djousalie, the nearest station on the Orenburg-Tashkent railway, includes the Kresto, Pokrofsky, Annensky and Nadiozhdenski mines, and a coal area of about 9 sq. miles, 65 miles from the mines.

Geology: the Atbasar shows sedimentary sandstones, shales and conglomerates, on a plateau of about 20 sq. miles, lying about 70' above the level of the district, carrying numerous outcrops of malachite, and at depths of 50 to 70' from surface, are found sandstone beds mainly 18" to 8' thick and of 3' estimated average thickness, carrying bornite, claimed to average about 13% copper.

Development: work at Atbasar is under way and reserves were estimated at 543,900 tons of 10.7% ore.

Equipment: includes new mining machinery, buildings and smelter of 6,500-ton capacity of copper per annum, this being erected between the coal and copper mines.

Production at Spassky:

Year	Ore, tons	Copper, pounds
1906		1,865,690
1907		3,552,570
1908		3,838,235
1909	15,551	3,675,840
1910	19,647	5,540,160
1911	31,302	6,401,920
1912	28,315	8,955,520
1913 (15 months)	43,591	14,000,000
1914	20,697	10,490,000
1915	20,847	7,728,000

VERK ISETZ CORPORATION

RUSSIA

Address: Kalata, Ural district, Russia.

Property: the Kalata mines, 145 miles N. of Kyshtim, eastern Urals, Russia, opened early in the last century mainly for pyrite for acid manufacturing.

Geology: copper-bearing schists similar to those worked by the Kyshtim and Sissert companies. Ore is a heavy sulphide, with bonds of magnetite in the pyrite. Silica content is only 2% other minerals being 2.3% copper, 43.5% iron and 50% sulphur.

Development: on the 406', 455' and 560' levels the main shoot is 360' long and 84' wide, yielding 3,000 tons of ore per foot of vertical depth. This ore is nearly solid pyrite. Timbering must be done soon after extracting ore. Slag is used for filling stopes. The deepest of the 3 shafts is 770'. Mining in 1915 cost \$1.80 per ton.

Equipment: electric hoist with ¾ ton skips, coarse crushing plant, compressors and smelter designed by F. W. Draper. The latter consists of two blast-furnaces, 287" by 56", producing a 12.5 to 13.5% copper matte, two 12' Great Falls type converters, turbo-blowers, refinery and 3,000 kw. power plant. In 1915 there was reduced 169,760 tons of charge, equal to 530 long tons daily. Fuel consumption was 1.66% of the charge, or 2.49% of the ore, practically pyrite smelting. Slags contained 0.33% copper.

SPAIN

ARAMO COPPER MINES, LTD.

Office: 2 Metal Exchange Bldg., London, E. C., England. **Mine office:** Pola de Lena, Asturias, Spain.

Officers: A. van Straalen, E. R. Merton, H. Gardner and L. Corvilain, directors; C. W. Aston Key, sec.

Inc. July 3, 1897, in Great Britain. **Cap.**, £40,000, shares £10 par.

Property: the Aramo copper and cobalt mine, bought for £20,000 in full-paid shares. No accounts are made public. Idle some years owing to litigation terminated in 1914 in company's favor. Resumption of operations since then, delayed by European war.

CALA; SOCIEDAD ANONIMA MINAS DE**SPAIN**

Office: Estacion S. 2d, Bilbao, Spain. **Mine office:** Cala, Santa Olalla, Huelva, Spain.

Officers: Don Enrique Areilza, pres.; Don Jose del Castano, Bilbao. v. p.; Don Ernesto Bengoa, sec.; Don Juan de Areito, managing director.

Inc. Aug. 31, 1900, in Spain. **Cap.**, 15,000,000 pesetas shares (acciones) and 7,000,000 obligaciones.

Accounts for 1916, show a current balance of 143,240 pesetas and expenditures of 175,573 pesetas for construction account; 185,540 pts. for interest on bonds; 98,198 pts. for interest on accounts and 50,000 pts. loaned to Coto Teular Co., leaving a balance of 30,050 pts. Total expenditures to date amount to 5,803,317 pts., for mine account, and 14,914,332 pts. for railway account. Total for all accounts, 31,153,638 pts.

Property: a group of 8 mines, 345 hectares, at Cala, near de Pena and Rio Tinto mines, carrying extensive bodies of magnetic iron ore and cupriferos pyrite. Company owns and operates a 97-kilometer railroad from the mines to San Juan del Aznalfarache, on the Guadalquivir river, in the adjoining province of Sevilla. The mill and reduction works were installed in 1917.

Production: for 1916 was 23,973 tons of ore. Shipments were 12,669 tons crude ore; 7,346 tons calcined ore, 1,010 copper mineral, the total value being 286,536 pesetas.

CAMPANARIO; SOCIÉTÉ DES MINES DE CUIVRE DE**SPAIN**

Address: Anatole Olivier, sec., 5 Rue du Helder, Paris, France. **Mine office:** Valverde del Camino, Huelva, Spain. Baron A. de Dietrich, chairman; Charles Chalupt, T. H. Bustos, Max Lyon and Jules Strap, directors; Arthur Marshall, gen. mgr.

Inc. Dec. 20, 1906, in France. **Cap.**, f5,000,000; shares f500 par.

Property: seven hundred hectares, including 6 old mines, and actually having about 250,000 tons of cupriferos pyrite in sight.

Equipment: includes an elaborate and extensive surface plant.

Production: about 40,000 tons of pyrites annually, ore being first treated by lixiviation and cementation to recover its copper content and residue sold for its sulphur.

CASTILLO DE LAS GUARDAS; SOC. ESPANOLA DEL**SPAIN**

Office: Apartade 12, San Sebastian, Spain. **Mine office:** Castillo de las Guardas, Sevilla, Spain.

Officers: Edmond Delage, chairman; Julie Astoreca, sec.; Enrique Largillier, managing director, with Louis de Beauce, Georges Therel, Henri Mayeussier, Henri Th. Cury, Henri J. Lesage, Leon Luzeret, Alejandro Gandarias, Juna de Santisteban, Agustin Yza, Fernando Merino, Manuel Fernandez Balbuena, directors. Francisco Zarraga, manager; Manuel Fernandez Balbuena, engr.

Inc. July 12, 1901, in Spain. **Cap.**, 7,500,000 pesetas, increased later to 10,000,000 pesetas; shares 500 pesetas par; issued 9,000,000 pesetas. Annual meeting in March.

Property: 240 hectares, 23 kilometers from Zalamea la Real, having a 15½ kilometer private railway, known as the Ferrocarril de Minas Castillo

y Empalme Ronquillo, connecting at Estacion Ronquillo with the Ferrocarril Sevilla y Cala.

Mine shows granite-porphry and diabase, carrying 5 orebodies, one of which under development, has a lens of 40 meters width and 220 meters length; proven for depth of 165 meters, carrying cupriferous pyrite averaging about 1.5% copper, 0.5% lead, 0.13% zinc and occasionally up to 2 oz. silver and 4 grams gold per metric ton. Mine was discovered 1843, and worked in a small way, until taken over by the present company, 1901.

Development: by the following shafts: Menesses, 142 meters; Don Pablo, 142 meters; Malacate, 100 meters; Colorado, 110 meters; Dos de Mayo, 40 meters; Remedies, 42 meters.

Equipment: includes a 683-h. p. steam and electric plant, with two 200-h. p. hoists, good for 140 meters each, 250-h. p. air compressor.

The company owns 353 buildings, with stone shops, also maintains separate schools for boys and girls, a hospital for workmen and their families, and a town hall.

CORDOBA COPPER CO., LTD.

SPAIN

Office: 56 Queen Place, London, E. C., England. **Mine office:** Estación de Cerro Muriano, Sevilla, Spain.

Officers: Edgar Taylor, chairman; Hugh F. Marriatt, Lieut. Col. C. H. Villiers, Lord Vaux of Harrowden, Richard E. Carr, J. E. Champney, directors; F. H. Williams, sec.; John Taylor & Sons, mgrs.; J. Hocking, mine supt.

Inc. Aug. 5, 1908, in Great Britain. **Cap.**, £200,000; shares 5s par; all issued, and fully paid. Company is a consolidation of the Cerro Muriano Mines, Ltd., and North Cerro Muriano Copper Mines, Ltd.

For year ending Dec. 31, 1911, profits were £14,899; for 1912, £39,405; 1913, £83,321; 1914, a loss of £4,203; in 1915 profits were £10,077; and in 1916, £45,665.

Dividends: in 1912, 20%; in 1913, 20%; in 1914 and 1915, nil; in 1916, 10%.

Balance sheets for 1916 shows: total assets of £259,266, including £68,700, cash, war loans, treasury bills, etc.; total liabilities showed profit and loss, £27,789; reserve account, £20,000 and current liabilities of £11,476. Revenue account gave £208,549 as the total, which included £203,398 for sales of blister copper, £365 for lead ore sales, and £807 copper on hand.

Property: 469 hectares, 10 miles northeast of Cordoba, in the south of Spain, held under perpetual lease from the crown. Property is reached by the Andalusian railway. Mines show old workings, dating from the Roman era, extending to a depth of 400', notwithstanding a heavy flow of water. There are 6 large and several small veins in mica-schist, diorite and quartzite, carrying chalcopyrite and pyrite, with gangue of calcite, quartz and country rock, the ground being soft, requiring the filling of stopes with waste. Veins are reported to have widths of 12' to 40', with proven lengths as follows: Calavera, 1,635'; Excelsior, 635'; Lorenzo, 4,575'; Isabel, 5,550'; Cerro Muriano, 8,500'. Some ore taken from the old Roman workings assayed 28 to 34% copper.

Development: by four main shafts—The Santa Victoria, bottomed in the footwall at 726'; the San Rafael, 1,571'; the San Arturo, 1,115'; the Esperanza, 201'; the Eastern, 1,539'; the Excelsior, 850'; the Lorenzo, 869', and the Isabel, 620'. Development work for year 1916 totaled 6,821', including 260' of shaft sinking. The San Rafael shaft, 300 meters from the Santa Victoria, shows a vein of 5 to 13 meters width with the better portions worked out by the Romans. Ore reserves were estimated, Dec. 31, 1916, at 142,914 long tons, averaging 2.39% copper. Development work at the mine was considerably retarded by the amount of water in the mine due to unusually heavy rains, 290,755 tons of water having been baled besides that raised by the pumps.

About half of the product is treated by the mill and half by the smelter. The mill has 6 units of the Murex magnetic separation process which treat the re-crushed jig middlings, other flotation processes being unsuitable

owing to the presence of calcite. In 1916 Murex plant treated 14,599 tons of re-ground jig middlings and tailings, averaging 1.34% copper and produced 1,374 tons concentrates, averaging 10.6% copper, with a 74% recovery.

The smelter includes a calcining plant and a converter plant. The blast furnace blown in Aug., 1908, is in blast only alternate months, its capacity being double that of the mine. The smelter treated 35,165 tons, which included 8,220 tons of picked ore and concentrates, 9,360 tons of sintered ore, 1,625 tons of briquetted ore, and 31 tons of purchased ore the rest being flux. Produced 3,675 tons of 46.4% matte, in 1916, that gave 1,746 tons of blister copper.

Production: in 1916 the mine output was 95,947 tons of 2.18% copper content. After sorting, 84,800 tons of 2.47% copper content were treated in the milling, concentrating and smelting works. The concentrator treated 48,727 tons of 1.57% ore, which yielded 4,798 tons of 9% concentrates, and 14,599 tons of middlings assaying 1.34% copper. The recovery for the Murex and concentrating plants was 75% as compared with 70.7% of a year ago.

Production, in 1916, was 1,746 tons of blister copper. Reserves are estimated at 142,914 tons of 2.39% copper ore. Present production about 300,000 lbs. copper a month. This property is one of the largest and most interesting of the old Hispana-Roman mines and was famous before the Christian era for the high quality of copper and brass produced from its ore, but was entirely idle for 2,000 years, until reopened, 1903, by the predecessors of the present company.

ESPERANZA COPPER & SULPHUR CO., LTD.

SPAIN

Office: 65 London Wall, London, E. C., England. Mine office: Zalamea La Real, Huelva, Spain.

Officers: T. D. Lawther, sec. and managing director; Alex. McNab, G. Mure Ritchie, chairman; preceding are directors.

Inc. Feb. 14, 1906, in Great Britain, as successor of Spanish Minerals Development Co., Ltd. Cap., £350,000; shares £1 par; fully issued, fully paid.

Net earnings were £27,553 in 1908; £19,961 in 1909; £14,754 in 1910; £29,562 in 1911; £32,730 in 1912; £14,647 in 1913; £8,412 in 1914; £23,499 in 1915; £50,277 in 1916.

Dividends: 5% in 1908; 5% in 1909; 2% in 1910; 3% in 1911; 5% in 1912; 10% in 1916.

Property: the Esperanza group, 1,833 acres, including 833 acres of mining rights, 55 miles from the port of Huelva. Holdings include the Esperanza, Nueva Esperanza, Angostura, Forzosa and Santo Tomás mines. Some of these properties were worked in very ancient times, mainly on a small scale, showing characteristic narrow Roman shafts, with foot holes alternately, on either side, for ingress and egress of miners.

The Angostura mine had 231,000 tons ore reserves, Jan., 1917.

The Esperanza and Forzosa mines had 507,000 tons ore reserves, Jan. 1917.

Neuva Esperanza yielded 1,029 tons in 1912, 107 in 1913, and 534 in 1914. Development of Neuva Esperanza, San Daniel, and Forzosa properties by diamond drilling, shaft sinking and crosscutting, is in progress without definite results reported to January, 1917.

Total ore reserves at end of 1916 estimated at 738,000 tons.

Equipment: includes two leaching plants dealing with mine liquors, making 98 tons of copper in 1913; 82 tons in 1914; 135 in 1915, and 125 in 1916.

Company has a private narrow-gauge electric line connecting with the Buitron railroad. The power plant consists of 4 Premier gas engine units each with a suitable gas producer plant, with electric generators, the plant giving economical and satisfactory service.

Production: begun July, 1906, has been as follows: 20,421 long tons ore in 1906; 54,276 tons in 1907; 87,894 tons in 1908; 103,140 tons in 1909; 112,143 tons in 1910; 108,650 tons in 1911; 97,681 tons in 1912; 95,897 tons in 1913; 111,457 tons in 1914; 86,288 tons in 1915, and 108,725 tons in 1916.

Company produces no metallic copper directly from its ore, but the copper contents of the pyrite shipped amounts to about 23,000,000 lbs. yearly.

Property considered excellent, management good and dividends assured for years to come. War prices have doubled the company's profits despite greatly increased costs.

HUELVA COPPER & SULPHUR MINES, LTD.

SPAIN

Office: C. Forbes, sec., 6 Old Jewry, London, E.C., England. French office: 31 Rue Lafayette, Paris, France. Mine office: Almonaster, Huelva, Spain.

Directors: P. Lyttleton Gell, chairman; H. Gaillochet, v. c.; G. Dyckhoff, E. Chopy, P. E. de Caplane, G. Chanlaire, J. Roux-Brahic, H. Bon-donneau and Comte C. de Leusse; L. Delafosse, mgr.; H. F. Collins, cons. engr.

Inc. Oct. 28, 1903, in Great Britain. Cap., £400,000; increased 1907 to £600,000, but reduced again in July, 1912, to £420,000; 279,139 shares issued and fully paid. Company is a reconstruction of the Huelva Central Copper Mining Co., Ltd.

Revenue from ore and metal in 1915-16 was £177,692, of which £2,130 was profit, after writing off £26,000 for depreciation and £9,491 for development.

No dividends have been paid since Oct., 1907, when 5% was distributed.

Property: the Cueva de la Mora and Monte Romero mines, comprising 246 hectares (507 acres) and other properties of 650 hectares, lying between the Rio Tinto and Tharsis properties, Huelva, Spain. The total area in 1916 was 3,400 hectares. Lands are favorably located and are traversed by the Olivargas and Juliana rivers. The company is reforesting its lands with pine and eucalyptus.

The Monte Romero is the principal mine, and the Corta San Alberto and Angelita mines have reserves of smelting and sulphur ores, but need development. The Corta ore is low-grade, but in large deposits and the mine is estimated to contain 5,000,000 long tons of cupriferos pyrite, averaging 1.7% copper. The San Alberto mine, opened by shaft, has produced a little ore of good average grade. The Monte Romero carries ore of 1 to 5% copper tenor, but some of the ore is higher in zinc. Mine has a full equipment, including a haulage plant and large ore bunkers. Ore reserves at June 30, 1916, were placed at 63,000 tons; also 305,271 tons of 0.7% ore on the cementation heaps. A new pyrite smelter commenced work in March, 1914.

The company has built a complete town for its workmen, numbering about 1,200 men, the town having a normal population of about 5,000. The company's buildings include schools and hospitals, with necessary mine structures. Transportation is by a 13-kilometer railway, connecting with the Zafray y Huelva line.

Production: was 5,563 tons of cupriferos pyrite in 1905; 20,523 tons in 1906; 34,905 tons in 1907; 48,511 tons of ore and 67 tons of cement copper in 1908. Production of fine copper is estimated at 175,000 lbs. in 1905; 600,000 lbs. in 1906; 1,000,000 lbs. in 1907; 1,350,000 lbs. in 1908; 25,000 tons of 5% ore shipped and 45,000 tons sent to cementation plant in 1909; and in 1915-16, 61,730 tons smelted yielded 3,828,160 lbs. of copper.

PENA COPPER MINES, LTD.

SPAIN

Sec. and office: Ernest Johnston, 293/7 Salisbury House, London, E. C., Eng. Mines office: Nerva, Huelva, Spain.

Directors: C. C. D'Anvers, chairman; M. Paisant, A. Harter, C. A. Massaouti, R. G. Levy, E. Porges and Horace Barrett.

Henrique Schreck, gen. mgr., Peña Mines, Huelva, Spain.

Inc. Sept. 19, 1900, in Great Britain. Cap., £750,000; shares £1 par; £537,600 issued.

Dividends: 1903, 5%; 1904, 5%; 1905, 4%; 1906, 7½%; 1907-1914, nil; 1915, 6%; 1916, 6%; 1917, 7½%.

The accounts for 1916 show a net profit of £64,933, out of which £31,248 was paid as dividend. The remainder was added to the balance in hand, which now stands at £59,837.

Company was formed in London in 1900 to acquire a copper and sulphur mine in the south of Spain that had, for two or three years previously, been worked by a Belgian company. Small dividends were paid from 1903 to 1906, but subsequently condition became less favorable. About six years ago the contract with the Rio Tinto company in connection with railway transport to the coast was terminated, and an independent branch railway to the mine was constructed. During the period of building, deliveries of ore were suspended. The railway was opened in 1914, and since that time the position of the company has steadily improved. Report for 1916 shows that 161,283 tons of ore was raised, as compared with 122,120 tons in 1915; of this amount 53,729 tons was added to the leaching floors, and 107,554 tons was placed for export. The deliveries during the year were 30,766 tons of cupreous ore, 87,527 tons of non-cupreous ore, and 112,145 tons of washed ore. The yield of copper precipitate contained 598 tons of fine copper.

Property: 1,724 acres, the Pena del Hierro group of 17 old mines, 2 miles N. E. of the Rio Tinto mine. Ore extraction is by open quarry work, the over-burden being stripped.

Production:

Year.	Tons. mined.	Ore shipped, tons.	Copper recov'd, tons.	Ore on dumps, tons.
1910	132,559	144,810	1,017	529,938
1911	131,367	124,323	1,004	500,714
1912	84,698	80,844	793	511,704
1913	68,759	5,734	703	580,802
1914	58,832	31,028	597	613,645
1915	122,120	140,616	607	589,956

RIO TINTO CO., LTD.

Secretary and offices: J. Gordon Macleod, 3 Lombard St., London, E.C. England. **Mine,** at Rio Tinto, Huelva, Spain. **Works office:** Port Talbot, South Wales.

Officers: Chas. Wm. Fielding, chairman; Rt. Hon. Earl of Denbigh, and John M. Macdonald, directors; Turquand, Youngs & Co., auditors; Walter J. Browning, mine mgr.

Inc. March 29, 1873, in Great Britain. **Cap.,** £3,500,000; increased, November, 1905, from £3,250,000, shares £5 par, in £1,625,000 cumulative 5% preference shares and £1,875,000 ordinary shares, fully issued and paid. The new issue of 50,000 ordinary shares, par £5, was sold to shareholders at £63 per share, netting the company £3,150,000, for the redemption of an outstanding bond issue of £2,989,740, at 4%, which was fully retired. Transfer form, common; fee, 2s. 6d.; warrants to bearer are issued in denominations of 1, 5, 10 and 25 shares, fee 1s. per warrant, fee for conversion into registered shares, 2s. 6d. per certificate. Stock Exchange settlement; all shares quoted in the official list. Fiscal year ends with the calendar year; accounts are issued in April, and an interim semi-yearly report is issued in October. Dividends are payable in Paris by the Société Générale, 29 Boulevard Haussmann.

Accounts for 1916 showed a gross profit on sales of £2,198,092, compared with £1,292,260 in 1915, and a net profit of £2,145,830. Balance forward, after paying £1,862,500 in dividends, was £283,330.

Dividends: were begun 1879, and have been paid continuously, varying greatly, according to net earnings. Dividends on the old ordinary shares, of £10 par, 1879 to 1896, ranged from 6s. in 1886 to 38s. in 1896. On the present ordinary shares of £5 par, dividends have ranged from 40% in 1897 to 110% in 1906. Dividends were small at first, because the company was seriously handicapped by 3 different sets of mortgage bonds, bearing 5% interest. In 1895 the mortgage debt was consolidated into a single issue of £3,600,000 first mortgage debentures, bearing 4% interest, with a sinking

fund and semi-annual redemption, which would have extinguished the mortgage in 1919, but, by the issue of new share capital November, 1905, floated at the tremendous premium of 1,160%, the company placed itself in an impregnable financial position, the credit for this able stroke of finance having been due mainly to Mr. Fielding. Recent dividends on ordinary shares have been as follows: £3 12s. 6d., or 72½%, for 1901; £2 10s., or 50%, for 1902; £3 10s., or 70%, for 1903; £3 10s., or 70%, for 1904; £4, or 80%, for 1905; £5 10s., or 110%, for 1906; £4 7s. 6d., or 87½%, for 1907; £2 15s., or 55%, for 1908; £3, or 60%, for 1909, with an interim dividend of £2 10s. for 1910; £2 12s. 6d., for 1911; £4 10s. in 1912; £3 15s. in 1913; £1 15s. in 1914; £2 15s. in 1915; £4 15s. for ordinary and 5s. for preferred in 1916; and £2 5s. in 1917 to June. The company has a reserve fund of £500,000, of which £400,000 are invested in consols and £100,000 are in choice selected shares.

Property: 16,000 acres, freehold, of which 4,710 acres were secured from the Spanish Government. Mining operations are conducted in an area of practically 5 sq. miles.

Statement for 1916 shows assets totaling £6,520,537, represented by equipment, £2,977,527; ore in process, £1,150,004; stores in Spain, £498,132; sundry trade debtors, £594,195; staff provident fund, £148,304; war loan, £337,586; and cash, £781,637.

History: Rio Tinto is the Methuselah of all known mines. The first semi-authentic account of the mines dates from the eleventh century before Christ, when the Phœnicians traded in copper made from its ores. Carthage, that vigorous young offspring of Tyre, succeeded to the hegemony of the Iberian mines, and worked the Rio Tinto mines extensively for several centuries, being displaced, in turn, by the Romans, after the repulse of the second Punic invasion, and the total overthrow of the Carthaginian power. The Rio Tinto was worked by the Romans for centuries upon a very considerable scale, and after the decadence of the Roman power the mines were operated in a very crude way by the Goths. Again the fortunes of war gave the Iberian peninsula to new masters and the Moors in turn were owners and operators of this great copper deposit. Following the expulsion of the Moors from southern Spain by Ferdinand and Isabella the mines fell into the hands of the Spanish and were reopened by them very early in the sixteenth century. The Spaniards, while among the world's best miners, and the pioneers of silver and gold mining in both North and South America, never paid close attention to copper or iron, and, even at home the Rio Tinto, although the property of the Spanish Crown, was worked, during its most successful periods, by foreigners, as it is to this day.

In the seventeenth century the mine became a considerable producer, under the management of a Swedish engineer named Wolters, and after his death did fairly well under the direction of a French metallurgist named Tiquet. In the eighteenth century the mine was leased from the crown by a company of English adventurers, of whom the leading spirit was Lady Maria Theresa Herbert. During the chaotic period of the French invasion, early in the nineteenth century, the mine was abandoned, and, after being reopened, 1812, by the Spanish Crown, was worked in a small way only. For the next 60 years the mine was under the management of various lessees, until sold outright in 1873 to Matheson & Co., of London, for 92,800,000 pesetas, that firm organizing the present company, which has proven one of the most profitable mining corporations in existence.

The relics of the mining and smelting operations of the ancients are large, numerous and remarkable. The late Don Gonzalo Tarin, who was consulting engineer of the company and was closely connected with the mine for 40 years, beginning 1867, in his very able work, "Memorias," estimated the quantity of scoria remaining from ancient smelting operations, whether Roman or Phœnician, or both, at no less than thirty million metric tons, and his acquaintance with the property and its history and his opportunities of estimating and verifying these figures were perhaps better than those of any other man. Lying above slag piles left by the Phœnicians is a

10' bed of alluvium, on top of which are the Carthago-Roman slags. The smelting practice of the Romans apparently was very good, the slags left by them being as clean as those produced to-day. It is possible, however, that some of the copper left in the old slags has been leached out, during some 2,000 years of partial exposure to the elements, but it is the opinion of Señor Tarín that the slags were resmelted, in which case the latest modern metallurgical practice is but a repetition of the methods employed around the beginning of the Christian era.

The only remains of ancient mining tools and machinery that have been found at the Rio Tinto are 3 oak water-wheels, an oak ladder and some oak pitwork, with several bronze rims of kibbles, which presumably were of wickerwork. The iron tools undoubtedly have turned to rust in 2 millenniums, oak proving more enduring than iron. There also are many potsherds, including fragments of miners' lamps of the well-known classic pattern, and Roman coins are unearthed occasionally.

The Roman system of mining, so far as can be judged from the evidence offered by the Rio Tinto, was to cut narrow seams and slab off the ore in large masses, either by wedging or by the agency of quicklime tamped into the crevices and then wetted, and possibly both methods were used, these being the systems most generally employed previous to the adoption of gunpowder for blasting. The richer veins were followed persistently and the ancients were good judges of values, as has been learned by many a modern mining company that has reopened ore mines in Spain and Italy, in the hope of finding that much high-grade ore was left unmined. The Rio Tinto was not worked out because the deposit was too vast, but the rich ores of the secondary zone of enrichment were quite effectually extracted in all the old workings.

The Rio Tinto is situated in a rugged district, in a spur of the Sierra Andevallo, though the hills sometimes are held to be a spur of the Sierra Aracena, which itself is a branch of the famous Sierra Morena. The Rio Tinto, however, is separated from the Sierra Andevallo, which is some 12 miles distant, by the rivers Odiel and Járroma, and the mines are 51 miles by rail from the seaport of Huelva, in the province of that name, lying in the extreme southwestern corner of Spain, near the Portuguese boundary.

Geology: orebodies of the Rio Tinto occur in mammoth lenses, with clay-slate on the S. and porphyry to the N., and are surmounted by large masses of iron-ore gasson. The deposit has been leached to a depth of 100' where the zone of secondary enrichment begins, continuing to an average depth of 300'. Diamond-drill borings have shown untouched orebodies carrying upwards of 130,000,000 long tons of ore, giving sufficient reserves for about 60 years' production, and it is unlikely that the full extent of the orebodies available has been proven. The ore is of 2 classes, by far the larger part being slightly cupriferous pyrite, used largely in the manufacture of sulphuric acid, the second class consisting of copper sulphides disseminated in a silicified porphyry gangue. For removal of overburden there are 14 steam shovels, the largest having dippers of 4 cu. yds. capacity, and about 2,000,000 cu. meters of overburden is removed yearly, though this figure has been considerably exceeded in some years under exceptional requirements.

The ore produced is graded in 3 classes: (1) smelting ore carrying 4 to 6% copper; (2) export ore about 3.5% copper, and 45 to 50% sulphur; (3) leaching ore has 1.5 to 2% copper only. The average amount of copper contained in the ores treated has ranged from 1.5% copper, in 1876, the first year of production by the present company, to 3.234% in 1884. The output of the mine for 1912 was 2,406,969 tons carrying 2.18% copper. Tonnage was gradually increased for the last 5 years but the copper content has varied and is now higher than it has been for 2 years past. The ores carry an average of 1.5 oz. silver per long ton, with traces of gold, and considerable silver is saved, by the Claudet process, at the smelter. About one-third of the total production is exported for sulphur contents, about one-third

smelted, and the balance either leached or sent abroad. The ores average 4 to 5% copper in the zone of secondary enrichment, and with depth decline gradually in value, until at about 1,000' depth the average copper tenor is only about 1.25%. The main orebody is cupriferos pyrite, carrying copper in the form of minute grains of chalcocite and chalcopyrite. Owing to the ore being unusually rich in sulphur the shipping ores of the Rio Tinto are in good demand, and in addition to supplying various British works the company exported washed sulphur ore in large quantities to Germany, France, Belgium, and a number of acid works in the United States. The reserve heaps at the mine are estimated to carry about 150,000 long tons fine copper.

Development: Rio Tinto has 3 mineral zones, carrying a succession of lenses, these being known as the South or Nerva lode, the San Dionisio or Middle lode and the North lode, in addition to which there are 2 smaller detached lenses adjacent to the North lode, which also are being worked opencast. There are 5 different mines, of which 4 are worked opencast and 1 underground. The underground mine is worked pillar-and-stall, with levels at intervals of 12½ meters, levels being opened 4 meters high and the entire floor divided into galleries and crosscuts of 4x4 meters, leaving pillars of 6x6 meters, which is not an entirely satisfactory method of extraction, leaving as it does more ore in the pillars than is mined.

The San Dionisio mine, the westernmost and deepest of the group, has a shaft of nearly 1,200' depth. The work of changing over the San Dionisio for opencast extraction was begun 1907, and completed 1911. The overburden, consisting principally of porphyry and slate, was removed by steam shovels and carried through tunnels on the different levels, similar work being done on the South lode opencast extension. Ore will be mined by steam shovels to as great a depth as practicable, below which it will be necessary to hoist by shafts to the lowest tunnel level. The San Dionisio is likely to be the chief source of ore supply for several decades to come and work has been planned systematically for 10 years in advance.

Most of the ore mined is hauled out through tunnels without the need of shafts or engines. The lowest tunnel now in use for the 2 main lodes, the South and Dionisio, has not proven deep enough and management plans driving a new tunnel, 200' below the present one, which will be 3 miles long, and will require 3 to 4 years for completion.

Wherever possible mining has been done by open pit workings which have the great advantage of giving complete extraction of the ore, and also are more economical in tonnage costs in the long run, though requiring enormous initial expenditures for the removal of overburden. Fortunately, the financial resources of the company permit the outlay of vast sums, the principal of which will not be repaid for many years, but which eventually will be returned in full with very handsome interest. The possibility of using the caving system for underground mining was considered, but an adverse decision was reached. Timber is scarce and high-priced. The depth of the largest pit is about 600' and beyond the great pit the immense orebodies are worked by drift-stopes, the capping being blasted and sent down the shafts to fill and hold the ground as the ore is removed. Steam shovels recently have replaced manual labor to a considerable extent in opencast ore extraction.

Equipment: a central electric power plant, installed 1908, replaced a number of uneconomical steam installations. The mining equipment is adequate, but owing to extraction being mainly opencast the Rio Tinto lacks the powerful and spectacular mining machinery found at many other great copper properties, through no lack of enterprise, but owing to the company's fortunate position in requiring the minimum of such costly machinery.

Below the main pit are the roast yards, leaching bed, precipitation plant and smelter. The methods of leaching are described at length in the chapter on hydrometallurgy, in this volume. The average rainfall of the Sierra

Morena, 1873-1905, was 28" yearly, but there are protracted seasons of drought, alternating occasionally with heavy rainfalls, hence extensive water storage is necessary, and there are large dams for this purpose, the last having been built 1907. The ore leached is no longer calcined, the copper becoming soluble by natural weathering, assisted by systematic sprinkling. About 7,000,000 gal. of leach-water, strongly charged with copper sulphate, are treated daily in the various lixiviation plants, yielding cascara, or copper precipitate.

The smelter at the mine, built 1902, with American equipment throughout, treats a large proportion of ore on the ground, including considerable ore of a grade formerly leached. The smelter has two 42"x160" elliptical water-jacket cupolas, 23' 4" over all in height, with charging doors 10' above the bottoms, which are detachable and mounted on wheels. Each furnace has 8 water jackets and 2 charging doors, ore and fuel being charged alternately. The furnaces have continuous discharge into 30-ton settlers, 12' in diameter and 40" high, which have continuous slag discharge. Furnace product is low-grade matte, of 29 to 34% copper tenor, taken in 8-ton ladles by electric traveling cranes to the converter department, where there are 6 stands, rotated hydraulically from a pulpit. Shells, 80"x120", of horizontal barrel type, with spherical valves and 12 tuyeres each, are in 2 parts for convenience in lining, and are double-lined with a 4" external course of fire brick, rarely replaced, and an inner section, 22" to 26" thick, of ground silica and low-grade quartzose copper ores, with 10% of clay for a binder. When newly lined the shells have a capacity of only 3 to 4 tons each, increasing to about 8 tons when the inner linings are nearly burned out. The smelter product is converter bars, of 98 to 99% copper tenor.

There are 5 towns for employes built on the property of the Rio Tinto, and a large number of new dwellings were erected, 1909-10, to replace those destroyed, early 1908, by subsidence of the workings of the South lode. Further attention was being paid to sociological conditions of employes in 1916.

The Rio Tinto employs about 15,000 men, in Spain, of which about 5,000 are British, earning average wages of 15 reals, equal to about 60 cts. per day of 8 and 9 hours. There is no Sunday work, and the men are paid daily. The population of the dual mining township of Rio Tinto-Nerva is about 30,000, and that of the port of Huelva 25,000, hence it is estimated that the Rio Tinto Co., Ltd., is the direct source of support of 50,000 people in Spain and indirectly supports perhaps half as many more in Spain, England and upon the Continent.

In October, 1913, miners went on strike which only lasted a month, so that the output was not seriously curtailed.

The mines are connected with the seaport of Huelva by the Rio Tinto-Huelva railway, a narrow-gauge line of 87 kilometers length, built 1873-74 by the company and slightly lengthened, 1908. This line does a general freight and passenger business, in addition to handling the company's heavy traffic. Huelva is built on the site of the old Phœnician city of Onoba, at the junction of the Tinto and Odiel rivers, known to the Phœnicians and Carthaginians as the Urium and Anas. The company has extensive railway terminals and wharves at the city.

The Welsh reduction plant at Port Talbot, South Wales, is a modern smelter of good design and equipment, receiving material by sea from Spain, and having direct rail connection with the Great Western railway. Electric power is used throughout and there are 2 Temperley electric transporters for carrying bags of precipitate and bars into the ore sheds. The Port Talbot works have five 30-ton refining furnaces, top-charged by continuous operation electrically with side-slag discharge. Slags from the reverberatory furnaces, carrying 4 to 6% copper, are remelted in a water-jacket blast furnace.

Production: 1876-1916, was 20,000,000 tons of pyrites shipped, and 40,000,000 tons of ore treated locally, a total of about 60,000,000 long tons, this -

yielding about 730,000 long tons fine copper. No production figures are available since 1913, on account of war reasons, but considering strikes and temporarily reduced yields, these figures are approximately correct. In 1913 there was shipped 652,168 tons of pyrite, while 1,207,403 tons of 2.19% ore was treated at the mines. This total of 1,859,571 tons compares with 2,406,969 tons in 1912; respective copper outputs were 44,978,880 and 57,395,520 lbs.

Average cost, formerly about 7 cts. per lb., now is only 6 cts. per lb. of finished copper, after deducting revenues from sulphur sold and miscellaneous sources. The management of the company is first rate both technically and financially, and the mine itself, after 3,000 years of production, requires no commendation.

SAN MIGUEL COPPER MINES, LTD.

SPAIN

Office: E. Johnston, sec., 295 Salisbury House, London, E. C., Eng.
Mine office: Almonaster, Huelva, Spain.

Officers: C. C. D'Anvers, chairman; H. Barrett, A. Harter, R. B. Levy, M. Paisant, E. Porges and C. A. Massaouti, directors; J. F. Allen, con. eng.

Inc. Oct. 12, 1904, in Great Britain. Cap., £150,000, shares £1 par; increased, November, 1908, to £200,000; fully issued and fully paid. A former debenture issue of £75,000, at 6%, was redeemed, 1905. Dividends were 18¾% in 1906, 7¼% in 1912, 7¼% in 1913, and 5% in 1914.

Accounts for 1915 show a profit of £2,072, but deducting £3,907 for mine development charges, there was a loss of £1,835. Previous balance, including reserve, was £35,258, and owing to over-valuation of ore dumps, this was reduced to £1,910.

Property: 1,900 acres, including the San Miguel and adjoining mines containing cupriferous pyrites. The property was worked for some years by Sociedad Miniera de San Miguel de Huelva, a Portuguese company, until taken over in 1904 by the present owners. In 1907 the opencast levels of the mine caved, since which time production has been limited to underground ore extraction. The mine has ore reserves, estimated, 1912, at 700,000 long tons, and in addition there are about 450,000 tons of partly leached ore on surface, in heaps. Underground ore reserves are estimated at 2.5% copper tenor.

The company owns a 12-mile private railway, built at a cost of £40,000, from Almonaster to El Cerro, connecting at the latter point with the Ferrocarril Zafra y Huelva.

Production: 1,612,800 lbs. copper in 1904, 978,880 lbs. in 1906, 797,440 lbs. in 1907, 1,124,480 lbs. in 1908, 1,438,080 lbs. in 1909, 1,635,200 lbs. in 1910, 1,729,280 lbs. in 1911, 1,422,400 lbs. in 1912, 1,379,840 lbs. in 1913, 952,000 lbs. in 1914; 1,252,160 lbs. in 1915.

In 1915 the mine produced 26,834 tons of ore, of which 13,077 tons were exported, and 13,757 tons added to heaps for leaching. In 10 years the mine has produced 590,000 tons of ore.

THARSIS SULPHUR & COPPER CO., LTD.

SPAIN

Head office: George Reid, sec., 136 W. George St., Glasgow, Scotland.
Mine office: Huelva, Spain. **Works in Great Britain:** Hebburn-on-Tyne, Willington Quay, Cardiff; and Glasgow.

Directors: Lord Glenconner, chairman; L. Oscar Schmidt, René Millet, Albert J. J. Messéan, Hugh Brown, F. Alexis Ducoing, Sir Herbert E. Maxwell, S. C. Hogarth; W. P. Rutherford, Jr., man. director.

Inc. Oct. 27, 1866, in Great Britain. Cap., £300,000, since increased by amalgamation with other companies and the issue of new capital, to £1,250,000. Shares £2 par, fully paid.

Dividends: begun 1868, have been paid since without the lapse of a single year, and have averaged 18¾% per annum. To the end of 1916 they aggregated 925⅓%, amounting to the magnificent total of £10,477,182, putting this company well to the front among the profitable mines of the world.

In addition to dividend disbursements, the company has written off sums aggregating £2,600,114, and on Dec. 31, 1916, had £811,444 in cash and securities. Net profits of operations have ranged from a minimum of £27,052 in 1868, to a maximum of £478,878 in 1899, with £162,743 in 1909, £161,211 in 1910, £188,140 in 1911, £253,066 in 1912, £246,727 in 1913, £156,310 in 1914, £103,291 in 1915, and £199,150 in 1916.

Property: company owns a number of cupreous and iron pyrite mines in the province of Huelva, Spain, some of which were worked in ancient times by the Romans, and possibly by the Phoenicians before them.

At the present time its supplies of ore are principally drawn from the Calañas, or La Zarza, mine, from which 389,197 tons of sulphur ore were extracted in 1916. This mine has been systematically developed at depth, and many million tons of ore are now awaiting extraction. The depth of the orebody is still undetermined.

In the earlier years of the company, the Tharsis group of mines was its principal source of supply, but the richer ores of that property becoming exhausted, the Calañas mine became the mainstay of the company's prosperity. Now that the demand for sulphur is increasing, the company during the last few years has been preparing on a large scale for the renewal of extraction from the Tharsis group. The Tharsis mines still contain many million tons of pyrite, of low copper but high sulphur contents, and the company will shortly be in a position to again supply large quantities annually from that source. In order to cope with the large anticipated increase in the traffic, an extension of the company's pier at Huelva has been authorized by the Spanish Government.

The company also owns the Almagrera and Lagunazo mines, both within a few miles from the Tharsis group.

The Tharsis group is connected with the port of Huelva by the company's railway, 29 miles long, from which a branch line, 18 miles, runs to the Calañas mine; and when the new pier extension is completed, the company will be in an exceptionally good position as regards shipping facilities.

The company's iron pyrite, containing 48 to 50% sulphur, is shipped all over the world for its sulphur content, but its cupreous pyrite is principally shipped to Great Britain and Ireland, where, after the sulphur has been extracted by the acid-makers, the residue, or cinder, is forwarded to the company's works for the extraction of the copper by the wet process and the preparation of the iron residue for the market. A small quantity of silver and gold is also recovered at the copper extraction works.

Owing to the low copper content of the ore now being worked, the company's production of refined copper is much reduced, having fallen from 13,544 tons (30,258,560 lbs.) in 1884 to 3,712 tons (8,314,880 lbs.), in 1916.

UNITED ALKALI CO., LTD.

SPAIN

Office: Cunard Bldg., Liverpool, Eng. Mine office: Valverde del Camino, Huelva, Spain. Works office: St. Helens, Lancashire, Eng.

Officers: Max Muspratt, chairman; E. Mount, sec.; J. H. Cresswell, gen. mgr.; C. Kaesmacher, asst. mgr.; Alex. Hill & Stewart, cons. engrs.

Inc. in Great Britain. Cap., £6,550,000. Net earnings were £584,809 in 1915, from which £118,714 was disbursed for interest on debentures.

The company is primarily a chemical and manufacturing corporation, copper mining being merely a small branch of its business, which embraces 46 subsidiary works and corporations, some of the plants of very great size. The company has its principal works at St. Helens, Runcorn, Flint, Widnes and Glasgow, making extensive use of Spanish and Portuguese pyrites, which are burned for sulphur, after which the cinder remaining is leached for copper.

The company's copper properties in Spain include the Sotiel Coronada mines; also the Castillo del Buitron mines, held under lease from the Cia. Anonima de Buitron, and Tinto and Santa Rosa mines, all in the province of Huelva. These properties show typical Huelvan slates, carrying lenticular contact deposits between slate and porphyry, having a generally N.-W. strike, with dip from 30° to vertical, carrying cupriferous pyrite.

The Sotiel Coronada mine, 666 hectares, produces cupriferous pyrite ores and cement copper equivalent to an annual output of about 1,000,000 lbs. fine copper.

Extraction is by underground and open-cut operations, and mining is by overhand stoping, with dry walling and rock filling for depleted stopes. All pyritic ore above 1.5% copper is exported, the low-grade ores being leached at the mine, and washed sulphur ore exported.

The Castillo del Buitron property is a group of 4 concessions, 47 acres, at Zalamea La Real, and includes La Poderosa group of 6 hectares, adjoining, and the Concepción mine of 6 hectares, at Almonáster. The Castillo del Buitron group has 2 principal lenses of ore, these being the Levante, with a length of 150 meters, but of decidedly irregular outline, and the Poniente, about 200 meters long. Production of this group averages 1,500,000 lbs. fine copper yearly.

The Tinto & Santa Rosa group includes La Santa Rosa and El Tinto mines, having a combined area of 141 hectares, at Zalamea La Real. The Santa Rosa mine has 2 parallel lenses, with 7 levels opened, and the Tinto mine has ores said to average about 1.5% copper and 46% sulphur. The group has 9 shafts, and was estimated 1908, by the Spanish Government, to have 1,500,000 metric tons of ore developed. Production from this group was 38,005 long tons of pyrite and 803 long tons of cement copper, 1905, and 58,181 metric tons of ore in 1908, and present production is estimated at about 2,000,000 lbs. fine copper yearly.

The company controls the Ferrocarril del Buitron of 42" gauge, of 79 kilometers length, running from Castillo del Buitron to Huelva, equipped with 18 locomotives.

Production: from Spanish mines was 180,000 metric tons of cupriferous pyrite and 1,000 tons of copper precipitate in 1916. The company formerly was a large purchaser of iron pyrites, but now supplies its own requirements in the main.

SWEDEN

ALTENS KOBBERGRUBER

SWEDEN

Idle since 1908. **Office:** care of Sulitelma Aktiebolag, Helsingborg, Sweden.

Property: 339 claims, also a 60-acre mill site and 2,000 acres miscellaneous lands. This is the northermost copper mine in the world, lying near North Cape, in 70° N. latitude. The mine is 300 miles from rail, but only 300' from the sea.

Geology: Post-silurian schists and slates have been penetrated by dioritic greenstone, showing about 75 orebodies in diorite, and also as impregnations in dolomitic strata. The veins have a generally N.-N. W. strike, fissures in diorite dipping at about 30°, and dolomitic layers at about 60°. About 20 strong veins and many small ones are under development, former ranging 1 to 3 meters in average width, and traceable 50 to 2,000 meters. The various veins average about 1.25% copper, ores occurring as chalcocite, bornite, and chalcopyrite disseminated in pyrite.

Development: by numerous tunnels, of which the Sture is 650 meters and the Jernmalm 415 meters long, also 6 shafts, deepest 100 meters. The mine has several miles of workings. It was opened in 1825, closed in 1878 and reopened in 1895 by present owner.

Production: in 1907 was 25,000 metric tons of ore yielding 1,050 tons of matte and 600 tons of 48% sulphur ore, producing 625,000 lbs. fine copper.

LAKE COPPER PROPRIETARY CO., LTD.**SWEDEN**

Office: J. Lamb, sec., 85 London Wall, London, Eng.

Directors: Col. Lynch-Staunton, chairman; R. C. Lambert and S. W. Millard; James Swinburne, cons. elec. engr.

Inc. March 19, 1906. Cap., £500,000; 298,000 of £1 par and 40,000 of 1s. par; issued, £225,000 in £1 shares, £2,000 in 1s. shares. Debentures: £500,000, 6%, issued June, 1912; repayable in yearly drawings between December, 1922-1932; issued, £90,420.

Company paid £200,000 cash for all the shares of the Lake Copper Grufoors Aktiebolaget, owning 1,500 acres of mining leases.

Property: the Stora Strand and Vingnas mines, about 90 miles N. of Gothenburg, Sweden. Orebody on the Stora Strand has been proven for over 10 miles in length and to 800' depth and carries copper-silver-gold values. Reserves estimated at 100,000 tons of ore. Ore occurs in a copper slate bed and averages about 2% copper.

Development: by 13 shafts on the Stora Strand and 4 on the Vingnas.

Should be a profitable producer when fully equipped.

SOUTH AMERICA

SOUTH AMERICA

ARGENTINE

FAMATINA CO., LTD.

ARGENTINE

The company's property is vested in a receiver and manager, appointed June 27, 1913, on behalf of the prior lien and other debenture holders.

Office: 638 Salisbury House, London, E. C., Eng. **Directors:** Wm. Parker, D. H. Bayldon and G. E. Stephenson. F. F. Fuller, sec.

Company is a reconstruction of the Famatina Development Corporation, Ltd.

Inc. June, 1912. Cap., £800,000 shares 10s. par; 1,523,489 issued and fully paid, of which 1,126,165 are credited 7s. paid. Bonds authorized, £200,000 6%, of which £151,500 are issued.

Property: 850 acres, in 4 groups, in the Mexicana district of the Sierra Famatina range, province of Rioja, Argentine Republic, including the 6 principal mines of the district, the Upulungos group, Mellizas group, Compania group and San Pedro group. These lands lie at an elevation of 15,000' and are very difficult of access and transport.

The company has inherited a troublesome problem and a tendency to financial as well as mining troubles. Fresh capital was put into the company in 1912, with the understanding that the property would be profitable as soon as smelting was resumed. The new manager, Mr. Parker, stated, May, 1913, that the assay value of the ore had been overestimated and that the ore extracted is lower grade than previously reported. The smelter is not yet complete nor running smoothly, and the finances of the company are in a bad way, the £20,000 guaranteed by the big stockholders having been spent and the directors seeking further funds. Mines regarded as good, but company overcapitalized.

BOLIVA

ARAMAYO FRANCKE MINES, LTD.

BOLIVIA

Office: 148½ Fenchurch St., London, E. C., Eng. **Mine office:** Tupiza, Potosi, Bolivia.

Directors: F. A. Aramayo, chairman and managing director; Bernard Dale, L. A. Kensington, Robt. G. Ribon and F. J. Torromé. M. Roberts, mgr.; H. F. Ingo, sec.

Inc. Oct. 17, 1906, as Aramayo Francke & Co., Ltd. Cap. £600,000; shares £1 par; £597,090 outstanding. Name of company changed to present title, Jan., 1911.

Annual report for fiscal year ending May 31, 1916, shows: net profit, £167,559, as compared with £3,504 in 1915 and £135,764 in 1914.

Dividends: 6d in 1909; 1s 6d in 1910; 2s in 1911; 3s in 1911-12; 3s 6d in 1912-13; 2s in 1913-14; 1s 6d in 1914-15; 3s in 1915-16; 3s in 1916-17.

Property: consists of the consolidated mining rights over the mountain group of Chorolque, 817 hectares, containing mainly tin, bismuth and wolfram; the concentration works of Santa Barbara, Santa Elena and Sala-Sala; the establishments of Cotani, with its mines; the Quechisla smelter; the mines at Tasna, covering 1,460 hectares, with concentrator and smelter at Buen-Retiro; the mines at Churquini, Chocaya, 81½ hectares, the estates of Quechisla and Atocha and the concentrating plant at Asllani, besides other mining rights of lesser importance.

Production: for fiscal year ending May 31, 1916, amounted to 2,094 tons black tin, 148 tons wolfram, 35.86 tons copper and 110,000 oz. silver.

COROCORO DE BOLIVIA, COMPANIA **BOLIVIA**

Office: Santiago de Chile. **Mine office:** Coro Coro, La Paz, Bolivia.

Inc. April 23, 1873, in Bolivia. **Cap.**, 1,025,000 bolivianos.

Property: 500 hectares; is the largest copper mine in Bolivia, employing about 1,000 men. Mine 530 meters deep, is opened on steeply inclined sandstone and conglomerate strata carrying native copper, and rarely native silver, with occasional cuprite and chalcocite.

Development: by six vertical shafts timbered with Oregon pine 8"x10" and equipped with electrical hoists ranging from 50 h. p. to 180 h. p. The ore when mined is soft, and even when dry is so weak that it disintegrates in the hand. The copper is between the grains of sand so that grinding in the usual sense is not necessary. Two 12"x18" jaw crushers will disintegrate 1,000 tons in 10 hours. Jigs obtain 95% of the total mill recovery. Capacity of present mill is 200 to 250 tons of ore per day with heads assaying 2% to 3% copper.

Equipment: 1,250-h. p. Diesel engine and a mill, the product of which is exported as copper mineral, production ranging 800 to 1,200 quintals of 46 kilos. monthly, of "barillas de cobre" of about 85% average copper tenor, estimated by the Bolivian government to cost 7.8 bolivianos per quintal. Copper sulphide, as chalcocite, is exported as crude ore at the rate of 1,500 metric tons monthly of 18% copper.

COROCORO UNITED COPPER MINES, LTD. **BOLIVIA**

Registered office: 151 Finsbury Pavement House, London, E. C., England. **Main office:** 7 Rue des Italiens, Paris, France. **Mine office:** Coro Coro, La Paz, Bolivia.

Officers: Baron René de Batz, chairman; G. T. Crane, E. F. Harrington, J. L. Barber, A. Berthin, Noël Berthin, H. M. Kersey, C. Portalis, L. Monnier, and L. Charbonnel, directors; G. B. Wolfe, sec. in London; Roger Léon, sec. in Paris.

Inc. Aug. 6, 1909, in Great Britain. **Cap.** £700,000, shares £1 par; issued, £673,607, fully paid. Company took over the properties of J. K. Child & Co., Ltd.; Sucesión Noël Berthin; Compañía Sud Americana de Cobre de Corocoro, and Carreras Hermanos.

Accounts to July 1, 1916, showed: net profit of £172,243; £4,617 was written off for development and £47,752 for mines and buildings; balance forward was £180,542; dividends amounted to £73,484; £35,445 carried forward. The reserve is given as £70,000.

Property: 515 hectares at 12,000' elevation, in the Coro Coro district in central Bolivia. The principal mines are the Vizcachani, Santa Rosa and the Guallatiri, the first named formerly owned by J. K. Child & Co., the second by Carreras Bros., and the third by the Noël Berthin estate. The copper is found native in several beds of sandstone interstratified with reddish and brownish shale. The ore-bearing beds occur in 2 series, separated by a strong fault; the beds to the east of this fault are known as ramos and dip east, the copper-bearing strata being succeeded by a considerable thickness of red slates capped by green slates and limestone overlaid in turn by red clay and brown sandstone. The beds west of the fault are known as vetas, or veins, and are much harder than the copper-bearing ramos. The mineralization is not uniform and the native copper occurs in particles scarcely visible to the naked eye, as well as in grains, plates, threads and sometimes flat masses weighing several hundred pounds. The main fault, known as Dorado vein, is also mineralized and is now the main producer of the company, yielding sulphides and arsenides of copper. It is supposed that this fault was the feeding fissure whose solutions spread into the sandstone and was precipitated by organic matter.

The mine workings have not yet crosscut very far into the series, but show at least 4 ramos and 6 vetas, the 4 ramos being divided into 7 cuerpos, or beds, and the 6 veins into 10 to 14 beds. Some of these beds have 7 to 8

meters of homogeneous ore, the White Ramos being 30 meters wide on the 10th level of the Vizcachani shaft, of which 8 meters are mined as ores. The beds average 10 meters workable thickness with an average content of $3\frac{1}{2}\%$.

The district is extremely arid, without timber, and almost without shrubs, and extensive use is made of local fuel, which is taquia. Taquia is used for firing boilers and also for drying and roasting ores and in the past even was used for smelting.

Work was recently started on the croppings of several beds where the mineralization appears in the shape of sulphides. These sulphides, after hand-sorting, are bagged and shipped. Company is erecting a flotation plant for the concentration of the ores; the starting capacity being 125 tons daily.

The mine openings in the conglomerate strata stand fairly well, though with some crushing, and levels average 25 meters apart. Winzes are inclined, with steps cut. Little timbering is used, except for shafts, owing to its great cost, timber being imported mainly from North America, and the workings are secured principally by the poteo or dry-walling system. Steel is used for arching lateral workings.

The property is divided into 4 operating units, principal and active sections being the Corocoro and the Guallatiri. The Corocoro has a vertical shaft 330 meters deep, equipped with a steam plant, and ore-sorting and crushing plant. The Guallatiri has shafts of 180 and 350 meters.

The ore is treated in 3 mills of 70 tons to 100 tons daily capacity, making a product known as barilla, or crude copper mineral, of 80 to 88% copper tenor, which is shipped to Europe for refining.

Production: in 1912 was 4,100,000 lbs. fine copper; in 1913, 3,784,000 lbs.; in 1914, 4,150,000; in 1915, 7,166,000; in 1916, 11,300,000 lbs.

An electrical power plant of 500 k. w., in which alternators are driven by semi-Diesel engines, has been erected, and a further increase of 300 k. w. is contemplated.

Property, reported to have been under option to Messmore Kendall, J. D. Ryan, Chas. Sabin et al. in Feb., 1916, was relinquished. Price was reported to be £1,350,000.

Owing to the remote and almost inaccessible location of these mines, past production has been small, compared with possibilities, but the company is making progress and output is steadily increasing. The property is considered decidedly promising.

OLLA DE ORO (BOLIVIA) GOLD MINE BOLIVIA

Office: 33 St. Swithin's Lane, London, E. C., Eng. Directors: A. F. Martin, chairman; R. R. Harris and W. E. Hall. E. T. Roe, sec. Y. G. Preumont, mgr., La Paz, Bolivia.

Inc. Aug. 18, 1909, in England. Cap., £40,000; shares £1 par; all issued.

Dividends: 5% in 1913; $6\frac{1}{4}\%$ in 1914.

Property: 5 groups, 302 pertenencias, 720 acres, on the Umabamba river, La Paz, Bolivia, carrying gold ore in quartz veins in slate and quartzite. Vein is 2-6' wide and ore averages about $\frac{1}{2}$ oz. gold per ton with a little silver.

Development: by several tunnels, longest 800'.

Ore reserves: estimated at 35,000 tons in sight with 9,600 tons broken ore in stopes.

Equipment: includes mining plant and a mill with 140-h. p. turbine, 2 Hardinge ball and 2 pebble mills, compressor, electric power and tram lines. Plant capable of treating over 100 tons daily. Over 85% of the values are saved by amalgamation.

Production: owing to loss of mill was but 9,920 tons in 1914; 21,426 tons in 1915; yielding 4,949 oz. gold. In 1916 various lawsuits involving title to company's claims have been decided in its favor.

Company has had severe hardships to combat, cloudbursts wrecking the mill in December, 1912, and again in March, 1914, so that both mining

and milling operations were transferred to a new site. Ore value for 1915 decreased to 0.3 of an ounce gold for 5' width.

PORCO TIN MINES, LTD.**BOLIVIA**

Office: H. F. Ingo, 148½ Fenchurch St., London, E. C.

Directors: E. Hooper, chairman; J. Edwards, L. A. Kensington and J. Macandrew. H. A. Lewis, gen. mgr.; M. Roberts, cons. engr. Avelino Aramayo & Co., general agents in England.

Inc. Sept. 27, 1912, in England. Cap. £140,000; shares, £1 par; 120,075 issued. Debentures: £19,900, 6%.

Property: 400 acres, 25 miles from Potosi, Bolivia. Mines were worked in the 16th century for silver, but are now worked for tin. The district is mountainous, up to 17,000' at one point, and was described in the Engineering & Mining Journal, Feb. 24, 1917, by J. T. Singewald, Jr., and B. LeRoy Miller.

Geology: two mountains, Apo Porco and Huaya Porco, consist of igneous material. The Porco company is working the tin deposits in the former. Country rock is agglomerate, tuff and quartz porphyry. The two former contain shale fragments. The San Jose vein is a shattered zone consisting of heavy pyrite, with low tin values and 8 oz. silver per ton. One shoot is 500' long and 6½' wide. Another is up to 170' long and 8' wide, assaying 3% tin.

Development: by tunnels, open cuts and drifts. Reserves in 1915 were 261,500 tons of 2% metallic tin ore.

Equipment: includes 2½ miles aerial tram and a water-power driven 100-ton mill, which includes 2 ball mills, screens, jigs, Wilfley tables, Huntington mill, classifiers, Humboldt tables, buddles, etc. The tailing is to be cyanided for the silver.

Production: mill feed averages 2½% tin and 12 oz. silver per ton. In 1915, the yield, 168,000 lbs. of tin, and 443,500 lbs. in 1916.

BRAZIL**ITABIRA IRON ORE CO., LTD.****BRAZIL**

Office: C. F. Levick, 81 Gracechurch St., London, E. C.

Directors: S. Baldwin, I. H. Benn, P. M. Gotto, A. E. Harris, T. H. C. Levick, J. W. B. Pease and F. A. E. Samuelson. G. H. Robinson, engr.

Inc. March 31, 1911, in England. Cap., £2,000,000, in 500,000 pfd. and 1,500,000 ord. £1 shares of which 359,438 and 1,158,474 are issued.

Property: 18,271 acres in the Province of Minas Geraes, Brazil. Ore reserves are estimated at 100,000,000 tons of hematite, assaying 69% iron. A royalty of 6d. (12c.) per ton is payable to the B. H. Syndicate, Ltd., the previous owners.

OURO PRETO GOLD MINES OF BRAZIL, LTD.**BRAZIL**

Office: G. H. Wells, 5 Queen St. Place, London, E. C.

Directors: J. Taylor, chairman; E. Beer, M. Paisant, R. Taylor and E. F. H. de Wael. A. J. Bensusan, mgr.; John Taylor & Sons, mgrs.

Inc. July 10, 1914 (originally Jan. 31, 1884), in England. Cap., £100,000, in 60,000 10% non-cumulative pfd. and 40,000 ordinary £1 shares, of which 12,212 and 39,422 are issued respectively. Profit in 1915 was £9,545, against £7,402 in 1914.

Property: a concession of 3½ sq. miles in the province of Nunias Geraes, Brazil, including the Passagem mine, which had reserves estimated at 74,700 tons at the end of 1915.

Equipment: includes 80-stamp mill and cyanide plant. Ore is somewhat refractory, containing arsenic. During 1915, 85,400 tons yielded 30,203 oz. gold and in 1916 about 28,000 oz. gold were extracted.

ST. JOHN DEL REY MINING CO., LTD.**BRAZIL**

Office: F. V. Steward, Finsbury House, Blomfield St., London, E. C. Eng. Mine office: G. Chalmers, supt., Morro Velho, Minas Geraes, Brazil.

Officers: H. P. Harris, chairman; J. R. Remnant, E. A. Goulding, H. LeRoy Lewis and C. F. W. Kup, directors.

Inc. 1830, in England. **Cap.**, authorized, £800,000, in 600,000 ordinary, 100,000 preference, and 100,000 second preference shares of £1. Issued, £648,265, in 548,265 ordinary and 100,000 preference shares, fully paid. In 1891 capital was increased from £252,000 to £432,000; in 1893 to £462,000, in 1895 to £500,000, in 1895 to £600,000, in 1904 to £700,000, and in 1910 to £800,000. Preference shares are entitled to a non-cumulative dividend of 10% (paid free of income tax in December and June), and to priority for capital, without further participation. Second preference shares will be entitled to a non-cumulative dividend of 10%, and to priority for capital over ordinary shares, without further participation.

Statement for year ended Feb. 28, 1917, shows income from gold and silver, etc., £450,280, and expenses, £291,096, leaving a profit of £159,184, less London charges and taxes, £39,749, or £132,637 net. Dividends absorbed £67,780. Balance forward to 1917-'18 was £4,057. Company has reserve fund of £90,000, and investments of £127,005.

Dividends: from 1842 to 1867, £896,500 on ordinary shares; since then these shares received a total of 320% to 1910, after which 10% per annum. Preference dividends are paid in June and December. Last dividend on both classes of shares paid June, 1917, amounting to £40,808.

Property: the Morro Velho and Cuiaba gold mines and iron deposits in State of Minas Geraes, Brazil. Considered the oldest and deepest modern mine in the world, as work has been continued since 1830, and workings are 5,900' deep vertical.

Development: amounts to about 4,000' yearly. Below No. 20 level, 5,900' deep; there has been opened 844' of lode. Temperature on this level is 102° for the air and 108° for the rock. Reserves are estimated at 5½ years for the mill, which in 1916-'17 treated 187,400 tons.

Equipment: complete mine, mill and power plants. Treatment is by 130 stamps, 7 tube-mills, concentrators, roasting furnaces, cyanidation and filters. Aerial trams are used to advantage. Company operates a store, hotel, medical department, electric railway, farm, and eucalyptus plantation. Power is generated by water at cost of 2.62c. per h. p. day.

Production: in 1916 was 187,400 tons of \$12.06 ore. The recovery was 95.72% at cost of \$7.20 per ton.

CHILE

ANDES COPPER CO.

CHILE

Office: 42 Broadway, New York City.

Officers: L. D. Ricketts, pres.; Wm. Braden and C. F. Kelley, v. pres.; A. H. Melin, treas., with John D. Ryan, B. B. Thayer, W. D. Thornton, Messmore Kendall and T. Wolfson, directors. D. B. Hennessy, sec.

Inc. Jan. 20, 1916, in Delaware. **Cap.**, \$50,000,000; shares \$25 par.

Will acquire and develop mineral, timber and railroad lands in Potrerillas district, Chile.

ANDES COPPER MINING CO.

CHILE

Office: 42 Broadway, New York City.

Officers: L. D. Ricketts, pres.; Wm. Braden, v. p.; C. F. Kelley, v. p.; A. H. Melin, treas., with John D. Ryan, B. B. Thayer and Messmore Kendall, directors. D. B. Hennessy, sec.

Inc. Jan. 20, 1916, in Delaware. **Cap.**, \$50,000,000; shares, \$100 par.

Property: a very large tract of ground at Potrerillas, Chile, held by the Anaconda Copper Mining Co. under option and drilled by that company. This work is reported to have shown the existence of a very large tonnage, over 50,000,000 tons, it is said, carrying 1.67% copper. The property is now being extensively developed and prepared for operation. Will

acquire and develop mineral, timber and railroad lands in Chile (Potrerillas district).

ANDES EXPLORATION CO. OF MAINE**CHILE**

Controlled by Anaconda Copper Mining Co.

Address: 42 Broadway, New York City. B. B. Thayer, pres.; Wm. Braden, mgr., Santiago, Chile. Company is engaged in exploratory work and has not yet published a report.

BRADEN COPPER MINES CO.**CHILE**

Controlled by Kennecott Copper Corp.

Office: 120 Broadway, New York.

Officers: Wm. C. Potter, pres.; Stephen Birch, v. p.; L. Fredrick, treas.; C. K. Lipman, sec.; W. E. Bennett, asst. sec.

Directors: Wm. Braden, Messmore Kendall, Stephen Birch, Saml. J. Clarke, Thos. Cochran, Edm. A. Guggenheim, Harry F. Guggenheim, Wm. P. Hamilton, Henry O. Havemeyer, Seward Prosser, W. C. Potter.

Inc. May 26, 1909, in Delaware. **Cap.**, \$10,000,000, shares \$5 par; increased 1911 to \$14,000,000, non-assessable; issued \$12,953,530 to Dec. 31, 1916.

Bonds: authorized \$20,000,000 issue of 15-year 6% sinking fund gold bonds, non-convertible, due Feb. 1, 1931. Issued \$15,000,000. For the purchase of this last issue a minimum of \$1,000,000 per annum will be applied, payments being made semi-annually, starting Feb. 1, 1917.

Owns entire capital stock and bond issue of the Braden Copper Co., the Braden Copper Mines Co. being purely a holding company. Farmers Loan & Trust Co., New York, registrar. Annual meeting, fourth Monday in June.

In Dec., 1915, offer was made by the Kennecott Copper Corp. to purchase the stock of the company, payment to be made in Kennecott Copper Corp. stock. As an alternative any stockholder had the privilege of receiving \$15 in cash for each share of the Braden Copper Mines Co. As a result of this offer the K. C. Corp. now owns 99% of the stock of the company, which, based on the market value of K. C. Corp. stock at the time the offer was made, cost the K. C. Corp. \$42,281,300.

Combined statement of income and surplus accounts for Braden Copper Mines Co. and Braden Copper Co., for year ending Dec. 31, 1916, shows income from copper production, \$12,648,111; operating expenses, \$5,057,655; net operating profit, \$7,590,455; interest and misc. income, \$385,495; taxes, misc. charges and interest on Braden Copper Mines Co. bonds, \$1,029,786; net income, \$6,945,765. Net surplus, \$5,478,704, of which amount \$4,605,273 is cash and certificates of deposit.

Braden Copper Co.

Operating officials: S. S. Sorenson, gen. mgr.; L. E. Grant, asst. gen. mgr.; O. L. Myers, gen. aud.; H. R. Graham, mine supt.; R. E. Douglass, mill supt.; W. J. Turner, smelter supt.; Jas. Chambers, supt. of railroad; B. T. Colley, mgr. Welfare Dept.; J. K. MacGowan, purch. agt.

Consulting engineers: Fred Hellmann, mining; E. A. Cappelen Smith, metallurgical; H. A. Guess, milling; P. H. Thomas, electrical; S. B. Williamson, construction; H. E. Skougor, designing engr.

Inc. June 18, 1904, in Maine, and name changed to present title, Aug. 9, 1904. **Cap.**, \$2,332,030 shares \$10 par, non-assessable; fully issued. Company is protocolized in Chile. Is controlled, through ownership of entire stock issue, by Braden Copper Mines Co. Has a \$4,000,000 issue of 6% first-mortgage convertible bonds. Annual meeting, 4th Tuesday in July.

Property: 174 claims, about 2,362 acres, including 16 acres at Rancagua for railroad yards, etc. Mines are reached from Valparaiso by the Chilean State railroad, 158 miles to Rancagua, and from that point by company's narrow-gauge railway, 43 miles to the smelter and mill and 1½ miles farther to the mines. The elevation is 7,700 to 9,000', the mine being in a very rugged region on a part of the main range of the Andes.▲

During 1916, company purchased four new tracts of land. The largest covering 10,000 acres of mountain land, is the new tailings site and will hold 200 million tons of tailings. It is 8 miles from the mill and together with the dam, will cost \$1,200,000, but will not be ready until July, 1918.

Another purchase of 40,000 acres surrounding the mine puts all the company's works, including the new smelter under construction at Calcutones, on the company's own land and carries smoke easements on adjacent tracts.

The third purchase was for sundry lots of land and water rights needed for the new power plant on the Pangal river and a right of way for the power line. The fourth piece of land is in Rancagua, adjoining the company's present ground.

Geology: all the rocks are igneous and the rock at the mine is an andesite surrounding a plug of tuff which fills the throat and crater of a volcano. This light gray tuff is no longer loose and friable, but cemented into a hard concrete-like mass. The ore deposit is unique, being a volcanic vent of nearly circular section 4,000' across and filled by tuff and an agglomerate of rounded boulders of all sizes. The crater rim is surrounded by highly fractured and brecciated andesite, the fractures being mineralized around the circumference. The ore zone has been further fractured by porphyry dikes, which occasionally cut into the tuff.

The orebodies occur around, but outside the rim of the crater, in the andesite at, or near, its contact with the tuff. The ore consists of shattered andesite, often finely brecciated near the tuff contact, the copper minerals the tuff, but in the andesite the grade becomes lower, passing from breccia filling the cracks and openings. The orebodies are limited on one side by the tuff, but in the andesite the grade becomes lower, passing from breccia to fractured rock and fading out in the more blocky country rock. The fractures in the rock range from a mere film of sulphide ore up to 3 to 4" of mixed bornite and chalcopyrite, mainly the latter. The orebodies dip at 70° toward the center of the crater. Five distinct orebodies have been proven, and four, the Fortuna, Teniente, Centinela and Bornite, are being worked. All are marked by strong outcrop stained with copper minerals. The zone of oxidation is shallow, ranging from a few feet to 150' in depth, and as the property carries mainly disseminated ore, the management holds to the belief, with strong reason, that values will carry to great depth.

The mine is nearly circular in form, following the outside of a nearly vertical plug or tuff which is slightly conical with its base uppermost. The ore has been followed and partly developed on one horizon right around the circle. On the one half is the Fortuna, on the other the Teniente main orebodies.

The Fortuna orebody is typical of all the deposits. It is lens-shaped in horizontal section, is developed for 3,000' in length and has a maximum width of 260'. It has been well developed on all the levels; below the 4th little increase can be expected, as the rock has tightened and ore is lower grade. The lowest tunnel, No. 4, is 1,425' below the outcrop. The copper occurs as bornite and chalcopyrite, associated with ankerite and quartz. The Fortuna orebody is the principal one in point of development. The shrinkage stoping system, similar to that employed at the Ray Cons., is used. Stopes are carried up 7 metres wide, with 5-metre pillars. The topography of the country is such that shafts are unnecessary; all ore can be taken out through tunnels, and, even though parts of the mine are very wet, pumps are not required.

Development: by 5 tunnels; No. 4 and No. 5 are haulage ways at present. The Fortuna was gophered extensively, by former owners, for high-grade ore, which was followed and extracted wherever found. Average grade of Fortuna ore is lower than in El Teniente mine. Workings show copper sulphides and occasional metallic copper throughout the brecciated material for depth of 2,000'.

The Teniente orebody, whose outcrop is supposed to be in the crater of the old volcano, shows high-grade ore at the surface in bunches and stringers. It is the largest and most important orebody, having a length, on Teniente No. 1 level, of 4,800', and an average width of 300'. The depth as taken in computing ore averages about 840'. It is in this orebody that the greatest increase of tonnage is to be expected. It is much the largest of the orebodies and, with the exception of the small Bornite orebody, the richest. Its size and value have only been proved in the last few years, and stoping operations are just beginning.

No. 1 Teniente level and No. 2 Fortuna level have been extended along the tuff contact entirely around the crater, $3\frac{1}{2}$ miles. The Teniente is the oldest mine of the district, having been worked by the Spaniards for the high-grade ore in the small veins.

The Centinela orebody is being mined above Teniente No. 3 level and will probably extend below it. The Bornite orebody is practically worked out above the 4th level. Mining is being done between the 4th and 5th levels. The orebody is rich, but small, and no great extension in depth is looked for. Regimiento No. 2 orebody lies beyond the Fortuna, is lower grade and its size has not yet been determined.

Development: in 1916 totaled 51,230', exclusive of stope preparation, or nearly 10 miles. In addition there was driven 3,509' of the new electric railroad tunnel.

Ore reserves: estimated Nov. 17, 1916, by Fred Hellman, consulting engineer of the company, as: 131,680,000 tons of positive ore carrying 2.4% copper, 88,000,000 tons of probable ore carrying 1.89% copper, or a total of 219,680,000 tons, averaging 2.19% copper, as compared with 86,445,616 tons of 2.88% ore estimated Jan., 1915. These figures show an increase in positive ore of 65,454,410 tons with corresponding increase in copper contents of 1,213,288 tons.

Electric power is used throughout and generated at the hydro-electric plant on the Cachapoal river by four 2,000 k. w. Pelton wheels and generators, developing 10,000 k. w.; a fifth vertical Francis turbine with generator is being installed which will increase the total capacity to 15,000 k. w. Power is delivered to mine and mill at Sewell over a 16-mile 33,000-volt transmission line.

For serving increased capacity planned (10,000 tons of ore per day), an additional hydro-electric power plant is under construction on the Pungal river, 6 miles from the Cachapoal power plant, which will develop a total of 15,000 k. w. by three Pelton impulse wheels and generators. A new transmission line is being erected between these two power stations: a new and second transmission line having already been installed between Cachapoal and Sewell, carrying current at 66,000 volts for the new smelter at Caltones and mill and mine at Sewell.

The motor-driven aerial tram of 2,630 meters length, with 550 meters drop and 1,000 tons daily capacity connecting the mine and mill, now called Sewell, was formerly used for ore transportation, but is now in use as a store delivery system. The main line, of 2,000 meters length, runs from the mill to the central transfer station, where connection is had with a 1,000-meter line to El Teniente mine and a 500-meter line to La Fortuna mine. An electric tram line covered with snow sheds its entire length, owing to drifting snow and numerous snowslides, connecting the lowest level No. 5 of the mine with the coarse ore bins at the mill, handles the ore, capacity 5,000 tons daily.

The new concentrator has 3 sections of 1,200 tons, nominal capacity, each; the coarse ore goes from bins to gyratory crushers, to two 72" x 25" rolls, to four 48" Symons disc crushers, to rolls, to 3,000-ton fine-ore bins for delivery to Marcy mills and thence to mill itself.

Concentration is effected by 4* impact screens, 2 sets of rolls, 4 trommels, 6 Wilfley tables, 8 Hardinge mills, 2 Yeatman classifiers, 8 conical settling tanks, 6 Wilfley tables, 16 conical settling tanks, 6 Hardinge mills.

automatic samplers for concentrate and tail rolls and storage bins. The concentrator has a capacity of 5,000 tons daily, though it averaged but 3,723 in 1916. An enlargement of the mill begun in 1916, will give it a capacity of 10,000 tons daily.

The experimental leaching plant was in operation during the year 1915, testing the process for extraction of copper from concentrate; believed that process might be successfully carried out on a commercial scale, but cost of plant would be large and, at the present time, not advisable.

A 20-ton sulphuric acid plant provides the acid required in the flotation plant. Wilfley table concentrates are roasted in a Wedge 7-hearth furnace, the feed carrying from 6% to 7% moisture, 16% copper, 13.6% silica, 28.6% iron, and 33.3% sulphur. Hearth temperatures, from 1 to 7, respectively, in degrees Centigrade are 380, 460, 600, 750, 790, 680, 630. The furnace shaft makes one revolution in 3 minutes 20 seconds, and 12 h. p. is required to operate the furnace when treating 35 tons of concentrates per 24 hours. The calcine contains about 2% sulphur.

The lead chambers are four in number, each with a volume of 46,750 cu. ft., and formed of timber framing and $\frac{1}{8}$ -in. lead sheets. The following table gives certain data on chamber operations:

Chamber No.	Temperature, Deg. C.	Color of Gas	Deg. Baume of Drip
1	80	Gray	51-52
2	75	Light gray	50-51
3	60	Slightly yellow	49-50
4	48	Pale yellow	46-48

The daily production of chamber acid is from 23 to 24 tons at 66 deg. Be. Five tons produced in the Glover tower bring the total to 28 or 29 tons per day. The plant has been in operation since March, 1913.

A smelter is now in operation at Sewell. This plant, with blast furnaces, converters and refinery, was completed during the latter half of 1911. Since that time several improvements have been made, the most important being the addition of nodulizing kilns. These are similar to the kilns used in the manufacture of Portland cement. The 4th and 5th are largest ones installed, 8' in dia. and 100' long. Speed of kilns about 1 r.p.m. Heat is applied by an oil burner at discharge end. By feeding nodules instead of raw concentrates the furnace capacity has been almost doubled, due to absence of water in the charge. Coke consumption was practically cut in two.

The smelter equipment at present consists of 14 storage bins for concentrates, lime, coke, etc.; 4 sinter grates, with a daily capacity of 50 tons concentrates, roasted to 40 tons; 5 nodulizing kilns, with daily capacity for the first 3 installed of 215 tons concentrates, roasted to 180 tons; 2 blast furnaces, one being 48"x240" and the other 48"x600". Daily capacity is 300 tons raw concentrates, or 600 tons nodulized concentrates; 3 Pierce-Smith basic-lined converters, two having 33 tuyères, the other 17 tuyères; 1 copper casting apparatus. The power plant at the smelter includes 1 Nordberg 2-cyl. engine for converter air supply, capacity 10,000 cu. ft. air per min., at 13 lbs. pressure, rope driven, by a 600-h. p. motor; 1 No. 9 Connersville blower, capacity 20,000 cu. ft. air per min., at 3 lbs. pressure, belt driven, by a 250-h. p. motor, 1 Rateau-Battu-Smoot turbo-blower, for blast furnace supply, direct connected to an 800-h. p. motor, capacity 39,000 cu. ft. per min., at 3 lbs. pressure; 1 Ingersoll-Rand, Imperial type 10, compressor. Another turbo-blower is being erected. This is for converter air supply and will be direct connected to a 1,700 h. p. motor, capacity 24,000 cu. ft. air per min., at 13 lbs. pressure.

A new smelter is now under construction at Caletones, about 5 miles from Sewell, from where the concentrate will be conveyed by a Trenton Bleichert tramway system to the smelter which is intended to handle 1,000 tons of concentrate from the 10,000-ton mill now under construction at Sewell.

General summary of smelter operations:

	Per day
Tons of concentrates treated.....	350
Tons of coke consumed.....	60
Tons of fuel oil consumed.....	10
Tons of matte converted.....	150
Tons of copper produced.....	60
Number of men employed.....	350
Electric energy used, 1,500 h. p.	

The experimental Minerals Separation Co.'s flotation plant proved so successful that a 3,000 ton plant, to treat the entire slime product was built and is now in operation. It consists of 8 standard M. S. units that treat the tonnage handled by the 3 mill sections. Extraction is over 77%, and it is expected an 80% extraction will be obtained with the completion of the air cell installation. Daily production of all concentrates is about 350 tons. Average assay is: copper, 19%; iron, 23%; sulphur, 28%; lime, 2%; silica, 17%; alumina, 8%.

The complete works, including the concentrators, leaching plant and smelter, are planned to eventually treat 10,000 tons of ore daily, estimated to average 2.50% copper, at a cost, estimated by the management, of 7½¢ per lb. laid down in New York.

Production is estimated at 3,000,000 lbs. fine copper in 1908; 7,500,000 lbs. in 1909; 9,000,000 lbs. in 1910; 9,500,000 lbs. in 1912, and 18,098,000 in 1913.

Production:

	Tons. Milled.	% Cu.	% Rec. Mill.	Ratio Conc.	% Cu. Cncts.	% Rec. Smelter.	Net prod. Lbs.	Cost Cu. per lb.	cts.
1916	1,362,629	2.12	76.07	.....	.....	.....	42,153,270	8.03	
1915 (a).....	1,106,420	2.09	74.92	11.29	17.68	94.49	32,733,576	8.72	
1914	900,299	2.12	.....	.....	.....	.....	28,304,092		

(a) For year ending Oct. 31, 1915; 35,444,000 lbs. for calendar year 1915.

Production of blister copper for 9 months ending Sept. 30, 1917, estimated at 46,954,000 lbs.

Average price for copper sold in 1916 was 26.35¢ per lb.

Although operations at the Braden property have not yet fulfilled the expectations of its sponsors, it is believed that the treatment problems are now solved and with the completion of plant extensions and of the new smelter at Caltones, under construction in 1917, that the profits will be enormous. Known ore reserves will last 35 years on a 10,000 tons a day basis and the extent of the orebodies is as yet only partially known.

CALAMA: COMPANIA DE MINAS Y FUNDICION DE, CHILE

Reorganized 1913 as Compania Miñera de Calama. In August, 1916, property was sold to the Chile Copper Co., which see.

CATEMOU: SOCIETE DES MINES DE CUIVRE DE, CHILE

Main office: 50 Boulevard de la Senne, Brussels, Belgium. Office: 5 Rue du Helder, Paris, France. Operating and works office: Estacion Chagres, Aconcagua, Chile. A. W. Lehman, gen. mgr.

Officers: Eugène Renevey, chairman; Max Lyon, managing director; Georges Renevey, Jean Renevey, Félix Adam, Robert de la Bouglise and Robert Franklin, directors; Joseph Wouters, sec.

Inc. June 2, 1899, in Belgium. Cap., \$5,000,000; shares \$500 par; divided into 10,000 preference shares at 8%, and 35,000 ordinary shares; non-assessable. Debentures, \$2,500,000 5% bonds. Annual meeting, last Friday in June.

Dividends: 4% in 1910, 5% in 1911, 6% in 1912, 6% in 1914, 8% in 1915, 12% in 1916.

Lands: 155 claims, with sundry miscellaneous tracts held in fee and under government concessions, including the Finca de Nilhue, total hold-

ings of 30,000 acres, in the districts of Putaendo, Los Andes, Melipilla, La Ligua, Quillota and El Nilhue. Property includes numerous mines in Catémou, Melon and elsewhere, with quarries of fluxing material. The Finca de Nilhue carries a stock of 1,200 cattle, for transport and food, and is a valuable factor in reducing costs.

The local management reports that ores carry an average of 4% copper, and 2 oz. silver per ton. Veins carry the usual oxidized ores in a comparatively shallow surface zone, succeeded by chalcocite, bornite and chalcopyrite.

Los Mantos, or Mantos Rojos, mine, opened 1820, has country rocks of sandstone and limestone, with eruptive dikes traversing the sedimentaries, there being 2 blanket veins, of 5 to 7' thickness, composed of calcareous matter impregnated mainly with bornite, but having a little chalcopyrite and occasional gray copper, ore ranging 3 to 4.5% copper, 1% lead, 2% zinc and 30 grams silver per metric ton. The oxidation zone has been eroded, leaving only sulphide ores. These blanket veins have been worked on a considerable scale since 1835, and the ore, while low in grade, is especially suitable for fluxing purposes.

Development: exclusively by tunnels, having a vertical depth of about 50 meters and length of about 1,200 meters, with ore reserves developed for 3 to 4 years extraction. The mine produces no water, and walls stand excellently without timbering. Work is generally by contract, according to tonnage produced, miners being paid 5 to 7 pesos per metric ton for ore won. Only about 8% of the ore broken is discarded as waste, and ore is concentrated by flotation or smelted direct. Ore is taken to the smelter by a 1,580-meter aerial tram, with drop of 750 meters, having 500-kg. buckets. Cables last 2 years and guide cables last 5 years.

In 1916, Los Mantos mine employed 500 men, producing monthly 2,000 to 5,000 tons of ore of 4% copper tenor.

El Soldado mine, one of the Nogales group, and the greatest distance from the smelter, being in the Commune of Melon, on the Calera é Cabildo railway, was opened 1841. This property has 15 known veins, of 5' to 7' average width, carrying mainly copper sulphides, with quartz gangue. Several veins carry oxidized copper ores, with gangue of aluminous silicates, the series of veins having an approximately N.S. strike, with dip of 45° east, between trachyte and feldspar-porphry. The series of veins is faulted, frequently with throws of 1 to 2 meters, and there is another series of dikes and veins crossing at approximately right angles to the dip, but with parallel strike, the dikes being partly decomposed porphyry, carrying occasional oxidized ores and aluminous silicates. These veins have been worked extensively in the past, showing many antigua openings and ore averages 5 to 6% in copper tenor.

Development: mainly by tunnels, greatest vertical depth obtained being 80 meters and old workings are about 150 meters in length. This mine shows some immense chambers, one being called the Cathedral, in recognition of its vast size. In 1916 production was about 600 metric tons of high-grade ore monthly, secured with an average force of 150 men. Transportation is by wagon at a cost of 3 to 4 pesos per ton. An aerial tram is planned.

La Ligua group includes the Restauradora, San José and Vieja mines, producing about 40 metric tons daily of 3 to 4% copper ore, mainly used for fluxing and secured with an average force of 150 men.

Miscellaneous mines include El Nilhue mine, in the department of Putaendo, opened 1886; Las Maquinas de Catémou mine, in the department of Putaendo, opened in 1870; La Esmeralda mine, opened 1860; La Constancia and La Democracia mines, 10 kilometers from the smelter, carrying blanket veins, and La Marquesa, Malva, Tabourina, Caracoles, Almendro y Pleito and other properties, in various stages of development, some of considerable promise.

The mines and works have telegraph and telephone communication.

Forces, 1916, averaged 1,200 men, with the high average wages of 5 pesos for underground workmen, and 4 pesos for surface labor.

Reduction works: include 2 smelters, each with converter plants, with aggregate capacity of 400 to 500 metric tons of ore daily, one situated at La Poza, 12 kilometers from Chagres Station and the second near the Chagres Station on the Andes railroad. The concentrating plant by flotation process is located close to La Poza smelter. These works are equipped mainly with American machinery.

La Poza smelter, of 300-ton daily capacity, has 2 old 75-ton rectangular water-jacket blast furnaces, and new blast furnaces of 36"x96" and 35"x84" dimensions at the tuyères, turning out 50% matte. The converter department has five 57x77" shells, with 12 tuyères each, of the Copper Queen type, turning out cakes carrying 99.7% copper and 40 oz. silver per ton. There is a 40-ton briquetting plant and the converter department has a quartz mill. Power is furnished by a 165-h. p. Pelton water wheel and a 175-h. p. engine. Furnace blast is supplied by No. 6 Connersville blowers and converter blast is furnished by a Riedler air-compressor, with capacity to reduce 20,000 cu. ft. of free air per minute to 15 lbs. pressure. Fuel is coke, one ton of coke smelting 6 tons of ore, ores treated being highly silicious, with slags averaging 0.4 to 0.5% copper. In 1912 La Poza smelter treated 51,000 metric tons of ore, of 6% average tenor, obtaining therefrom 3,000 metric tons fine copper. Employs 90 men at average wages of 3.5 pesos daily.

The converting plant at Chagres smelter consists of a large horizontal Peirce-Smith machine.

El Cobre del Melon smelter, 16 kilometers from Estacion del Melon on the Calera & Cabildo railway has a 36x84" and 36x120" Allis-Chalmers cylindrical water-jacket blast furnace and converters. Ores smelted at this plant carry excess of silica and alumina and are deficient in sulphur, necessitating the free use of low grade cupriferous pyrite and limestone, for fluxing. Fuel is very expensive, coke costing 70 pesos per metric ton, and English coal 60 pesos per ton, one ton of fuel smelting about 3.5 tons of ore. Equipment includes a Pelton water-wheel, 60-h. p. locomotive and No. 6 Green blower. A reverberatory furnace 17'x55' has been lately installed. A 4-kilometer aerial tram is proposed to the Nogales group.

Production: was 3,379,947 lbs. fine copper in 1907; 4,060,873 lbs. in 1908; 4,073,761 lbs. in 1909; 4,920,500 lbs. in 1910; 4,660,000 lbs. in 1911; 6,960,000 lbs. in 1912; 5,843,230 lbs. in 1913; 7,878,465 lbs. in 1914; 7,210,350 lbs. in 1915; 11,082,330 lbs. in 1916. Property is estimated by company to have, with further improvements, a productive capacity of 10,000,000 lbs. fine copper yearly.

Management is good.

CENTRAL CHILI COPPER CO., LTD.

CHILE

Address: W. A. Habberfield, sec., 15 Angel Court, London, E. C., England. **Mine and works office:** Panulcillo, Ovalle, Coquimbo, Chile. **B. Schlegel,** gen. mgr at mines; **Eugene A. J. Goldsmid,** chairman and joint managing director; **B. C. Hinman,** joint managing director; **H. L. Bromhead,** and **A. Goldsmid,** directors; **R. L. Lee,** smelter supt.; **A. H. Morrill,** mine supt.

Inc. organized June, 1894, as a reconstruction of the Panulcillo Copper Co., Ltd., and reorganized, Jan., 1898. **Cap.,** increased Nov., 1905, to £400,000, shares £1 par; issued, £312,468.

Inc. Jan. 11, 1898, and is second reconstruction of the Panulcillo Copper Co., Ltd., registered Jan. 5, 1864, and first reconstructed as the Central Chile Copper Co., Ltd., in June, 1894. **Cap.,** £400,000, shares £1 par; 312,468 shares issued and fully paid. Increased from £300,000 to present amount Nov., 1905, 30,000 new shares being offered to shareholders at par; the shareholders received an option on 26,954 shares at par for 6 months, on 25,000 for 12 months at 22s. 6d. and on 25,000 for 18 months at 25s.

Balance sheet: Dec. 31, 1915, total assets £325,838, including £240,227, p.l.

and equipment; £43,124 stocks of regulus, ore, etc.; £26,163 cash and war bonds. Working account showed revenue of £238,725 from metals, and £160,575 as mining, purchased ore and smelting expense. Profit for year was £37,086. Profit and loss account showed total of £37,291; debit balance of £27,874 for 1914; depreciation £4,128; with £704 credit balance. Dividends were 6d. April 10, 1900; 6d. Jan. 22, 1901; 1s. May 31, 1907. Net earnings on working account were £10,932 in 1905; £24,913 in 1906; £12,684 in 1907; 1908 gave a net loss of £12,616; 1909 a net profit of £6,712; 1910 a profit of £7,954; 1911 a profit of £2,191; 1912 a profit of £22,124; 1913 a profit of £8,113; 1914 a loss of £5,598; 1915 a profit of £37,086.

Property: includes mines at Panulcillo, 25 kilometers northeast of Ovalle, and mines in the vicinity of Nisfilé. The Panulcillo group, area 56 hectares, includes the Panulcillo Alto and San Gregorio mines.

Development: principally by the 1,000-meter San Gregorio tunnel. Ore is mainly chalcopyrite, associated with pyrite, in limestone gangue, with some commercial production of malachite, azurite and chalcocite. During the year 477.5 meters of development work and 266 meters of diamond drilling were done.

The Cocinera and Inagotable mines, are at Ferro Negro.

In the Tambillos group work was paralyzed by the war.

Holdings were increased, 1915, by acquisition of 6 claims, 21 hectares; 5 near Panulcillo, and one at Tambillos.

Equipment: the 400-ton smelter, connected with the Panulcillo Alto mine by tram, is 76 kilometers from Coquimbo. This plant does a considerable custom business, employing about 250 men, at average wages of 3.68 pesos daily. Equipment includes 3 calciners, 2 reverberatory furnaces, and one 46x180" and three 42x84" blast furnaces. Pending the construction of a converter plant matte is shipped. Slags are hauled in cars to the dump. There is also a crusher, and in connection are a machine shop and a good laboratory. The smelter treats silicate custom ores, company's sulphides furnishing flux. Matte is crushed and exported to New York for smelting. In 1915 company smelted 32,063 tons of its own ore, averaging 2% copper and 27,826 tons of 8.13% copper of purchased ore, all of which contained 2,737 tons of fine copper, 44,700 troy oz. of silver and 1,233 troy oz. gold.

Production: fine copper, 1913, 2,274 tons; 1914, 2,491 tons; 1915, 2,737 tons; 1916, to Sept., 2,006 tons.

CHAÑARAL: SOCIÉTÉ DES MINES ET USINES

DE CUIVRE DE.

CHILE

Office: 94 Rue de la Victoire, Paris, France. **Mine and works office:** Chañaral, Atacama, Chile.

Officers: Eugéne Renevey, chairman; preceding officer, D. Bethmont, A. DuBois, A. Delattre, Georges Renevey and R. de La Bouglise, directors.

Inc. July 17, 1906, in France. **Cap.,** 6,000,000 frs.; increased 1910, to 7,000,000 frs.; shares, 500 frs. par.

Lands: 925 hectares, including 244 mines, mining claims, the more important being Los Pozos, Las Animas, Cerro Negro, at distances of 25 to 55 kilometers from the smelter at Chañaral, with which the mines are connected by rail. Property includes lands bought, 1906, of Besa y Ca., and of Las Animas Copper Mining & Smelting Co., Ltd., 1909. Lands are desert and water is scarce. The mine water carries salts and should be distilled for domestic uses.

Las Animas deposit consists of a system of 3 veins with parallel strike and dip of 70°, in wall rock of syenite, traceable 2 kilometers. Average width of the 3 veins is about 5', with ore occurring mainly in vertical shoots sometimes 100' in depth. Oxidized ores, to depth of 150 meters, are succeeded by sulphides, mainly with chalcopyrite, and some cupriferous pyrite. Gangue is silicious, or calcareous, or both. Ore shipped to smelter averages 4 to 5% copper. The mine is opened by 4 shafts, three of which are used for hoisting. The fourth shaft is used at present for pumping. Depths of shafts vary up to 550 meters. The shafts are equipped with two steam

hoists and a Diesel engine hoist. Compressed air is used for drilling, pumping and sub-hoisting.

The Los Pozos deposit has 2 parallel orebodies which outcrop for several kilometers in porphyry and syenite, one having a silicious and the other a ferruginous gangue. Width of orebodies has not been determined: cross-cuts, 70 meters long, still show mineralized headings and indicate large deposits of the porphyry type. The mine has been opened by a tunnel 300 meters long and 90 meters below the outcrop, by a 600-meter drift and by numerous cross-cuts. The mine is being developed by a system of raises, winzes and sub-levels, leaving the pillars to be mined later if filling can be done.

The mine is equipped with a compressed air plant, using a Diesel engine.

El Manto Verde mine at Los Pozos, 25 kilometers from Las Animas, has 2 parallel orebodies in porphyry and syenite, 1 carrying oxidized ores of about 6% average copper tenor, there being no sulphides, though chalcocopyrite is found in the Laura mine, nearby. There are shafts of 80 meters and 195 meters depth, latter having its first 65 meters vertical and balance at 50°, and there also is a tunnel. The mine has extensive and erratic old workings and shows large bodies of low-grade ore, somewhat refractory.

In addition to the foregoing mines, which are the principal properties, there is La Descubridora mine, formerly an important producer, abandoned at depth of 650 meters; the Andacollo mine, with ore averaging about 12.6%; the San Agustin, with 3.5% ore, and the Manto Atacama, with 3% ore. With further development the properties of this company can furnish a sufficient variety of ores to permit proper furnace mixtures.

The Cerro-Negro deposit has one orebody with ferruginous gangue, but in other respects it is similar to that of the Los Posas. Rich ores only, 10% or better, are mined because of heavy cost of transportation due to the distance of 50 kilometers from mine to smelter. Company expects to build a railroad. In the meantime some development work will be done.

The company owns numerous other claims in the districts of Sierra Aspera, El Salado and Pueblo Hundido, some of which are valuable and are reserved for the future.

The smelter is located at the harbor of Chañaral. It has four water-jacket furnaces, one of 100, one of 80 and two of 50 tons. There are two converter stands. Converter shells are 1.68 meters in diameter and 2 meters in length. The basic process is used with excellent results in spite of small size of converters. Air at 10 lbs., is delivered to the converters by a two-cylinder direct connected, double expansion, Walker compressor.

Electric power is delivered throughout the plant, using alternating three-phase, 220 volts and 50-cycle current.

The product of the smelter is bar copper averaging 99 to 99½% copper and containing about 60 grams gold and 150 grams silver per metric ton.

The company owns a shipping pier and lighters. Property is considered valuable and management good.

CHILE COPPER CO.

CHILE

Office: 120 Broadway, New York.

Officers: Daniel Guggenheim, pres.; Albert C. Burrage, v. p.; Murry Guggenheim, v. p.; H. F. Guggenheim, v. p.; C. K. Lipman, sec.; preceding with Isaac Guggenheim, S. R. Guggenheim, William Loeb, Jr., John N. Steele, Albert C. Burrage, Jr., Russell Burrage, Chas. D. Burrage, E. A. Guggenheim, H. R. Wagner, E. A. Cappelen Smith, W. C. Potter, directors. W. E. Bennett, asst. sec.; L. Fredrick, treas.; D. A. Crockett, transfer agent, 149 Broadway, New York City.

Inc. April 16, 1913, in Delaware. Cap., \$110,000,000; shares \$25 par; issued, 3,800,000; 600,000 shares held in treasury for conversion of \$15,000,000 7% gold bonds. Shares are listed on the New York stock exchange. Company owns entire issued capital stock of the Chile Exploration Co. of New Jersey.

Chile Exploration Co.

Office: 120 Broadway, New York. **Mine office:** Chuquicamata, Chile. Same directorate as Chile Copper Co. **Operating officials:** H. C. Bellinger, gen. mgr.; E. E. Barker, mine supt.

Inc. Jan. 11, 1912, in New Jersey. **Cap.**, \$1,000,000; shares \$100 par; entire stock issue owned by Chile Copper Co.

Combined statement showed: total assets \$128,853,360; including \$117,922,464 for property, construction, equipment and development; \$4,172,031 for materials, supplies, merchandise and items in transit; \$1,833,956 for deferred and receivable accounts; \$4,438,027 for copper in transit and in process; cash, \$486,880. After deducting \$146,173, deficit of 1915, from undivided profits, the surplus for 1916 was \$1,790,218.

Combined income account showed: \$10,558,724 from 41,305,477 lbs. of copper at 25.56c. gross price, delivered; and operating expenses, \$6,425,022; net operating income \$4,133,702, and other income \$39,346; interest, \$1,463,676; depreciation, \$772,981; balance undivided profits, \$1,936,391.

Property: the copper deposits of Chuquicamata, province of Antofagasta, Chile, the largest known in the world, form the crest of a low ridge some distance from the main range of the Andes, 9,600' elevation above sea level. Chuquicamata is about 85 miles E. of the Pacific Ocean on a branch of the Antofagasta & Bolivia Railway, 163 miles from Antofagasta. The company owns 693 claims, about 9,592 acres, 1,914 acres mineral land, 3,822 acres comprising the plant site, 328 acres acquired for waste dump purposes and 3,528 acres covering limestone, iron ore, salt and sulphur deposits.

The outcrop of the orebody is 8,000' long, with an average width of 554'. The maximum length of orebody, as proven up to present time, is about 7,000' with a maximum width of 1,800'. Ten holes have been put down to a depth of over 1,000'; one of these, in August, 1915, had reached a depth of 1,685', and was in 1.70% ore at that point. Sixty holes put down had an average depth of 681.8'. Small veins of rich ore cut through the mass, but the average of the entire deposit is estimated at 2.12% copper. The copper in the oxidized area occurs in the form of brochantite, a mixture of copper sulphate and copper hydrate, known as a subsulphate of copper. There is also a small amount of atacamite and chalcantite, or natural blue vitriol.

The drill holes show that the oxidized minerals change in depth to sulphides, notably chalcocite, bornite and chalcopyrite. About two-thirds of the ore developed carries brochantite (a basic copper sulphate containing 56% copper) and the balance copper sulphides. The underlying sulphide ore, practically all ore below 400' from surface, can be treated in the customary way by water concentration and direct smelting. This will be work of the future. At present the company is devoting its attention to the sulphate part of the orebody, the mining of which will be done by steam and electric shovels.

In August, 1916, the company acquired the holdings of the *Compañía Minera de Calama* for \$1,508,368. The property included an important adjacent group of mines; an antiquated smelter at Calama, 14 miles from Chuquicamata; considerable amount of land at Calama, some with water rights; a water-power concession near Calama; a group of copper claims near El Abra, 28 miles from Chuquicamata on a branch of the A. & B. railroad. The mines are located on two vein systems known as the Panizo-Rosario del Llamo and the Poderosa-San Felipe systems. These have yielded considerable amounts of about 16% to 18% copper. The veins, up to 45' wide, are strong and persistent, and the ores in the upper levels are oxides of copper, brochantite principally, mixed with chalcocite. In the lower levels the ore is chalcocite and enargite. The dumps of the property are reported to have sufficient copper content to repay purchase price.

Ore reserves: estimated by Fred Hellmann, consulting engineer, at the end of 1916, as 354,700,000 tons positive ore, averaging 2.18% copper and 345,300,000 tons probable ore, averaging 2.12% copper.

Treatment: the reduction plant, $2\frac{1}{2}$ miles from the mine, which started operations May 18, 1915, has a capacity of 10,000 tons a day. The extension of the plant to 27,000 tons per day has been started and it is estimated that the plant will be operating on the increased capacity within the next three years. Copper is recovered by a leaching process, the ore being peculiarly amenable to treatment by this method. Careful study of the problem by E. A. Cappelen Smith showed that the ore gives little or no slime, and is readily soluble in an 8 or 9% solution of cold sulphuric acid. As it contains no arsenic, antimony or bismuth, the solution is not fouled by repeated use.

The ore is subjected to crushing in two 84"x60" jaw crushers, 3 No. 10 gyratory crushers, six 48" horizontal and 24-48" vertical Symons disc crushers, to $\frac{3}{8}$ " size. It is then distributed to mastic-lined, concrete vats, of which there are six, 110' wide, 150' long and 17.5' high, each with a capacity of 10,000 tons of ore. Tanks are built of reinforced concrete, lined with mastic $1\frac{1}{2}$ " thick. The leaching process requires approximately 6 days for the complete cycle, 1 day for filling the tank, 2 days for leaching, 2 days for washing and draining and 1 day for discharging. The pregnant solution is drawn off into solution tanks and the leached residue taken from the vats by clamshell buckets, operated on a traveling bridge, transferred to cars, and piled on the waste dump. The copper solution, before electrolysis, is dechloridized by agitation with finely divided copper. The chlorine is precipitated by this method in the form of cuprous chloride, which is removed from the solution in settling tanks. This cuprous chloride is dissolved in brine and passed over scrap iron where the copper is precipitated in a finely divided condition, suitable for dechloridizing more solution.

The clear solution overflowing from the Dorr thickeners goes to the electrolytic tank house where it is electrolyzed, using ordinary copper cathode starting sheets and insoluble anodes made of Duriron. The electrolytic refinery consists of 510 electrolytic tanks, 19' long, $3\frac{1}{2}$ ' wide and 4' 10" deep, made of concrete and lined with mastic. Of the 510 tanks, 30 are used for making cathode starting sheets, and 480 for electrolytic deposition of copper from solution. The solution enters the head tank of the system containing about 5% copper and $2\frac{1}{2}$ %-3% free acid and leaves the last tank containing about 1-5% copper and 8-9% free acid.

Power for operating the reduction plant is generated at Tocopilla on the Pacific Coast by four 10,000 k.v.a., 53,300 h. p. total, steam turbines, served by oil-fired steam boilers. A 110,000-volt, 3-phase, 50-cycle, 87-mile steel tower transmission line connects this plant with Chuquicamata. A large part of the delivered power is utilized for electrolytic purposes, through 7 2,500-k. w. motor-generators, which convert 5,000-volt alternating current into 250-volt direct current.

There is now being designed and purchased additional electrical machinery to increase the power-house capacity to 115,000 k. w. (153,300 h. p.) by adding three 25,000 k. w. turbo-generators. A new 135,000-volt transmission line and 16 3,480-k. w. rotary converters are also being added, the latter being used to provide the necessary 250-volt direct current. Large extensions and improvements in the applications of electric power are in progress.

Estimates made by Mr. Yeatman of cost per ton of ore, on a basis of 10,000 tons per day of 2% ore are as follows:

Mining and transportation to mill.....	\$0.50
Crushing, leaching and electrolytic precipitation.....	1.065
Transport of copper to port, port charges and ins.....	0.115
Freight to Europe and selling commission.....	0.214
Depreciation and contingencies.....	0.191
Total.....	\$2.106

Transportation of copper and supplies being difficult, Chile Exploration and Braden Copper, early in 1916, jointly purchased two steamers, the

Sherman for \$790,000, and the Republic for \$825,000, to trade between Chile and New York. The Chile Steamship Co. and Sherman Steamship Co. were formed to operate these vessels. The revenue from general carrying business soon repaid the purchase price and the owners were offered \$1,250,000 each for them, but refused. J. K. MacGowan is president of both steamship companies.

Production:

Year	Ore		Extraction, Per Cent.	Copper, Pounds	Cost at Plant, Total Cost,	
	Treated, Tons	Copper, Per Cent.			Cents Per Pound	Total Cost, Cents Per Pound
1917	224,026**	1.79**	80.70**	62,498,000*	8.06**	11.31**
1916	1,742,748	1.74	77.15	41,306,000	11.75	15.46
1915†	625,394	1.71	66.87	10,944,000	16.34	18.55

* 9 months. ** April, 1917. † 7½ months.

Transportation and insurance rates are abnormal, being 2 cents per pound above those prior to the war.

Estimated annual production of copper on a basis of 10,000 tons per day is 120,000,000 lbs. refined copper, while the extension under way to 27,000 tons capacity will produce 824,000,000 pounds. The extension is expected to be complete by April, 1919. The estimated cost of production per pound of refined copper is 6 cents, including delivery in New York, Hamburg, Germany, or England.

Company's reports, while brief, are ample; and are profusely illustrated with plans and photographs.

NALTAGUA: SOCIÉTÉ DES MINES DE CUIVRE DE CHILE

Main office: 5 rue du Helder, Paris, France. Mine office: El Monte, Chile.

Officers: Baron Emmanuel Leonino, chairman; Max Lyon, managing director, 83 Avenue du Bois de Boulogne, Paris; J. de Bethmann, A. Boscher, Chas. Chalupt, A. de Dietrich, P. Keller, A. de Mun, Jorge Matte, A. de Montureux, G. Renevey and B. de Senevas, directors; Henri Blanc, mgr.; Henry Salomon, sec.; Count Bernard de Saint-Seine, cons. engr.; C. Lehmann, asst. mgr.; Pretot, Fontaine & Co., Valparaiso, purch. agts.; Ledoux & Co., New York, chemist-assayer.

Inc. Jan. 26, 1907, in France. Cap., \$10,000,000, in 100,000 shares, par value \$100. Bonds or debentures authorized, \$3,000,000, with 5% interest. Total assessments to date, \$3,000,000. Net profits in 1909-10, \$36,000; in 1910-11, \$195,000; in 1911-12, \$595,000; in 1912-13, \$603,689; in 1913-14, \$318,442; in 1914-15, \$716,811; in 1915-16, \$2,043,429, giving a total of \$4,408,371. Interest on bonds paid and drawn bonds repaid. Fiscal year ends June 30.

Dividends: paid 1913-14, \$300,000; 1915-16, \$500,000.

Property: formerly held by the Compañia Minera de Naltagua, comprises 195 pertenencias of mineral lands and the Naltagua farm with a total of nearly 2,000 acres.

Geology: claims show a succession of parallel mantos, or blanket-veins, some in limestone and some in porphyry. These bedding-veins have a known length of about 10 kilometers and are said to average 3% copper. Development was begun July 1, 1907, and the 10 years' work amounts to about 9 miles. The principal mines are the Vacas, San Ramon, Los Ranchos, Carmen Alto, Venus, Consuelo, Trinidad.

Development: San Ramon, so far the principal producer of the company, has a 3' to 10' vein averaging 7½%, running N. and S., carrying oxidized ores to 65' depth succeeded by bornite, changing downward into disseminated chalcopyrite. The ore carries 1.5 to 4.5% copper as mined, and is self-fluxing, requiring only a little pyrite to give a 50% matte. The mine is developed by tunnels with backs of about 50 meters. Underground work-

ings aggregated 1,200 meters July, 1912. Mining costs at this mine are 18 pesos per metric ton for ore delivered at the smelter.

Las Vacas mine, near San Ramon, has somewhat similar but leaner ore, though the bed is not so thick, and has a calcareous gangue.

Ranchos mine includes the Gato, in which a 6' vein of 4% ore in porphyry had been opened for stoping in 1913.

Carmen Alto mines have a large amount of ore blocked out in 2 veins which will be mined when a 700-meter tunnel is completed, connecting the district with the railway.

Equipment: owing to development being by tunnel only, mines have no hoists. There are several Ingersoll-Rand compressors. The company plans a 2,000-h. p. hydro-electric plant on the Rio Maipo. There is abundant wood on the Naltagua ranch.

Transportation equipment includes several aerial trams and a private railway. The aerial tram from El Monte to San Antonio, where the tower station is located, is 5,600 meters in length, with 22 towers, of 22 meters maximum height, on concrete foundations, having greatest span of 386 meters. An incline tram, at San Antonio, connecting with the lower station of the aerial tram, is 300 meters long, at an incline of 30°, having a double line of rails. A 2½-kilometer railway connects the incline tram with the private rail system, which has a total length of 25 kilometers. Equipment includes 6 locomotives, with 2, 3 and 5-ton ore cars.

The 300-ton smelter at Naltagua, in the valley of the Rio Maipo, adjacent to the Rio Mapocho, 70 kilometers by river to the coast, and 225 kilometers to Valparaiso, with a freight rate of 6 pesos per ton to the latter point. The smelter was blown in 1909. Equipment includes two 40" x 160" blast-furnaces. Slags, assaying about 0.4% copper, are granulated, and sluiced to the dump by water.

Two 17' x 55' reverberatory furnaces of the Anaconda type were blown in recently.

The converter department has 3 stands, with 9 shells of the Copper Queen barrel type, an electric traveling crane with a hydraulic accumulator for rotating the shells and a large Pierce-Smith basic converter.

The smelter power plant includes 770-kw. engines, 4 Connorsville blowers and a 200-kw. air-compressor for converter blast. The boiler plant has five 200-h. p. boilers, three 300-h. p. boilers and a 30-meter steel stack.

Works were described by F. A. Sundt in Mexican Mining Journal for October, 1914, and by Mark R. Lamb in Engineering and Mining Journal for Oct. 28, 1916.

About 1,500 men are employed at the mines and works, with average wages of 5 pesos at the mines and 6 pesos at the smelter.

Production: has been as follows: 293,209 lbs. in 1908-09; 2,253,090 lbs. in 1909-10; 2,486,772 lbs. in 1910-11; 4,082,892 lbs. in 1911-12; 4,703,005 lbs. in 1912-13; 5,659,356 lbs. in 1913-14; 6,504,004 lbs. in 1914-15; 9,417,692 lbs. in 1915-16. Above figures are for Chile bars assaying 99.1% copper.

PODEROSA MINING CO., LTD.

CHILE

Office: F. W. Bishop, sec., 145 Dashwood House, New Broad St., London, E. C., Eng. **Operating office:** Casilla 855, Antofagasta, Chile. **Mine office:** Collahuasi, Tarapacá, Chile.

Directors: Chas. Fearn, chairman; L. W. Harris, V. Echeverria and W. J. Barnett. J. H. Ivey, mgr.

Inc. Nov. 27, 1908, in Great Britain. Cap., £500,000, shares £5 par; fully issued and fully paid.

Accounts for 1916 show total income of £119,738, of which £67,699 was profit. Investments amount to £80,870; cash, £20,892; and supplies, £12,940.

Dividends: 5% in 1909; 10% in 1916; nothing between.

Property: 37 contiguous claims, 185 hectares, or 457 acres, including the Poderosa, which is the principal producer, and the San Carlos, Rosario, Condor and other mines. The lands lie at an extreme elevation of 15,400'

among the rounded peaks on the western edge of the Bolivian plateau, a region above the timber line, and barren of vegetation, with the exception of yareta, which constitutes the fuel of the district. Copper mines were worked in this district during the era of Spanish dominion, and previously by the Indians, as evidenced by remains of ancient furnaces, fragments of matte, scoria and tools left in old workings. Development of the mines was begun 1903, and regular ore shipments were begun January, 1906.

Geology: the property shows the Poderosa, or main vein, a fissure without visible outcrop, lying alongside a diorite dike intrusive in dacite. The vein lies under the dike, but in places departs from it. It has numerous branches and parallel fissures. A fault with a horizontal shift of 50' to 100', lessening downward, separates the vein in 3 portions, worked in the Poderosa and San Carlos mines, respectively. The ore occurs in shoots, and carries 8 to 60% copper and 6 to 8 oz. silver.

The Poderosa mine has several shafts, with a winze to 1,300' depth. Early in 1916 a change took place in the character of the lode and over a width of 5' the average copper content was 10%. Another good shoot was also opened. In June, 1917, it was reported that results at No. 10 had not justified expectations, but No. 6, 7, 8 and 9 were promising. Reserves were considered enough for a year's work in 1917. Dumps contain 137,000 tons of 3.5% ore.

Equipment: includes power plant, ore-sorting plant, concentrator, etc.

Production: in 1916 was 4,747 tons of 26.8% ore. The mill treated 4,726 tons of 6.8% ore, yielding 550 tons of 32.9% concentrate. In 1910 the mine yielded 10,902,080 lbs.; in 1911, 6,419,372 lbs.; in 1912, 5,077,204 lbs.

COLOMBIA

BREITUNG MINES CORP. OF DELAWARE

COLOMBIA

New York Office: 11 Pine St.

Officers: E. N. Breitung, pres.; Max Breitung, v. p.; Wm. A. Hamilton, sec.-treas. The foregoing and E. L. Bayliss, A. C. Ludlum, New York; J. P. Hodgson, Bisbee, Ariz.; S. R. Kaufman, Marquette, Mich.; J. M. Satterfield, Dover, Del.; H. M. McIntosh, Chicago, Ill., directors.

Inc. June, 1912, in Delaware, as a holding company: (1) To acquire an interest in, or the entire capital stock of, paying companies owning extensive ore bodies of precious or semi-precious metals requiring only better management or more capital to largely increase their earnings; (2) to buy or co-operate with owners of similar ore bodies of demonstrated extent and values requiring funds for adequate equipment; (3) to acquire by purchase, lease or option mineral lands and prospects which have been sufficiently explored or where geological conditions warrant expectations of large returns.

Cap., authorized, \$10,000,000; outstanding Dec. 31, 1915, \$1,127,790; par, \$5.00. No bonds. Transfer agent, U. S. Corporation Co., New York. Registrar, Bankers' Trust Co., New York. Annual meeting, last Monday in December.

Property: owns all the capital stock of the Marquette Magdalena Co., a New York corporation protocolized in the Republic of Colombia, S. A. Now idle because of European war.

FRONTINO AND BOLIVIA (S. A.) GOLD MNG. CO., LTD.

COLOMBIA

Office: J. J. Truran, sec., 184 Gresham House, London, E. C., Eng.
Mine office: La Salado, Colombia.

Directors: S. W. Stephens, chairman; T. H. Alexander, H. P. Harris, Hon. R. W. H. O'Neill, R. C. Lyall, T. H. Alexander. A. N. Mackay, mine supt.

Inc. July 18, 1911.

Property: mining rights over 12 sq. miles and surface rights over 40

sq. miles in Colombia, S. A. The Silencio mine is the main producer. Recent development has been on the 14th and 15th levels. Company also owns an interest in the newly formed Marmajito Mines, Ltd., owning adjoining properties.

Ore reserves: June, 1916, estimated at 42,200 tons.

Equipment: includes reduction plant, with 10-stamp mill and cyanide plant.

Production: in 1915, 25,971 tons, yielding 26,938 oz. gold; 1916, 25,484 tons, yielding 22,358 oz. gold.

PATO MINES (COLOMBIA), LTD.

COLOMBIA

Office: Henry Richards, sec., 441 Salisbury House, London Wall, London, E. C., Eng. **Mine office:** Apartado 104, Barranquilla, Colombia.

Directors: Fred W. Baker, chairman; F. D. Behrend, H. S. Derby, A. Stanley Elmore, T. J. Hoover and H. C. Porter. W. A. Prichard, mine supt. Inc. Oct. 5, 1909. **Cap.**, £100,000; shares, £1 par; all outstanding.

Financial statement for year ending Sept. 30, 1916, showed: assets, £438,584, which includes, property, £100,000; Nechi Mines (Colombia), Ltd., holdings (14,000 shares, 10s. each), £18,653; cash, £16,268. **Liabilities include:** sundry creditors, £12,746; profit and loss, £136,499. Net profit for the year amounted to £74,894. Net receipts from gold shipments totaled £144,648.

Property: the Pato area still undredged is estimated at 529 acres and is calculated to contain 22,419,490 cu. yds. of \$5,347,638 net value. The Nechi property is estimated to contain 6,865,900 cu. yds. of \$4,372,128 net value.

The above properties lie in an oval basin cut through by the Nechi River and surrounded by crystalline rocks; within the basin are flat tables of gravel deposits whose clay is red or blue and contains beds of peat or brown coal. The gravel benches grow richer in depth and deep drilling has been recommended.

Equipment: includes hydro-electric power plant, an 8½ cu. ft. dredge, ice plant and repair shops.

Production: in 1916, 1,484,721 cu. yds. were dredged, as compared with 1,308,470 for the previous year, the gross value of the gold recovered being \$719,493, averaging 48.5c. per cu. yd., against \$618,884, averaging 47.3c. for the previous year. The field operating cost for the year averaged 12.46c. per yd., as compared with 11.4c. for 1915.

ECUADOR

SOUTH AMERICAN DEVELOPMENT CO.

ECUADOR

Address: Paul C. Schraps, Apartado 655, Guayaquil, Ecuador.

Property: gold mine in the Zaruma district, El Oro province, Ecuador. The nearest town is Portovelo. Transportation of supplies is difficult and expensive, being \$85 to \$95 per ton from New York. A 90' head-frame costing \$10,100 was recently erected at main shaft. This mine contributes nearly all the gold produced in Ecuador. Veins are in fine grained diorite and are often 15' wide. Extensive faulting is evident. Ore treated is a mixture of quartz and calcite, with 10% by weight of sulphides.

Equipment: includes water-power, hoist, compressor, stamp mill and counter current decantation cyanide plant. Reconstruction of the power canal was described by Paul C. Schraps in the Engineering and Mining Journal of Nov. 10, 1917.

ZARUMA MINING CORPORATION, LTD.

ECUADOR

Office: J. C. Stamfer, 156 Palace Chambers, London, S. W., Eng.

Directors: J. Rey, chairman; C. Brault, P. J. E. E. Chambost, A. E. Lund, E. Saladin and J. Vielle.

Inc. Jan. 31, 1913, in England. **Cap.**, £120,000, in 110,000 pfd. £1 and 200,000 dfd. 1s. shares; 90,000 of former and all of latter issued.

Property: 1,838 acres in the Zaruma district, Ecuador. In the Caridad

lode is estimated 90,000 tons of £12 gold-silver-copper-lead ore and in the Christina 61,000 tons of £10 ore.

PERU

BACKUS Y JOHNSTON DEL PERU; SOC. MIN.

PERU

Main office: 134 Plateros de San Pedro, Lima, Peru.

Officers: A. J. Bennett, pres.; R. R. Sturrock, v. p., with D. C. Babbitt, T. P. Jones and B. A. Simpson, directors. N. B. Roper, smelter supt.; A. S. Howie, supt. Morococha mines; J. A. Irving, supt. Casapalca mines.

Inc. May 1, 1917, in Peru. Cap., £480,000; shares, £1 par, fully paid. Company purchased practically entire holdings of the Backus & Johnston Co., a New Jersey corporation, fully described Vol. XI.

Property: consists of several large groups of copper-silver mines.

Casapalca Mines: the principal mines in this district are the Carlos Francisco, Upper and Lower, the Cuarenta, Corina and Chuquichuccho. The first named is developed by an adit, equipped with electric haulage, about 5,000' long, which cuts the vein at a depth of about 2,500' below the out-crop. The vein is being worked along a length of 7,500' from the adit level, and from adits about 1,200' and higher above the main adit. Ore from the upper workings is sent to smelter over a 4,500' aerial tramway. The output from the upper and lower workings of Carlos Francisco is 2,500 tons per month, averaging 2% copper and 40 oz. silver, including concentrates. The other three mines are still in an early stage of development, and their combined output is at present only about 700 tons of ore, running about the same grade as that from Carlos Francisco.

Morococha Mines: the company relies principally upon the Morococha district for its copper ores, the chief sources of supply being the Huillica, Natividad, Churruca, Isabel, Alicia, Favorita, Alapampa, Ombla, San Luis, Pacchapata, La Vieja, Manuelita, and the mines of the Cia. Santa Clara, Cia. Minera de Pesares and of the Cia. Blanc. All of these mines are operated by the company either on account of ownership, by partnership arrangements or on lease. The completion of the power plant at Bellavista in 1913, the arrangement for the rental of further power, with a consequently more complete installation of compressors and machine drills, and the driving of three drainage tunnels have resulted in much lower mining costs and in a much more extensive exploitation of the properties.

The Natividad, the deepest shaft of the district, is 250' below the drainage tunnel level—a total of 750'; and to provide for the deeper development of this and of the other mines of the district it is proposed, in conjunction with other miners of the district, to sink a large central shaft to a depth 500' below the level of the drainage tunnels and to install a pumping plant capable of handling 10,000 gallons per minute. The ore from the Morococha district is transported to the smelter, distant 32 kilometers, over the Peruvian Central Railway, which has a branch line 14 kilometers long running from Ticlio on the main line to Morococha.

Production at present is at the rate of 12,000 tons per month, averaging 7% copper and 10 oz. silver, but this will be raised to 16,000 tons as soon as the additions to the smelter are completed.

Smelter: the smelter and concentrating plants are situated at Casapalca on the main line of the Peruvian Central Railway, 154 kilometers from the port of Callao, at an altitude of 13,700'. The company is operating at present two blast furnaces and three 96"x150" horizontal barrel type basic converters, but an additional blast furnace as well as a fourth converter are now being installed. The sintering plant consists of 20 roasting pots of 10 tons' daily capacity each, and of two Dwight-Lloyd sintering machines. Flue dust is briquetted and returned to furnaces. The smelter handles a considerable quantity of custom ore, and the company has always prided itself on its friendly relations with the independent miners of the district. In 1916 the smelter treated 175,000 dry tons ore, the production, in the form

of blister copper, being 19,395,000 lbs. fine copper, 3,262,500 oz. fine silver and 3,587 oz. gold. The additions at present under way will give the plant an increased capacity of about 50%.

Concentrating plant: low grade ores from the Casapalca mines are concentrated in a 200-ton mill adjoining the smelter, equipped with a No. 1 gyratory crusher, 2 primary ball mills, one regrinding ball mill, 2 Hancock jigs, 4 Overstrom tables and 5 single-deck and 2 double-deck Deister tables. Mill slime is dewatered in a 30' Dorr thickener and filter-pressed.

The main power plant, situated on the Rio Rimac, 4 miles below the smelter, contains two 800-kw. generators driven by Pelton wheels, transmission being at 10,000 volts. At the smelter there are two 150-kw. and one 125-kw. generators, also driven by Pelton wheels. Air is furnished as follows: for the furnaces, by one 118-cu. ft. and one 200-cu. ft. Connersville blowers, both driven by Pelton wheels, and by one motor-driven turbo-blower of 24,000 cu. ft. capacity; for the sintering pots, by 3 small rotary blowers of the Connersville type; for the converters, by a 14,000 cu. ft. Nordberg blowing engine, direct-driven by a synchronous motor; for the Casapalca mines, by 3 motor-driven Ingersoll-Rand air compressors with a combined capacity of 5,000 cu. ft. free air p. m.

CERRO DE PASCO COPPER CORPORATION

PERU

Office: 15 Broad St., New York.

Officers: L. T. Haggin, pres.; Edward H. Clark, v. p.; H. Esk Moller, sec.-treas.

Inc. Oct. 28, 1915, in New York, succeeding the Cerro de Pasco Copper Investment Co. Cap., \$1,000,000; shares, without par value: 782,000 shares issued; 218,000 in treasury for conversion of \$10,000,000 10-yr. 6% convertible Gold Bonds, dated Nov. 1, 1915; int. payable May and Nov. 1. Bonds convertible at option of holder after 2 years into stock at \$30 p. share. Bonds subject to redemption at option of company, on 90 days' notice, on any semi-annual interest date after 2 years at \$105, plus interest. Stock listed on New York Curb.

First published annual report showed income in 1916 of \$3,670,000 from its subsidiary companies, and dividends paid of \$2,666,664; bond interest of \$700,000; administration expenses, etc., \$119,312, and a balance surplus of \$187,552. Balance sheet, Dec. 31, 1916, showed cash, \$391,652, and investments in its three subsidiaries, \$29,519,120. Consolidated balance sheet gave assets as \$39,857,905; including current assets, \$10,540,228; current liabilities of \$3,035,782, and surplus of \$14,472,123. Current assets included cash on hand, \$2,549,544; bullion, \$3,147,520 and accounts receivable, \$1,441,615.

Earnings applicable to dividends in 1917 were estimated at \$9,000,000 taxes paid.

Dividends: during 1916 company received \$1,285,000 from the Cerro de Pasco M. Co., \$285,000 from the Cerro de Pasco R. Co. and \$1,850,000 from the Morococha M. Co., a total of \$3,420,000. Out of this there was paid \$300,000 to shareholders of first named company, \$300,000 to the second and \$1,850,000 to the third. Distributions are at the rate of \$1.75 per quarter. In 1917, \$4 per share was paid plus extras totaling \$1.75 per share.

Owns all outstanding stock of Cerro de Pasco Mining Co. and all of the Morococha Mining Co., and \$2,850,000 of the \$3,000,000 capital of the Cerro de Pasco Railway Co.

Cerro de Pasco Mining Co.

Office: No. 15 Broad St., New York. Peruvian general office: Lima, Peru. Mine office: Cerro de Pasco, Junin, Peru. Works office: La Fundición, Tíñahuarca, Junin, Peru.

Officers: L. T. Haggin, pres.; Edward H. Clark, v. p.; H. Esk Moller, sec.-treas.; W. J. Hamilton, gen. mgr., Lima.

Inc. June 6, 1902, in New Jersey. Cap., \$10,000,000, all issued. Owns the entire stock issue of the Cerro de Pasco Railway Co., and is controlled through stock ownership, by Cerro de Pasco Copper Corp. Estate of J. B. Haggin is said to hold about 40% of the total investment.

Property: over 940 claims, and 70,000 acres miscellaneous lands in the Morococha and Yauli districts and about 400 acres of land that includes three-fourths of the rich Cerro de Pasco district, with a smelter site and extensive coal tracts north of Cerro de Pasco.

Cerro de Pasco lies 14,300' above sea level, rendering physical labor very fatiguing. The population of the town is about 6,000, of whom only a small percentage are white. The region is bleak and all food and supplies must be brought in from considerable distances. The year has but 2 periods, the wet and dry, the former from November to April. Both are said to be bleak and exceedingly disagreeable. Snow and hail fall at any time, summer or winter, but rarely remain on the ground as long as 48 hours, even in winter. The fluctuation between mean summer and winter temperature is about 20° F. only, less than the daily variation.

Silver was discovered at Cerro de Pasco in 1630, and the mines produced, to the close of the nineteenth century, about 450,000,000 oz., from 40,000,000 tons of silver and copper ore, nearly all extracted by hand work and carried 3 to 6 miles on the backs of llamas, to primitive smelters, whence the silver bullion was transported by llamas 200 miles to Lima, until 1870, when a railroad was completed to Oroya. Formerly only the copper ores of 25 to 40% copper were shipped.

Geology: authorities disagree as to the geology of the district, but over an area a mile wide and nearly 2 miles long, nearly every claim carries ore, proving Cerro de Pasco one of the richest mineral fields of the globe. The orebodies outcrop prominently, as crestones, or ridges, and carry gold, silver, copper, lead, zinc and cobalt. The oxidized zone carries considerable gold, running as high as 1 to 2 oz. per ton, occurring in rich but erratic shoots. The high silver values usually extend to about 100' depth only, occasionally running up to thousands of ounces per ton, followed by rich silver-copper ores, which in turn, at a little greater depth, are succeeded by ore low in silver but richer in copper, the copper ores being estimated to have averaged 15 to 30 oz. per ton in the old workings. Primary ores below the water level contain bornite and chalcopyrite, associated with pyrite, tetrahedrite, arsenopyrite and sphalerite, containing little silver and only traces of gold. There are occasional veins of high-grade silver-lead ores, with others carrying up to 8% zinc; practically all the copper ores are bismuthiferous, hence refractory in reduction. The ores carry about 35% silica and 14 to 30% iron, the excess of silica requiring considerable limestone for fluxing.

Development: includes hundreds of old mine workings, some opened to 300' depth, though the majority not over 100' deep. The surface of the property shows scores of tajos, big pits resulting from the caving in of old open cast workings, some of these being 300' deep. The property lies in a basin, and the mines are very wet, especially below a depth of 400'. The Rumiallana drainage tunnel, begun April, 1877, by Henry Mciggs, was completed 1907, by the Compañia Empresa Socavonera del Cerro de Pasco, with which a financial arrangement was made, through a 5% stock interest given in the Cerro de Pasco Copper Co., obviating the payment of the 20% royalty to which the former company was legally entitled.

The present company has disregarded old workings and opened a new mine, by 2 tunnels, of about 2 miles length each, and 5 new shafts. The Diamante, Peña Blanca, Carmen and Noruega 2-compartment shafts have 4 levels opened, and are bottomed at 410'. The 4-compartment Esperanza shaft is planned to do the hoisting for the entire mine and the shops and power plant are near this shaft. Waste is used for filling, timber being very expensive, and used only for lining shafts and timbering important tunnels. The mines are equipped with powerful pumps. Estimates of ore in sight vary from 2,000,000 to 75,000,000 tons, the latter figure being excessive, and not countenanced by the management. Reserves of ore blocked out are said to be kept 4 years ahead of smelter consumption, these including first-grade ore of 8 to 10% copper tenor, with good silver values, and second grade ore, of uncertain copper tenor, though probably workable in the main.

The reduction works, at La Fundición, near Tíñahuarea, 9 miles from the mines, are connected therewith by rail. All buildings are of steel frames, covered with corrugated iron. The plant treats a small quantity of custom ores and has a sampling mill with crushers, rolls and chain-bucket elevators. The works are terraced throughout, permitting the handling of material by gravity, and are built on the unit plan, so that their capacity may be doubled or, if desired, quadrupled at later date.

The furnace building has twelve 2,000-ton flat-bottomed steel ore bins, filled from railroad tracks above, and loading into charging cars ran alongside, that are drawn by small locomotives on a narrow-gauge track running on either side of each furnace, 2 cars constituting a charge. There are five 56"x180" water-jacketed blast furnaces of about 300 tons actual daily capacity each. Slag is granulated by running water. The smelter building has a steel stack, 220' high and 20' in diameter. There are three 60' reverberatory furnaces and fourteen 18' six-hearth McDougal calcining furnaces. Six Dwight-Lloyd sintering machines were added in 1913.

The converter department, in a separate building, has 4 Pierce-Smith basic lined converters. Product of the converter is 99% blister copper, in cakes, shipped to Baltimore for refining.

The power plant includes a boiler house with sixteen 250-h. p. Babcock & Wilcox boilers, and an engine house, latter having a 600-h. p. Nordberg cross-compound engine, direct-connected to a 440-k. w. Westinghouse generator; two 475-h. p. Nordberg engines, direct-connected to two 250-k. w. generators; a 750-k. w. Westinghouse alternator and dynamo and 2 smaller dynamos furnishing electric power and light. There are 3 No. 11 Connersville blowers, driven by a Nordberg cross-compound engine, a large Nordberg air compressor for converter blast, and an air compressor for the pneumatic operation of furnace doors, etc. The power plant is practically duplicated, as a precaution against accidents.

A 12,000-h. p. hydro-electric plant was completed in 1913 and will greatly help the company's operations. The plant has a 10½-mile ditch and pipe line with a fall of 750', delivering 200 second-feet of water to 6 Pelton wheels connected in sets of 2 with three 3,000-k. w. dynamos. The transmission line is 70 miles long and will serve both Cerro de Pasco and Morococha. The entire plant cost \$1,000,000.

The adoption of electric power has greatly relieved the fuel situation and made the company practically independent of foreign coke.

The company furnishes its own fuel, owning extensive beds of bituminous coal, of rather indifferent average quality, though with some coal of coking grade. The principal coal mines are at Goyllarisquisca, Quishuarcancha and Vincuscancha. A branch line of the railway to Goyllarisquisca is 21 miles long, to Quishuarcancha 11 miles, the Vincuscancha coal mine being about midway. The coke plant near the smelter has seventy 75-ton beehive ovens, making a satisfactory coke for blast furnace use, no coke being imported. The coal contains 50 to 60% fixed carbon, 20% volatile matter and about 13% ash, with considerable sulphur.

The company's brick plant has proven an important success, as imported brick of all kinds are very costly, and the local plant turns out fire and silica brick of very fine quality, from clays found in the mines, and common building brick are made from a clay pit near the Vincuscancha mine. This plant also makes tile and tile pipe. A limestone quarry, 12 miles from the works, furnishes flux.

The Cerro de Pasco Railway: owned by the company and operated under a government concession, has a main line of 83 miles, running from Cerro de Pasca to Oroya, where connection is made with the Central Railway of Peru, which runs thence 130 miles to Callaó, the latter line being one of the most notable in the world, having cost \$43,000,000 and gaining nearly 3 miles vertical elevation, reaching the highest altitude of any railroad on the globe, after surmounting almost incredible obstacles, having an average grade of 2.5%, with no less than 37 tunnels, including the Galera tunnel of 1 kilometer length which cuts through a ridge of the Andes. The Cerro de

Pasco railway has a branch to the coal fields, and, with all spurs, sidings and yards, has about 135 miles of standard-gauge track, laid with 70-lb. rails. The main line has an average grade of 1.5%, with a maximum grade of 3%, and cost upward of \$2,000,000. Equipment includes 13 locomotives, in addition to 6 light switching engines at the smelter, and 59 steel ore and coal gondolas, with a total of 247 forty-ton cars, rolling stock being of the best American manufacture. The railroad is on a paying basis.

The company has 2 hotels, one for native and one for American labor, and maintains a clubhouse with bowling alley, swimming pool, gymnasium, etc., which is a social center and aids greatly in keeping the American workmen and their families contented. The company also furnishes facilities for riding and hunting. Although the altitude is very high, people of normal good health find no difficulty in living comfortably in the rarified air of Cerro de Pasco. Wages range from \$2.50 to \$4 per day for white labor, and 60 to 75c per day for native common labor, the latter being tractable, and, for some purposes, fairly efficient. Up to \$2, and even \$2.50 per day, is paid the native timberman. The company employs about 2,200 men at the copper mines, 1,500 men at the smelter, 1,000 at the Goyllarisquisca coal mine, 400 at the Vincuscancha coal mine, and 200 at the Quisuarcancha coal mine.

Production: 3,389,787 lbs. copper in 1906; 20,258,689 lbs. in 1907; 23,646,921 lbs. in 1908; 30,327,423 lbs. in 1909; 34,713,012 lbs. in 1910; 48,600,926 lbs. in 1911; 45,272,000 lbs. in 1912; 43,856,000 lbs. in 1913; 40,753,000 lbs. in 1914; 61,000,000 lbs. in 1915; 71,452,000 lbs. in 1916, and in 1917, to November, 61,625,000 lbs., the October yield being 9,050,000 lbs.

The Cerro de Pasco is undoubtedly the most expensive copper proposition ever developed, the total investment to date being nearly \$25,000,000. Many serious discouragements were met in the earlier days, but overcome, and sufficient progress has been made to justify terming the property a success. The ores are refractory and the great altitude of the smelter, which is 14,300' above sea-level, coupled with inefficient native labor, have given rise to an exceedingly complex and tiresome problem in ore reduction. Estimating cost of production at 8c per lb. and annual output at 70,000,000 lbs., earnings per share of the Cerro de Pasco Copper Corporation would be \$4.20 on a 14c, \$8.40 on a 20c and \$12.60 on a 26c copper market.

Morococha Mining Co.

Office: 15 Broad St., New York, and Morococha, Junin, Peru.

Officers: E. H. Clark, pres.; L. T. Haggin, v. p.; H. Esk Moller, sec-treas.; H. Kingsmill, mng. supt.

Inc. 1908 in New Jersey. **Cap.** \$10,000,000. Company is a subsidiary, formed by the New York interests of the Cerro de Pasco Co., prior to the settlement of litigation with the Socavon del Cerro de Pasco.

Property: the Gertrudis, San Francisco and San Miguel mines and a one-half interest in the Natividad mine, which is owned jointly with the Backus & Johnston Co.

The Mina Gertrudis, opened 1897, on the Cerro San Marcello, shortly west of Lake Morococha, shows 3 limestone beds with ore impregnations following the bedding planes; vein has strike of N. 51° E. and nearly vertical dip. It averages about 2 meters in width, with a paystreak of 60 cm. to 1 meter, carrying gray copper and chalcopyrite averaging about 14% copper and 1,000 grams silver per metric ton, balance of vein carrying about 5% copper and 300 grams silver per metric ton. The mine has a 12-meter shaft, but is developed mainly by a tunnel, just above the level of Lake Morococha, mining through winzes sunk from short crosscuts in the hanging. Ore is hand-cobbed at the portal of the tunnel.

The Natividad mine is opened to about 300 meters depth, developing a vein about 4' wide, carrying ore averaging about 14% copper and 14 to 70 oz. silver per ton. A new tunnel, planned to be 750 meters long, is being driven under the old workings.

The Mina San Miguel is developed by the Copaycocha and Vulcano tunnels, lower of about 500 meters length, and ore is mainly enargite, with some tetrahedrite and tennantite, associated with pyrite. Mine was opened 1894, and in 10 years produced from ore averaging about 20% copper and 333 grams silver per metric ton, 6,476,400 kgs. fine copper and 10,794 kgs. fine silver.

The San Francisco is opened by a 4,000' tunnel, completed in March, 1916, known as the Carlos Reynaldo adit.

Production is gradually increasing and the ore is sold to and smelted by the Cerro de Pasco Mng. Co. Production is approximately 20,000,000 lbs. per year. In 1915 company furnished $\frac{1}{3}$ of the output of Cerro de Pasco Mng. Co.

FERROBAMBA, LTD.

PERU

Office: F. F. Fuller, sec., 638 Salisbury House, London, E. C., Eng. Operating office: Arequipa, Peru. Mine office: Ferrobamba, Catobambos, Apurimac, Peru.

Directors: A. C. Burrage, chairman; A. C. Adams, T. C. J. Burgess, W. H. W. Bliss, C. D. Burrage, H. W. Brown and A. Solomon.

Inc. Nov. 5, 1909, in Great Britain. Cap., £150,000; 60,000 priority shares, 10s. par; issued, 36,658; 120,000 ordinary shares, £1 par, fully issued. Is registered in Peru.

The Ferrobamba property is one of the great copper deposits of the world. It is in central Peru at an elevation of 13,000' above the sea and about 45 miles west of Cusco, the terminus of the Southern railway, 500 miles from Mollendo, the seaport. The 207 claims are in 10 groups, covering 2,255 acres, all in the Ferrobamba district, Cotobamba province, Apurimac department, Peru. The deposits show oxidized ores of copper at the surface, underlain by sulphides largely bornite, and can be worked by steam shovels.

Property: includes valuable water-right concessions, from which it is planned to develop hydro-electric power, the rivers being fed by the melting snows of the Andes. The concessions include water rights to the Rio Chahuahuacho and several affluents, and application has been made for similar rights on the Rio Apurimac, about 23 miles in an air line from Ferrobamba No. 1. Including the last named concession, the available water power is rated at 120,000 h. p.

For purposes of development the property has been divided into 5 zones, or groups, known as Ferrobamba No. 1, Ferrobamba No. 2, Katanga, Charcas and Bonanza. Conditions are much the same at these different properties and it is thought that all can be worked opencast.

Ferrobamba No. 1, which includes Ferrobamba Nos. 1, 4 and 5, with area of 900 acres, has been the site of the principal development. This property shows an enormous mass of garnet rock, apparently of contact metamorphic origin, rocks being hornblende-biotite-granite and limestone altered into wollastonite by contact metamorphism for a remarkable distance, in many places up to 3,000' from any recognized igneous contact. Ferrobamba No. 1 is stated to carry 34 hectares of known copper ground, this area having a combined east and west length of 2,300', and north and south length of 1,640'; is estimated by the management to carry ore of payable tenor to a depth of 200', the contents being calculated by the management at 27,635,700 cu. yds., or approximately 12,000,000 tons of ore. Development is by a 100' shaft in chalcopryite and bornite ore assaying 6% copper, 3 oz. silver and 9 grains gold per ton. There is also a tunnel, used for a powder magazine, showing ore assaying 4.5 to 9% copper, and samples, at 2-meter intervals, for 100 meters, averaged 5.8% copper, 3 oz. silver and 9 grains gold per ton. Copper values, so far as determined by prospecting, are quite uniform, the average values of 3 oz. silver and 9 grains gold per long ton being remarkably constant. Churn drilling with Keystone drills in progress, from 1910 to 1912, together with underground

work in 15 tunnels and the shafts, has proved up 6,000,000 tons of ore averaging 3.7% copper and 1.3% sulphur.

Ferrobamba Nos. 2 and 3, 300 acres, constitute the Sulfobamba mine. Development to January, 1913, has proven 778,000 tons of ore carrying 2.25% copper, with 6.75% sulphur and 532,000 tons too low grade to work.

The Katanga or Reina de Cobre mine, area 300 acres, is estimated by Mr. Vautin as likely to rival Ferrobamba No. 1 in tonnage, though but little work has been done thereon. Surface ores, chalcopryrite and bornite, have given assays of 2 to 7% copper, 2 to 4 oz. silver and 8 to 16 grams gold per long ton.

The Charcas, which is the fourth group, is small, having an area of only about 25 acres. Mr. Vautin reports an orebody of 100 meters width and 800 meters length, carrying exclusively chalcopryrite, associated with pyrite, suitable for open cast workings, the whole visible face of a bluff of ore assaying up to 24% copper, with an average of 5% copper, 3 oz. silver and 9 grams gold per ton.

The Bonanza claims Nos. 1, 2 and 3, area 420 acres, lying 9 miles south of Ferrobamba No. 1, constitute the fifth group, known as the Bonanza mine. Surface conditions apparently are much the same as at the other properties, but no mining has been undertaken.

Development: in 1912 comprised 8,300' of tunnel or adit work and continuous operation of 2 churn drills.

It is stated that the oxidized surface ores as well as the sulphides are amenable to concentration. Extensive testing is reported to have shown that the ore concentrates 11 into 1 with 74% recovery of the product being a mixture of sulphide and oxidized minerals with 30% copper. Considering recent work by Arizona companies, this seems reasonable, and as the property can be worked by steam shovels, the deposit is workable. The discovery of iron-copper-sulphide ores in deposits 9 miles west of the mines, supplies a much needed source of sulphur. Property has been examined and reported on by Frank Klepetko and W. H. Wiley. In June, 1913, the property was closed down awaiting railway transportation and the company is exploring properties in the Chumbivilcas district, nearer the railway, held under option.

The company gave an option to Albert C. Burrage, of Boston, in 1911, providing for a new company, to be organized in New Jersey, capitalization of \$7,000,000, shares \$5 par, such new corporation to give to the Ferrobamba, Ltd., 420,000 shares, or \$2,100,000 in stock, and £250,000 cash, the balance of 730,000 shares, or \$3,650,000, to be subscribed, at par, for working capital, the cash part of the consideration, £250,000, to be payable in 4 equal annual installments, secured by mortgage debentures. This option was not exercised.

Making all due allowances for optimistic estimates, it is obvious that the Ferrobamba is a property of exceptional promise, with good prospects of making a very large low-grade mine, if adequately financed and skillfully managed.

MOROCCOCHA MINING CO.

PERU

Entire stock issued owned by Cerro de Pasco Corporation, and property described under that title.

WEST INDIES

2000

WEST INDIES

Including Cuba, Hayti, San Domingo. (See Porto Rico under U. S.)

CUBA

METAL MINES OF THE REPUBLIC

The following active mines are grouped by States:

Pinar del Rio

Asiento Viejo (copper).
El Brujo (copper).
Buena Vista Mining Co. (copper).
Cia. Minera de Cobre de Pinar del Rio y San Juan (copper).
Constancia (copper).
Francisco Mining Co. (copper).
Matahambre (copper).
Mercedita (copper).
San Gumersindo (copper).
Cia. Minera Occidental de Cuba (copper).

Matanzas

Jack (Chrome-iron).

Santa Clara

Carlota (copper and sulphur).
Mercedes (iron and copper).

Oriente

Cauto Mining Co. (manganese).
Cia. Mercantil de Credito (manganese and copper).
Cuba Copper Co. (copper).
Cuban Mining Co. (manganese).
Juragua Iron Co. (iron ore).
Ponupo Manganese Co. (manganese).
Spanish American Iron Co. (iron ore).

CUBA COPPER CO.

CUBA

Office: 2401-60 Wall St., New York. Mine office: El Cobre, Santiago de Cuba.

Officers: Benj. B. Lawrence, pres.; Colgate Hoyt, v. p.; I. W. Hunter, sec.; W. T. C. Carpenter, treas.; Edw. H. Emerson, gen. mgr.; Edw. B. Nagel, supt.

Inc. Jan. 5, 1907, in West Virginia, as successor of El Cobre Mines. Cap., \$2,000,000; shares \$100 par; in \$1,500,000 non-cumulative 6% preferred and \$500,000 common stock. Annual meeting, 1st Tuesday in March. Property being operated, in 1916, by the Cuba Leasing Co., a temporary organization arranged for financial purposes with same management as the Cuba Copper Co. Offices with Beer Sondheimer Co., 61 Broadway, New York.

History: was the first copper mine in the new world worked by white men; opened A. D. 1532 by the Spanish, the first copper from El Cobre mines having been used for casting Spanish cannon. Properties were taken over, about 1832, by a Hispano-English company, and ore was shipped to Swansea for reduction. The custom-house records of Santiago are said to show exports of 610,219 tons of ore, 1854-69, valued at \$50,186,225, probabl

in depreciated Spanish currency, the ore assaying from 12.69% upwards, and probably averaging about 16% in copper tenor. In 1844 El Cobre railway was built, the Queen of Spain being the principal shareholder. The property shows the remains of an old stamp mill. During the revolt of 1868-1878, the big Cornish pump was burned, flooding the mines, which remained idle until taken over, 1902, by the predecessor of this company. Immediately after the Spanish-American war, the property was denounced by F. D. Pagliuchi and financed by Wm. Astor Chandler and associates, who had much trouble handling the great amount of water and in opening up the orebodies.

The mine was finally unwatered in April, 1916, and the bottom level 1,120' deep found to show unoxidized chalcopryrite ore, averaging 8% copper in substantial widths, besides a large amount of low-grade ore amenable to flotation treatment.

Lands: 8 miles west of Santiago bay, show a mineralized zone of 200' width, traceable 6,500', carrying 3 parallel veins with much altered intervening rock. The mine is in a hill of rhyolite tuff agglomerate, of variable texture and appearance; the nearby hills are limestone, and diorite occurs to the south. The veins are confined to the rhyolite, only 2 are worked, the main or principal one being also called the South or "Middle" vein. The veins run E. to a fault which throws them 350' to the north. Ore occurs in pockets and shoots up to 80' across, in a vein of breccia, lying against a fault plane or mud slip. The gangue is altered rock and quartz. The ore contains much anhydrite and gypsum at 640' depth and below. Ore carries chalcopryrite, associated with pyrite, in a quartz gangue, the grains of chalcopryrite frequently being coated with covellite. Ore occurs in lenticular shoots. The oxidized zone is of 50 to 75' depth only, succeeded by sulphide ores averaging 4 to 5% in copper tenor, without either gold or silver in important quantities.

In the mine workings the oxidized ore extends deeper, and is underlain by semi-oxidized or tarnished ore, which gave much trouble in flotation work. The deeper ore is fresh chalcopryrite with pyrite.

Development: old workings were extensive, including some 40 shafts, with numerous remains of hoists and boilers. The 4 deepest shafts were about 1,000' each, with 17 miles of workings, timbered mainly with mahogany. The mine was found in bad shape, requiring heavy retimbering, as many of the old stopes, up to 20' and 30' in width, had caved. During the rainy season the mine makes 500 to 1,200 gals. per minute of strongly acid water, requiring pumps of bronze, with lead or wood-lined pipes. The mine has pumps with a combined capacity of 5,000 gals. per minute. Water from the mine was formerly run over scrap iron, producing considerable cement copper, but this has been discontinued, owing to cost and because the mine water formerly carrying 400 grams copper per ton now carries only 50.

The present company has sunk a 1,000' shaft at the footwall of the north vein and crosscut 400' S. to the vein. From this level winzes extend down to 1,300' in depth. Exploration consists in drifting along the vein with crosscuts at intervals to the hanging-wall.

El Cobre railroad, 9 miles long, connects the mine with Punta Sal, on Santiago harbor, and is equipped with 2 locomotives and 40 cars.

The reduction plant at Cobre includes a 600-ton concentrator with 4 largest size Hardinge mills for grinding the ore for the 700-ton flotation plant. Forces are about 450 men. Concentrates of about 16% copper tenor are shipped for smelting to the United States.

In this plant, "the ore is crushed dry by rolls, screened through 8-mesh and conveyed to the storage-bin. Four Hardinge and two ordinary tube-mills are fed from the storage-bin by individual Challenge feeders to insure equal distribution and regular feed, as the ratio of oil to ore is most important. Cresylic acid, carbolic acid, Mexican crude, and light asphalt oil are fed into the tube-mills by special machines. Grinding is done on a thick pulp, 25 to 30% moisture, until 65% will pass 60-mesh. The pulp

goes to the M. S. box without classification or re-grinding. Fourteen stirrers with 13 spitz-boxes are used. Direct concentrate is taken from as many boxes as show a good concentrate, the poorer froth being returned to the first box. Number of boxes treated varies with this and is changed by the operator who judges by eye. All the coarse tailing is roughed over Wilfleys to recover the coarse pyrite carrying copper. Caustic soda and fuel-oil are added as needed in the stirring-boxes. The various concentrates go to the classifier, the coarser product passing direct to the bins with about 8% moisture. The overflow is thickened and drained by an Oliver filter, giving about 20% moisture. The plant handles 600 tons per day and gives about 85% extraction of the insoluble copper in a 3% feed. It is interesting to note that with El Cobre ores using a cold neutral solution wood-products have not given any satisfaction. The concentrate carries 16% copper, 35% iron, 40% sulphur, and 9% silica." (Mng. Sci. Press, Jan. 22, 1916.)

Production: company is now milling about 600 tons of 3% ore daily. Property produces about 2,000,000 lbs. copper annually. (See "Mining in Oriente Province, Cuba," by Jos. T. Singewald and B. L. Miller, Eng. & Mng. Jour., April 1, 1916.)

LOS CERROS COPPER CO.

CUBA

Idle Office: Blackstone Bldg., Cleveland, Ohio.

Officers: W. I. Boardman, pres.; W. C. Watkins, v. p.; Sherman C. Dalbey, sec.; W. L. Rees, treas.; Col. D. H. Pond, gen. mgr.

Inc. Aug. 12, 1905, in Arizona. Cap., \$500,000; shares \$100 par.

Property: 2 claims, 100 acres, also 1,500 miscellaneous lands, near Fomento, Prov. de Sta. Clara, Cuba, opened by 3 shallow shafts and 5 tunnels, longest 250', showing ore assaying 10% copper, 20 to 25% zinc, 20% sulphur and 30% silica, with gold and silver values. Zinc apparently decreases at depth. The vein has a 12' to 15' gossan outcrop along its strike. Property is an antigua last operated in 1750. The ore though mostly low-grade and zinciferous can be concentrated and property is considered worthy of further development under competent direction.

MATAHAMBRE MINE

CUBA

Manuel Luciano Diaz, owner, Apartado 1795, Havana, Cuba.

Property: 8 kilometers from port of Santa Lucia, in province of Pinar del Rio, Western Cuba.

Geology: most orebodies in the region so far disclosed are found in shattered slates or shales in the foothills W. of the Sierra.

Development: to 1,000' depth. Reserves reported as sufficient for seven years' output. Exploration being continued. About 1,500 employed.

Production: began in Dec., 1913, and by April, 1914, company had shipped over 8,000 tons ore, averaging 18% copper and 1.5 oz. silver per ton. In 1914 nearly 6,000,000 lbs. copper were shipped. In 1915 production was about 40,000 tons of 12% ore; in 1916, 80,000 tons.

Concentrator to treat second-class ore being erected, 1917.

PONUPO MANGANESE CO.

CUBA

Offices: 71 Broadway, New York and Santiago de Cuba, Cuba.

Directors: Chas. F. Rand, pres.-treas., New York; Pedro Aguilera, v. p., Santiago de Cuba; Chas. F. Smith, sec.

Inc. in New Jersey. Cap., \$30,000; shares \$100 par; all outstanding. Gross earnings in 1915, \$567,800, of which \$315,748 was from iron ore sales. Operating expenses in 1915, \$250,568.

Property: company owns iron, manganese and copper mines, the iron mines being the only ones operated at present. They are worked as open quarries.

Production: in 1915, 72,387 tons ore, assaying 60% iron, silica 10%, phosphorus 0.015%. Average value ore shipped, \$4.44 in the U. S.

WEST INDIES MINES DEVELOPMENT CO.

CUBA

Address: 25 Broad St., New York.

Property: the Constancia and other copper mines near Viñales, Western

Cuba, and north of the Matahambre mine. M. Paetzold, Austrian consul at Habana, controls mines.

HAYTI AND SANTO DOMINGO

BLANTON COPPER MINING SYNDICATE

Office: The Bourse Bldg., Philadelphia, Pa. Mine office: Bucaro, San Cristobal, Santo Domingo.

Officers: E. J. Hedden, pres.; H. A. Smith, sec.; J. B. Thom, treas., with M. W. O'Boyer, A. D. Blackinton, J. F. Wilt, directors. F. T. Eddingfield, mgr., Santo Domingo; Otto Peterson, supt.

Inc. Feb. 16, 1910, in Delaware. Cap., \$500,000; shares \$25 par; non-assessable; \$360,000 outstanding. Authorized bond issue. \$400,000; \$180,000 outstanding. Annual meeting, 1st Monday in January. Total receipts from ore sales, from October, 1915 to July 15, 1916, amounted to \$45,196, or net cash, \$32,440, for 857 tons selected ore, the ore averaging 12.4% copper and \$1.60 in gold and silver. Shipments from January-July, 1917, totaled 231 tons of 12.78% copper ore. This ore is handsorted about 10 into 1. Property examined and reported on by the following Mining Engineers: F. Lynwood Garrison, Thos. F. Donnelly, Henry D. Adams, and F. T. Eddyfield.

Property: 1,700 acres, held under government concession, including the Bucaro mine, on the Rio Nigua, 27 miles west of San Domingo, bought of San Cristobal Mining Co. Property shows orebodies in limestone, near a porphyry contact, one orebody in the Bucaro mine carrying chalcopyrite, bornite and chalcocite, all auriferous and argentiferous.

Development: by tunnels, the work aggregating 3,500' in 1917. Company reports 35,000 tons ore blocked out and that property is near the profitable stage. The Ferdinand vein opened for 200' on No. 1 level is said to average 18' of 4% ore for 150', and has 25,000 tons nearly probable ore. The Santiago vein appears to be 40' to 80' wide and assays $\frac{1}{2}\%$ - $1\frac{1}{2}\%$ copper for levels 130' apart along 200' drift.

A 100-ton mill is to be erected and water power 7,000' from the mine, is said to be capable of development.

COPPER IN AMERICA

By WALTER HARVEY WEED

AN ADDRESS DELIVERED AT THE PAN-AMERICAN CONGRESS AT
WASHINGTON, D. C., 1916.*

Fifty years is but a brief span in the history of mankind yet it comprises practically the entire period in which copper has become and been an important factor in American industry and life.

Although the metal was known and used by the American Indians before the advent of Columbus and small deposits of the metal were worked by the early settlers, copper mining was an insignificant industry for the first 350 years after America was discovered. The history of copper mining in America can be fittingly divided into several periods. The first is the Colonial period, which in effect lasted until 1845 when the second, or Lake Superior period, began. In 1883 the Arizona and Montana mines began production ushering in a bonanza period in which very rich ores were mined, continuing with a gradual exhaustion of these extremely rich ores and a corresponding betterment in concentration and smelting methods until the advent of the present porphyry-copper period in 1904. These porphyry deposits have almost dominated the field since that time, though their total production is only equal to that of the Butte mines.

The colonial history of copper mining in America dates from 1692, when the metal was discovered at the pyrite deposits of Massachusetts, but the first copper mine in the United States was opened at Granby, Conn., in 1705. In 1709 a copper mining company was incorporated to work the copper ores near New Haven and in 1719 the deposits beneath the trap sheets of New Jersey, near New York City, were mined. The chief producer up to 1840 was, however, the Vermont copper mine at Ely in that State.

In 1844 the Lake Superior mines were opened and in 1849 dividend payments started and North American copper mining became an important industry. About this time the mines of Maryland were worked and in 1850 the Ducktown, Tenn., deposits were discovered and the rich black copper ores of the secondary enrichment zone were mined and shipped. Upon exhaustion of these rich ores, commercial failure attended all attempts to work the primary sulphides until such work was stopped by the Civil War.

In the British provinces copper was found on the Newfoundland coast in the early history of this, the oldest British colony in America, but it was not until 1865 that mining worthy of the name began. In Canada, the Bruce mines, opened in 1846, still await development, but important copper mining dates from the opening of the Sudbury deposits in 1886.

In Mexico copper mining and smelting were carried on by the Aztec races previous to the Spanish conquest, but modern mining dates from 1870 when the Boleo mines of Lower California were opened by the Rothschild interests.

In the past half century the economic rôle played by copper has changed from that of the tool of the savage, the domestic utensil and humble currency of the Roman, as well as its glorified use in art as bronze, to the indispensable metal of modern industry and twentieth century warfare. Its extraction from the earth's crust is a basic industry and

* Proceeding—Vol. VIII, section VII, Washington, 1917, p. 416.

like agriculture is of benefit to all for each pound added to the world's store is an actual contribution to the world's real wealth. In electrical uses, for alloys in particular for anti-friction metals and for brass, it is indispensable and has no substitutes. It is not too much to say that without it our cities would be dark, our streets quiet, our trains idle and shops closed.

The development of both the present day necessities and conveniences has been so rapid since 1880 that it is difficult to realize how important a part the metal has played in America.

Geographical Occurrence

The geographical distribution of copper ores in commercial quantities is quite different from the geographic occurrence of copper minerals. The latter are found in Newfoundland, in all the eastern provinces of Canada and in all but our southernmost and prairie States. Throughout this continental area there is a marked association of copper ores and either existing or planed down mountain sections. The Appalachian Mountain region from Alabama northward, like the Michigan Peninsula, is known to have furnished native copper to the Indians before the advent of Columbus, while in 10 relatively level States, including Florida and much of the central Mississippi Valley region, no copper minerals occur. Westward practically every mountain uplift contains copper minerals.

Ore deposits of copper, worked, working or workable, are less widespread. The Ducktown, Tenn., deposits are now the only important producers in the entire Appalachian region from Nova Scotia to Alabama. The Vermont copper mine at Ely; Ore Knob, N. C.; the Gossan lead of Virginia, once our most noted producers, have long been shut down. Sherbrooke in Quebec and Sudbury, Ontario, with the Michigan mines are practically the only active properties east of the Rocky Mountain Province.

Copper deposits occur throughout the entire length of the Rocky Mountain region, from Alaska through Canada, the United States and Mexico to the Isthmus of Panama. This region, the backbone of the Continent, with the Great Basin province and Pacific Coast section, includes the greatest ore bodies of the continent now being worked, yielding three quarters of the North American copper output. Throughout the arid desert region of New Mexico, Arizona and Nevada, every mountain range contains deposits of copper ore, most of them perhaps a reserve for future generations when new methods and economies, or advanced prices may make the working of such deposits profitable. The coastal region of Alaska and British Columbia contains three or four important producers and many, very many, undeveloped properties, but the greatest mines to-day are in the interior of the continent, from the Boundary and Rossland districts of Canada and the Butte mines of Montana southward.

At the present time there are but eight important copper producing States in the Union; Tennessee, Michigan, Montana, Utah, Nevada, Arizona, New Mexico, California, besides our great isolated territory, Alaska. Three other States, Colorado, Idaho, and Oregon are of minor importance as producers.

A similar association of copper deposits and geographic conditions prevails in South America, where the copper deposits are confined to the Andean Cordillera from Colombia south to the Straits of Magellan and to the lesser mountain uplifts which form the eastern border of the continent in Venezuela, Brazil and southward to the southerly tip of the continent owned by Argentina. This geographical association has been found

to be world wide and is as significant of geological conditions as of geographical relationships.

Though copper is so widespread in its geographical distribution, the world's supply of this metal comes from a few great deposits. There are less than 400 mines in the entire world producing as much as 100,000 pounds, or 50 tons of copper a year, an output normally worth about \$14,000. In the whole of North America there are but 21 really important copper producing districts, four of them in Canada; Sudbury, Rossland, the boundary district, and Maple Bay; one in Alaska; four in Mexico; and the balance in the United States, namely, Ducktown, Tenn.; the Michigan Peninsula; Butte, Mont.; Bingham, Utah; Ely, Nev.; Bisbee, Ariz.; Clifton-Morenci, Globe-Miami, and Ray in Arizona; Santa Rita in New Mexico; Shasta County, Cal., and possibly Yerington, Nev., comprise the entire list.

Political Economy

The political effect of the copper mining industry has been most important. The Michigan Copper Range was a wilderness of swamp and forest until the discovery of its nuggets and of huge masses of the native metal led to its settlement. At first sailing vessels and then steamships brought supplies and took away copper from a region that was snowbound and inaccessible during the half of the year in which Lake Superior was not navigable. The growing industry induced railway lines to build into this remote section of the United States, opening up a great extent of new country which after having supplied the entire United States with cheap pine lumber is now slowly but surely filling up with hardy farmers. The Copper Range itself now supports a population of over 100,000 people and its towns and settlements may well serve as a model for other mining camps.

In Nevada the Ely region, once the home of a few ranchers and its grass-grown hills the grazing ground for great herds of cattle, its nearest railway 70 miles distant, is now well settled, with its own railway line and steam shovels taking out 3,500 tons of ore a day, carried 20 miles to a mill and smelter plant. The mine payroll supports several busy, thriving towns containing about 8,000 people.

In Southern Arizona where the one transcontinental railway traversed the desert and had but scanty business throughout its course, the copper industry has built up new towns and branch lines, and induced the settlement of every spot where water is found. To-day the entire State feels the throbbing energy of the copper mines and smelters and the money paid for supplies and wages enriches in one way or another every home of the entire commonwealth. The copper industry has been the immediate and direct cause of the building of a new transcontinental line, bringing coal and supplies both for mining and for general use. Bisbee, Globe, Miami, Douglas, Clifton, and Morenci contain one-quarter of the population of the State, pay half its taxes, and support directly or indirectly over half the citizens of this our newest State.

An excellent illustration of the great influence copper mining has had on our national life is seen in Montana. Its copper output comes but from one place, Butte, a city of 70,000 people with four transcontinental railroads and four great electric power lines, bringing 40,000 electric horsepower to its mines. A monthly payroll of \$1,800,000, distributed to some 8,000 workers, results in a yearly output of metals worth \$78,639,000. A sister city, Anaconda, with 12,000 people, 27 miles distant, was built for and is supported by the reduction works where the Butte ores are treated.

Both cities are the market for enormous amounts of timber, coal, powder and other supplies, thus giving employment to double the number actually engaged in mine work. The five railways handle 193,000 cars of freight equal to 5,485 trains a year, carrying 8,640,000 tons. At Anaconda the reduction works, which cost \$15,000,000, treat 12,000 tons of ore, consume 2,300 tons of limestone, 500 tons of coke, and 550 tons of coal per day. Some 80,000 out of a total population of 400,000 are directly affected, one company alone, the Anaconda, employing 16,000 people and spending at average of \$30,000,000 a year in the State. These figures show the influence that an area 1½ miles long and one-half mile wide has upon the political economy of the State and indeed of the entire Nation.

That copper mining and copper production have increased wonderfully in the past 10 years is very generally known, but just how rapidly this increase has come about is not so well recognized. Statistics show so rapid an expansion of the industry that a copper famine has been predicted as likely to come in the near future. Without burdening the members of this Congress with production tables, it may be stated that in the first 10 years of the past century the world's production was only 91,000 long tons. This was increased by 5.5 per cent in the next 10 years, 40 per cent in the succeeding 10 years, 61 per cent the next decade, and reached a decennial increase of 99 per cent in the years 1881-1890. The average increase was 77.83 per cent for the last 20 years of the nineteenth century. In the United States a production of 650 tons in 1850, or of 37,650 tons for the decade following, had grown to a yearly output of 10,000 tons in 1867, 21,000 in 1877, and 81,017 tons in 1887, as Montana and Arizona both started production in 1883.

By 1897 the production had grown to 220,571 tons, almost doubled in 1908. The following year a full billion pounds of copper were produced and for 1915 that figure will seem small. An annual increase of 7 per cent in production is usually accepted as correct.

If these figures are plotted to scale with the years as abscissas and the production figures as ordinates, it will be seen that the production runs upward at so startling a rate as to justify the fear of a copper famine. My belief that this fear is unfounded is based on a knowledge of the immensity of the reserves of low-grade copper bearing material which can be called ore in the near future when improved and new methods of treatment, now being tried out, will lower working and reduction costs. Methods now actually in use on a commercial scale in experimental plants at Anaconda and at Butte, Mont., at Morenci and Miami, Ariz., in Michigan, and in other camps, make it certain that one per cent sulphide ore will some day be profitably handled, provided, of course, that the price of the metal stays at or above its normal average of 14 cents per pound.

It used to be said that it takes \$1,000,000 and 10 years' time to make a copper mine, but nowadays it takes 10 times that amount and half the time to make a really big producer. Should the Chuquicamata property in Chile and the Tanganyika mines of Africa fulfill their owners' expectations, the average decennial increase of 50 per cent will be taken care of for a while at least. The former property will in time treat even more than the mammoth daily tonnage of the Utah Copper Co.

About half of the American copper output goes abroad, much of it to England, whose copper mines, once regarded as the largest in the world, now yield but a scanty 150 tons a year. Germany, in later years our largest customer, and who is now using up her hoarded purchases in warfare, has already, we are told, bargained for new supplies to be

delivered when peace comes again. In fact not a nation of the Old World, save Spain and Portugal, produces copper enough for its own uses. The same is true of Asia. If hydroelectrical development, with its consequent expansion of industry, advances as rapidly abroad in the 10 years to come as it has done in the last decade, America's surplus copper will be as badly needed for peaceful uses as it is now for war munitions.

Prices

As is usual in most industries, increasing use and demand have been met by increasing production, which responds to increased price. This has been followed by gradually decreasing price, whose low average stimulates further increase in consumption. The history of copper prices conforms in general to this experience. The average price of Lake Superior copper from 1845 to 1910 was 14.19 cents per pound, but this figure does not tell the whole truth. Not only did prices vary wildly during that time, but the purchasing power of a dollar in 1845 and even in 1860 was nearly double that of to-day, so that a price of 24 cents in the early history of the country is quite different from 24 cents to-day. During our Civil War the price rose to a maximum of 55 cents per pound, averaging 47 cents for the year 1864. In the next year the price dropped 9 cents, 5 cents more the following year, with a further decrease of 9 cents in the succeeding 12 months. It rose again to 35½ cents in 1872, and showed a gradual decline in the next score of years, reaching a minimum of 9 cents in June, 1894. This is the lowest price yet reached by the metal.

In this connection it might be well to add that making no allowances for failures, but considering only the successful mines of the Lake Superior district, the actual cost of production of a pound of copper throughout a period of 65 years was 10.63 cents per pound and the companies have shown a dividend record equal to 3.56 cents per pound. With the advent of the porphyry coppers as producers, this record of low cost has been beaten, but it is safe to say that the average cost per pound of copper at all operating mines is to-day not much less than 10 cents per pound. A careful consideration of sales statistics and prices for the past 35 years when plotted shows that the average price of copper has been practically 14 cents. As both high and low prices are usually for relatively limited amounts of the metal, any average based upon these figures alone would be misleading. Yet even a geometrical average is merely a scientific guess as applied to the future since supply and demand must necessarily govern the price. If prices go down, the high cost producer must close down its mines. A rich company may produce the metal at a loss for a short period in order to keep its plant operating and its staff intact, but such operations are, of course, merely temporary. To tell the future price of the metal requires not only a knowledge of European conditions only known to a few, but also a consideration of the cost of production by the big producers and a forecast of interest rates for the years to come when surplus copper may be stored in periods of trade depression. There are, in fact, so many variable factors that the problem is almost hopeless if more than an estimate is desired. It is certain that the present high prices seriously curtail ordinary uses and teach consumers to turn to less desirable though usable substitutes. For many purposes sheet copper and copper coatings are used instead of solid metal, and in a multitude of small ways people are learning to do without copper and will continue to so do even when the metal prices fall. Fortunately, the electrical industries utilize more than one-half of

the total amount of copper consumed in America. For such purposes copper must be used whatever its price may be, the amount being only limited by the demand for electrical machinery and copper wires. A standard price of 15 cents a pound would be a boon to producers and consumers alike, and if our country would but stabilize the market, as was done abroad for zinc, this price, fair to all, could be maintained. Under pre-war conditions only the Europeans reaped the benefit of our lowest prices, owing to their ability and determination to combine against American producers.

Geology

As the metal combines with great facility with 36 other elements, it forms several hundred minerals, most of which are found in America. Notwithstanding this bewildering array of copper-bearing mineral species, many of them of wonderful beauty, the minerals of commercial importance are relatively few and in North America include a half dozen sulphides and as many ore minerals in the oxidized deposits of the metal. Contrasted with the rest of the world, American copper deposits are notable for the size and abundance of the native copper ores, and secondly, for the abundance and richness of copper glance ores. Bornite is common as an ore mineral and enargite, the sulpharsenide of copper, comparatively rare in other continents, is found in great abundance in Montana deposits. Gray copper, though a common ore mineral, is more characteristic of silver deposits than those of copper. Chalcopyrite, the usual and commonest copper ore mineral of European and, in fact, of most copper deposits outside of America, is of minor importance in most American copper districts outside of Tennessee, Ontario, and California. Oxidized ores rich in copper are characteristic of the shallow workings of the mines in Arizona and Mexico, where arid conditions prevail.

Probably 58 per cent of the American copper production comes from chalcocite ores, 7 per cent from enargite ores, 20 per cent from native copper ores, and the balance from the chalcopyrite ores of Nacozari, Sudbury, California, and Tennessee.

At present one may safely say that all the great deposits with promising outcrops have been discovered. It is, nevertheless, true that no two men will agree as to what is promising, and with increased experience certain minor hitherto overlooked characters become significant and indicative of good ore bodies below. Perhaps when these signs are correctly read, further great deposits will be found and opened up. At present, indeed, it looks as if all the really great deposits, readily recognizable as such, have been found and opened. It is certainly true that the big mining companies find it more and more difficult to get new mines that are up to their standard of size or rich enough for purchase.

Prof. Richards has aptly said: "It is a great thing to have a thousand million dollars worth of copper, but to the real geologist there is more satisfaction in knowing how the copper got there." Not many years ago the study of ore deposition was looked down upon by many scientists as a commercialization of science and the study a prostitution of one's talent. Our petrographers were formerly more interested in describing new rock species or writing technical descriptions of thin sections of rocks than in observing the obscure and more difficult phases of rock alteration by mineral-bearing solutions. To-day chemists, physicists, and the various specialists in geology realize that the complex problems presented by the study of ore deposits are worthy of a scientist's best efforts. Perhaps the best example of this is the study of the Clifton-Morenci district by Lindgren. In many cases the physiographer, paleontologist,

petrographer, and stratigraphic geologist are all needed and the chemists and physicists must be called upon for help.

The occurrence of copper minerals with particular rock types has been observed throughout the entire world. Early works on mining advised the reader to search for copper ores in the crystalline schists, the oldest, or supposedly oldest, rocks of mountainous regions. Increasing knowledge has shown that while copper deposits are found in nearly every kind of rock, most of the productive deposits now known are in igneous rocks and especially those of relatively late geologic age. Experience proves that metalliferous deposits are very frequently found in or near bodies of intrusive rocks. Practically all the dark-colored, basic, igneous rocks, including the traps, basalts, and other more distinctly ferromagnesian varieties contain copper. This has been established by reliable analysis, and further research has shown that the dark, iron magnesian silicates of such rock contain most, if not all, the copper. Similar analytical work indicates that on the contrary the silicious, igneous rocks, such as the granites, porphyries, and alaskites contain very little if any copper. The Hawaiian basalt is reported to average 0.18 per cent copper, with some samples carrying as much as 9.6 pounds per ton. The trap rocks of the Michigan Copper Range average 0.02 per cent, or four-tenths of a pound of copper per ton; the relatively basic Butte granite averages only 0.006 per cent.

Despite this well-known favoritism of copper for the basic rocks there are but two out of the many copper deposits of Pan America which occur in rocks of this character, namely, the native copper ores of Michigan and the nickel-copper deposits found in norite at Sudbury, Canada. The greater number of workable copper deposits of the American Continents are not only found in the relatively acid or silicious igneous rocks, but are genetically connected with them and appear to derive their copper content from such rocks. That this is the case is established by abundant and competent evidence. It is apparently strange that this should be so. The reason why is not generally understood, though it is equally important from the commercial as well as the scientific point of view. An explanation suggested is that the metal is well distributed in small quantities throughout the basic rock, but that only in exceptional cases has the cooling of such rocks been slow enough to permit of the segregation of the sulphides into separate masses through magmatic segregation. Such appears to be the case at Sudbury, Ontario, whose ores are in part simply basic rock containing unusually large amounts of chalcopyrite and pyrrhotite concentrated in the cooling magma and gathered along the margin of the mass. In the silicious rocks, on the other hand, fractional differentiation and crystallization have concentrated copper, together with boron, fluorine and water in the mother liquor, or residual quotient of the acidic magma. This part is still liquid, while the greater portion of the mass has solidified. This final product, which is also the most highly silicious, often corresponding to alaskite, appears to contain a relatively large amount of copper. Emanations from such material deposit copper ores associated with boron, fluorine, and often tourmaline.

In the scientific study of ore deposits America has, I believe, the foremost position. In Canada, the United States, and Mexico, close detailed study along the lines first used by King at the Comstock mines of Nevada, has built up a fund of information of inestimable value, since mining exposures are but ephemeral in character. This study has naturally been largely devoted to copper deposits which offer peculiar advantages for observation because of their varied mode of occurrence, easily recognizable minerals and of the chemical and physical properties of the metal.

The copper deposits of the continent present a very wide variety of types, though the really workable deposits are practically of but eight kinds and may be designated as the Sudbury, Tennessee, Michigan, Butte, Bisbee, Boleo, Shasta, and Ray types. To describe them even briefly would lengthen this paper beyond the time allotted. Though so varied in genesis, the practical miner would feel warranted in grouping them as pyritic lenses, limestone replacements, vein deposits, bedded veins, and last, but in tonnage much the greatest, the blanket deposits of the so-called porphyry, or disseminated area.

Lenticular deposits of pyritic ore were for a long period the world's chief source of supply; Rio Tinto, Spain, and Mount Lyell, Tasmania, are well-known foreign examples, and Sudbury, Ducktown, and the Shasta deposits would all fall within this division of the miners' classifications, though each has a different genesis. Limestone replacements are always genetically connected with igneous rocks and the accompanying metamorphic action, but as generally understood they form a distinct group which includes the Bisbee deposits, the Kennecott, Alaska, deposits and many others of lesser magnitude.

The Michigan native copper ores stand practically alone as impregnations of conglomerate beds and of the porous parts of interbedded, basaltic lava flows, fractured by movements along bedding planes. The study of these deposits carried on for so many years has not yet solved the mystery of the concentration of the metal in ore shoots, although it has shown the very wide spread occurrence of the metal, indicating that this peninsula has a reserve of low grade material possibly workable in the future that is greater than that of any other known locality in the world.

Vein mining is best exemplified in the great deposits of Butte, Mont., where quartz pyrite replacements of sheeted granitic rock carry immense bodies of glance and enargite ores, not only in the quartz vein matter but in the crushed, softened, and highly altered granitic rock. In the slightly later fault veins, similar ores occur in well defined shoots, separated by altered granitic material reduced to soft clay and breccia by attrition and fault movement, and it is notable that such ore shoots do not outcrop, nor come within several hundred feet of the present surface.

The limestone replacement deposits are but a phase of ore deposition accompanying or following igneous intrusion. They are usually found to be connected with disseminations and veins as parts of one ore bearing complex, but their great commercial importance warrants giving them separate mention.

The disseminated deposits, often called "porphyry" deposits, form a distinct class and one of great commercial importance. These deposits all occur in altered, usually granular acidic rocks or the schist bordering such intrusive masses. The deposits are blanketlike in form with a capping of valueless leached material from 50 to 300 feet thick. The ore bodies themselves are from 50 to 600 feet thick and of irregular but extensive area, that at Ray, Ariz., for example, covering 205 acres. Development shows that there is a gradual decrease in the percentage of copper in the ore downward, from 2 per cent or 3 per cent near the top of the ore blanket, to 1.3 per cent or even less at the lower limit of the enrichment. The transition to lean primary mineralization is often sharp, and within a few feet one may pass from the chalcocite ore to a relatively fresh rock peppered with tiny particles of pyrite and probably some chalcopyrite, the rock averaging about 0.5 per cent of copper. At the Miami field near Globe nearly 142,189,120 tons of ore have been developed by churn drilling and by underground work. At Ely, Nev., the

deposit contains 96,157,543 tons, and at Ray, Ariz., 108,873,226 have been blocked out, while at Bingham, Utah, the enormous total of 309,845,558 tons of ore has been blocked out. At the last-named camp 35,000 tons a day are mined, the ore carrying less than 1.5 per cent copper with 36 cents in gold and about 12 cents in silver per ton; all, these great ore bodies are the result of oxidization, leaching and reprecipitation of copper in a process generally known as secondary enrichment or secondary sulphide enrichment. The recognition of this process has been of direct practical benefit to the mining world and has done much to give geology a standing with the practical mining men. Though based upon chemical and physical factors its field study is geological work and its development due to geologists.

Secondary enrichment is the phenomena of sulphide formation from sulphates derived from the oxidization of lean sulphide ores. It is directly due to the formation of solutions in which copper is carried downward and precipitated by contact with pyritic material below. The process was first noted in copper deposits being named and described by the writer in 1899 and in 1900 by Emmons and Van Hise. It has been so generally established as true by mining operations that there is danger of its being applied where it has not taken place. Commercially secondary enrichment is not merely important but is often the determining factor between a payable mine and a worthless one. Scientifically it has stimulated investigation in chemical laboratories and by the aid of microscope, and has led to an amount of real research work that is not only of practical value but which is building up stone by stone a structure which, even if never completed, will endure as truth itself and will represent the science of mining geology.

In the light of our present knowledge, the adjective secondary is objectionable, for our richest copper ores are often Tertiary and even Quaternary in character. The copper ores lend themselves more readily to a study of enrichment processes than those of any other metal, for copper is not only readily soluble and in such state forms new compounds with great facility, but it also occurs in a wide variety of minerals, more so than any other metal. The bright color of its commoner oxidized minerals and the brilliant luster and tints of its sulphides make it an ideal material to study with the reflecting microscope.

We now know that the secondary sulphide ore so generally understood to be the product of secondary sulphide enrichment must be distinguished from a similar ore due to other processes and from primary chalcocite. The secondary enrichment processes as generally understood are but a phase or feature of oxidation, sulphide enrichment being contrasted with oxide enrichment, a term including the formation of the carbonates, oxides, and other oxidized ores of copper. A second and equally important form of sulphide enrichment discovered and enunciated several years ago, but apparently overlooked by many students, is an enrichment by ascending and probably heated waters. It is only since the metallographic microscope has been applied to the study of ores that the many changes and replacements of one mineral by another with gradual enrichment of the ore could be satisfactorily studied. This work is yet under way and its results not yet conclusive, but enough is known to be certain that pyrite is altered to chalcocite by descending copper sulphate waters and that this is the characteristic mineral of secondary enrichment deposits. Its development is dependent upon rainfall and climate, water level, associated minerals, rock texture and fracture. It is notable that the deposits of positively known primary origin consist of the copper-

iron sulphides, bornite and chalcopyrite; those of secondarily enriched ores mainly of chalcocite and covellite.

The enrichment of ore bodies through the action of uprising thermal waters, whether of magmatic derivation or otherwise, is a feature to which attention was called by the writer some years ago. Recent studies of Butte ores have shown that enargite is a primary mineral, altering to bornite and this in turn to glance. Such enrichment is secondary just as truly as that due to oxidation and the reaction of descending waters on pyritic material, yet these ores are deep seated and appear at depths of over 3,000 feet in the Butte mines.

This activity of thoughtful men along the various lines of research involved in a study of copper deposits and technology has naturally led to the formulation of theories of ore genesis. The generally accepted view to-day seems to be that most copper deposits are derived from igneous magmas and that such masses of molten matter within the earth's crust have given off sulphide emanations, such emanations being emitted both during and after intrusion—that is, before, during, and after consolidation. Chemical and physical work in recent years indicates that such mineralization took place under great, gaseous and hydrostatic pressure, forming a zone of contact metamorphism about the igneous mass and proceeding outward in fractures to form veins. As stated by Lindgren, we know the result, but as yet know but little of the physical condition or chemical character of the mineralizing vapors and gases. To the writer the theory of genesis proposed by Spurr and illustrated by the ore occurrences at the Dolores mine, San Luis Potosi, Mexico, appears to be the most acceptable and reasonable explanation of the phenomena of ore occurrence yet advanced. It explains the orderly zonal arrangement of the various metallic ores about an igneous center as due to the agency of highly heated solutions under great pressure coming from a supposedly deep igneous hearth or center of magmatic differentiation and rising through already consolidated granitic rock. According to this theory the copper ores are deposited nearest the igneous center, zinc-lead ores next, and gold-silver ores in the outer zone, with transitions connecting each zone. With a deep-seated center these concentric zones would form shells and bring about an orderly, vertical distribution of different metallic ores in mineral veins. This conception is not entirely new, for it is well illustrated by the figures and descriptions of the Cornish copper and tin mines given by Collins and others. It is essentially the zonal theory suggested by Sales for the ores of Butte, Mont., and extended to cover the borders of the great area of granitic rock known as the boulder batholith. It does not explain the origin of the great sulphide ore bodies of Shasta, Cal., which some observers think are segregations out of an alaskite shell lying over a less silicious batholith.

Investigation of copper deposits has perhaps involved no greater scientific activity and research in physics, chemistry, and geology than that devoted to the technology of copper, but the commercial importance of the latter work has undoubtedly overshadowed its scientific worth. Indeed until very recent years investigators in the employ of vast industrial enterprises, such as smelters, copper refineries, and the testing laboratories of the great consumers of the metal, have not been given authority to make public their researches. There is now a broader view of such work and a spirit of reciprocity which will, it is certain, save much duplication of research and enable many a student to take up a line of work where another left off.

The technology of the metal shows truly wonderful changes in the

smelting industry in the past 40 years or less which have passed since copper became an important factor in American life and industry. These advances in treatment of ore and metal have resulted in lower costs, which in turn permitted mining lower-grade ores, making available great deposits hitherto valueless. It is to the metallurgists and mill men, the chemists, and mechanical engineers to whom we really owe the greatly increased copper production of recent years. It is these men who have lowered its price, thus permitting the development of the trolley, telephone, electric light, and power industries of to-day, not to mention the myriad lesser uses to which the metal is put. Thus engineering chemistry, not geology, nor simply mining and mechanical engineering, has been the mainspring of the copper movement.

In the milling of the ores, ore dressing, as it is properly called, Mr. Richards and others have applied scientific methods and study and have brought this branch upon a firm, rational basis. Concentration is to-day no longer the haphazard or empirical science it formerly was. Recently froth flotation, in which the heavy ore minerals are floated off and the lighter valueless ones sink, has solved the slime loss, that nightmare of former years. Indeed it has done more than this, for the process has made it possible to treat certain ores hitherto valueless and to handle material formerly thrown over the dump, run off as tailings, or in many properties left underground.

In copper smelting the changes have been most radical. The evolution of the mammoth blast furnace of to-day from the rectangular stone and brick furnace of half a century ago has been brought about by the introduction, first, of water-cooled tuyeres used to carry the blast into the zone of melting and then of water-backed iron plates to replace the stone and brick lining of the smelting zone. The soapstone and brick furnaces of Ducktown, Tenn., handled only 10 to 12 tons of ore per day and had a blast period of six to eight weeks. This type was replaced in the early eighties by iron and steel water-jacketed furnaces. These "black copper" furnaces proved immensely successful while the supply of rich oxide ores from Arizona and the bonanza glance ores of other places lasted. During this period America became, as Peters puts it, "a school of practical metallurgy whose students, unlike those of Germany and the European continent generally, were unhampered by tradition, theory, or study." These practical men soon saw the necessity of employing chemists to make careful analysis and studies of slags, fluxes, and fuel, and our modern American metallurgy began. The invention of the external forehearth for the cleaner separation of matte and slag was the first notable result of this work. Then came the increased size of furnaces, the introduction of bessemerizing and, in 1904 or 1905, the successful introduction of pyritic smelting, attempted 10 or more years before, but not commercially profitable. In the majority of our reduction works part pyritic smelting is used in most blast furnaces.

The size of the blast furnaces has kept on increasing until at Anaconda furnaces handling 400 tons a day and having a smelting zone 56 inches wide by 180 inches long have had their ends removed and stacks connected, making great furnaces 87 feet long and having a daily charge of 3,000 tons of lump ore. In reverberatory practice the furnaces have also increased in size and efficiency. Furnaces 118 feet long are no longer a novelty, and charging from the top has corrected corrosion and made the furnace so efficient that once more our furnace men are talking as if the blast furnace was destined to go into the scrap heap. In this era of change the hitherto wasted heat of the furnace is now

everywhere utilized to make steam. The contact process has made the gases, which once poured out of the stacks to kill the vegetation of whole counties, a great source of revenue at certain favored localities. The sulphuric acid made from these gases is now used in manufacturing fertilizers, thus repaying agriculture for the damage formerly done by the fumes. Science has done more, for the Cottrell process now clears the smelter smoke of its metallic dust by electrical current, much as the dust and haze of a summer day is cleared away by the lightning flashes of a thunderstorm, though without the accompanying rain. The resulting product or dust is successfully utilized in making arsenic, bismuth, and other useful products. Electrolytic refining, experimentally proven in 1847, first successfully applied in Wales in 1869, did not become a really important factor in the copper world until it was introduced in America in 1883, since which time it has grown in importance, until now 80 per cent of the American production is electrolytic copper.

When so much has been done in a brief period of less than half a century and many brilliant minds are now working on the problems of the industry, no one but a dreamer can foresee the future. As copper mining has developed great communities and been a pioneer in the settlement of our far West, once shown on our school geographies as the great American Desert, one may hope and confidently expect similar results in Mexico, Peru, Bolivia, Ecuador, and Chile, countries as rich or richer, than our own in this metal and all destined for great places in the future history of the Americas.

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Property: 70½ acres in the Cripple Creek mining district, including Elkton and Tornado mines developed by three shafts to a depth of 1,350'. Has been a prominent operator for a great many years. For geology of the Cripple Creek district, see 16th Ann. Rept. of Colo.; also U. S. G. S. Bull. 260, 1915, pp. 85-98. Orebodies occur at vein intersections in vicinity of phonolite dikes.

In 1915, after careful investigation it was found by a new management that very little ore was in sight and it was mostly low-grade; that during 1914-15 the company had made no profits, had exhausted its treasury surplus, was about \$70,000 in debt and doing business largely upon credit; that general expenses amounted to \$1,500 per month and mining operations were being run at a loss of \$3,000 to \$4,000 per month.

Development: work in 1916 totaled 7,498', without discovering any additional orebodies of value. Management states that the prospects of finding merchantable ore below the 1,000' level do not warrant further exploration work and that therefore, since Jan., 1917, company has confined itself strictly to leasing.

Fifteen sets of leasers operating, 1917, shipping 500 tons \$20 ore per month.

Production: in 1916 amounted to 9,622 tons by the company and 10,511 tons by lessees, having gross value of \$104,405 and \$175,279, respectively.

In March, 1917, the "Independent Stockholders Committee" was formed with W. M. Downing, chairman; K. Macdermid, vice-chairman, and C. J. Starke, sec., for the purpose of changing the management of the company. The committee asserts that the El Paso mine has been worked for the benefit of the Golden Cycle Mng. & Red'n Co., and that if a flotation mill had been built, company could have mined its large reserves of low-grade ores, instead of sending only the high-grade to the Golden Cycle mill.

Committee also charges that the present management has shipped over 80,000 tons of El Paso ore to the Golden Cycle mill, averaging \$8-\$11 a ton, on which treatment charges of \$4 and sorting charge of \$1 were paid, whereas, if a flotation mill had been built, the company might have treated its ores at \$1 a ton and made a handsome profit.

Report on property by Louis S. Noble, sent out in 1917, is far from encouraging and unless some radical changes are made, stockholders will never receive another dividend.

Management is considering the advisability of a flotation mill and also of a cyaniding mill for treatment of the dump and low-grade ore in the mine.



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